FINAL PROGRAM

CORS/INFORMS Montréal

Montréal

BRIDGING CONTINENTS and CULTURES

Spring 1998 • April 26-29

www.informs.org/Conf/Montreal98

Sponsored by:
Canadian Operational Research Society/Société Canadienne pour la Recherche Opérationelle (CORS/SCRO)
and the Institute for Operations Research and the Management Sciences (INFORMS)

OPTIMIZE YOUR CHOICE OF MODELING TOOLS

Spreadsheets, modeling languages and custom programs.
Only Compass gives you the best of all three worlds.

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•Enhanced solvers for spreadsheet modeling in Microsoft Excel

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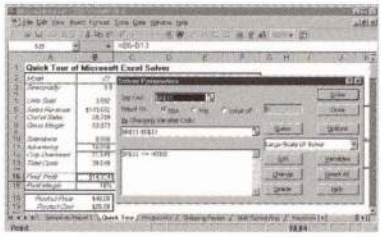
USE SPREADSHEET MODELING WHEN...

•Management familiarity with spreadsheets will help you communicate about your model and its results

•Spreadsheet-literate users want to "play" with the model

•The data for the model is conveniently available in spreadsheet form



•Easy charts and graphics will make your results more vivid

•Prototyping or demonstrating your model quickly with the free built-in solver is desirable

USE A MODELING LANGUAGE WHEN...

•A complex, multidimensional model calls for a powerful expressive language

•Error checking and model validation are especially important

•Need for easy maintenance and model reuse calls for separating model and data

•Model dimensions (e.g., numbers of products, regions, time periods, etc.) will change

•A large amount of data makes a spreadsheet model too cumbersome

USE A CUSTOM PROGRAM WITH A LIBRARY SOLVER WHEN...

•Greater efficiency is achieved by exploiting special features of the model or solver

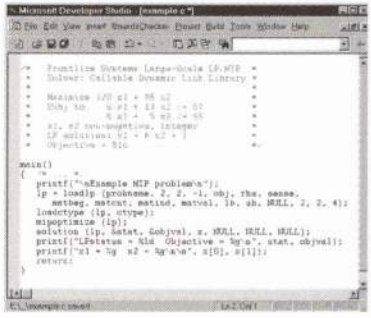
•Solution time is critical, or the model will be run frequently

•A custom interface is needed for user input, data extraction or display of results

•The model needs to operate in a special hardware or software environment

•The application is to be shipped in high volume or where the cost of support and maintenance is a key factor

The tools from Compass are the best. If you are a specialist in optimization, working either within a company or



institution or as an independent consultant, join your colleagues and get to know Compass Modeling Solutions. Find out now–before your next project–what Compass has to offer, and how you can benefit. Call, fax, or e-mail us today. Visit our world-wide web site. We will make sure that you have the best tools at your disposal.

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TOOLS of the Trade

AVAILABLE NOW

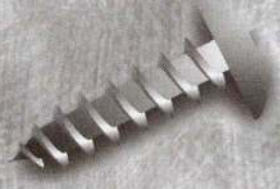
Anderson/Sweeney/Williams
Quantitative Methods for Business, 7e

Markland/Vickery/Davis
Operations Management, 2e

Ragsdale
Spreadsheet Modeling and Decision Analysis, 2e

Gido
Successful Project Management

SOUTH-WESTERN College Publishing



COMING SOON

Anderson/Sweeney/Williams
Statistics for Business and Economics, 7e

Anderson/Sweeney/Williams
Contemporary Management Science with Spreadsheets

Evans/Lindsay
The Management and Control of Quality, 4e

Gaither
Production Operations Management, 8e

Gerbing
Relevant Business Statistics: Using Excel

Bell
Management Science/Operations Research: A Strategic Perspective

Morton
Production and Operations Management

Eldredge
An Excel Companion for Business Statistics

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MESSAGE FROM THE GENERAL CHAIR

On behalf of the INFORMS Spring 1998 organising committee, it is my pleasure to welcome you to Montréal. The theme of this conference is ***Bridging Continents and Cultures***. It reflects Montréal's position in the OR community, both geographically and culturally. Being the second largest French speaking city in the world, Montréal has been considered a bridge between Europe and North America. Europeans and North Americans both see it as a modern North American city with European charm.

You will find that most Montréalers are bilingual and very hospitable. The conference hotels are situated right in the middle of the downtown area, where all the action is. Ste-Catherine Street, just two shorts blocks North of the Queen Elizabeth Hotel, is the city's main shopping street. It is lively during the day and the evening, and is well known for its traffic jams at 2:00am during the weekends! Montréal also has the highest ratio of restaurants for its population. Whether your preference is haute cuisine, ethnic cuisine or anything else, you will find it here: just ask any local person for advice on where to dine, and you will get a dozen suggestions that will suit your tastes. The weather can play tricks on us, but Montrealers have learned to live with its capricious ways. When the sun comes out in spring, they flock to outdoor cafes and bistros, and when rain pours, they go in the underground network that connects hotels, apartment buildings, shopping malls, museums and theatres. So, whatever Mother Natures reserves for the end of April, you can still have a great time.

Over the years, the Operations Research community in Montreal has established links with researchers in North America and researchers in the rest of the world, particularly in Europe and in South America. We have made special efforts in extending the invitation for this conference to researchers outside North America. We hope that to you will take this occasion to see different ways of solving problems and to establish new contacts that will lead to long-term cooperation.

The local committee has been working hard for over two years to make this meeting a success. Jean-Marie Bourjolly, our Program Chair, has prepared a great program, with the help of Michel Gendreau and Theo Crainic, the Sponsored and Invited Papers Co-Chairs, Frédéric Semet, the Contributed Papers Chair and Gilbert Laporte, the Tutorials Chair. Ben Smith, the Arrangements Chair, Sophie Lapierre, the Publication Chair and Corinne Berneman, the Publicity Chair, have done all the support work, that is less visible but as important. Finally, Clairette Simard, the Administration Chair, has handled the tedious office and accounting work. I thank them all for the outstanding work they have done.

We have decided to break with recent tradition, and go back to older tradition. We have always felt that the INFORMS meetings were the occasion to sample the culture of the host city and we believe that many members arriving on Saturday will take advantage of Sunday to visit the area. For this reason, all of the regular sessions are held on Monday, Tuesday and Wednesday. As always, some special events will be held on Sunday. We hope that most of you will take advantage of what Montreal has to offer: its historical sites, its art, its restaurants, its nightlife and enjoy mingling with the local people to have their *joie de vivre* rub off on you.

It is up to you, now, to build your own bridges across continents and cultures.

Paul Mireault
General Chair

Back diagonal: Frédéric Semet, Teodor Crainic, Michel Gendreau
Middle diagonal: Gilbert Laporte, Clairette Simard, Jean-Marie Bourjolly, Ben Smith
Front diagonal: Sophie Lapierre, Corinne Berneman, Paul Mireault

GOUVERNEMENT DU QUÉBEC

MESSAGE DU PREMIER MINISTRE

Québec, le 26 avril 1998

*Je souhaite une cordiale bienvenue à celles et ceux qui participent aux congrès annuels de la Société canadienne pour la recherche opérationnelle et de l'*Institute for Operations Research and the Management Sciences, INF*ORMS 98, tenus conjointement à Montréal.*

Je suis persuadé que cette importante rencontre des étudiants, professeurs, chercheurs et autres travailleurs qui oeuvrent dans le domaine des sciences de la gestion et de la recherche opérationnelle ou dans des secteurs connexes donnera lieu à des échanges intéressants.

Espérant que vous aurez le plaisir de découvrir les nombreux charmes et points d'intérêt de la métropole, je vous souhaite un bon congrès et un agréable séjour à Montréal.

Lucien Bouchard

I wish a warm welcome to those arriving in Montréal to take part in the joint annual congresses of the Canadian Operational Research Society and the Institute for Operations Research and the Management Sciences, INFORMS 98.

I am convinced that this key gathering of students, professors, researchers and other workers involved in the management sciences, operations research and related sectors will give rise to fruitful discussions.

In the hope that you will have the pleasure of discovering the many charms and points of interest of Québec's largest city, I wish you a fine convention and a pleasant stay in Montréal.

PRIME MINISTER · PREMIER MINISTRE

C'est avec plaisir que j'adresse mes cordiales salutations à tous ceux et celles qui assistent à INFORMS 98.

Les objectifs de cette rencontre, qui se déroule sous le thème ***Établir des ponts entre les cultures et les continents****, sont de vaste envergure. Grâce à votre apport et à votre savoir-faire, vous enrichirez grandement les discussions et les nombreuses activités qui sont prévues. Je suis persuadé du reste que vous vous réjouirez de cette occasion qui vous est offerte de partager idées et expériences avec nombre de gens qui s'intéressent à une question des plus actuelles.*

Je vous souhaite des délibérations agréables et fructueuses.

Jean Chrétien

I am delighted to extend my warmest greetings to everyone attending INFORMS 98.

The goals of this gathering, which focus on the theme ***Bridging Continents and Cultures****, are far-reaching; the discussions and many activities that are planned will benefit greatly from your input and expertise. I am certain that you will enjoy the opportunity to share ideas and experiences regarding this timely issue with fellow participants.*

Please accept my best wishes for a most enjoyable and productive session of deliberations.

Ville de Montréal

Bureau du maire

Cher participant,

À titre de maire de Montréal, j'ai le plaisir d'accueillir les 2000 congressistes du Congrès sur la technologie et les systèmes d'information, organisé conjointement par la Société canadienne pour la recherche opérationnelle et l'Institute for Operations Research and the Management Sciences.

Le thème de ce congrès, *Bridging Continents and Cultures*, décrit parfaitement Montréal, ville multiculturelle et ancienne colonie française du Nouveau Monde qui, depuis 356 ans, relie les continents nord-américain et européen.

Ce congrès permet également un apport important à la mondialisation du savoir. En effet, les passionnés de technologie et de systèmes d'information, viennent y partager leurs idées, présenter le résultat de leurs recherches et débattre de questions complexes. Grâce à des conférenciers éminents et animateurs venus, entre autres, de la Belgique, de Chypre, de l'Inde, de l'Italie, de la Pologne et des États-Unis, ce congrès constitue un véritable lieu de rencontre où les sciences de la gestion et de la recherche opérationnelle sont à l'honneur.

J'espère que votre congrès sera des plus agréables et je vous invite à découvrir les nombreux attraits de Montréal, une ville aux multiples facettes et une métropole nord-américaine au charme européen où il fait bon vivre. Montréal, coeur culturel du Québec et destination touristique populaire, regorge d'attractions qui plairont à tous.

Les amateurs de gastronomie auront l'embarras du choix parmi les 5000 restaurants de Montréal, dont les plus courus se trouvent dans le Vieux-Montréal et le centre-ville, tandis que les aficionados d'art pourront découvrir les 160 salles de concert, les 25 musées et les 150 théâtres et troupes de danse qui animent le coeur de notre ville.

Peu importe votre choix, je vous souhaite un séjour agréable et un congrès des plus réussis.

Le maire,

Pierre Bourque

Ville de Montréal

Bureau du maire

Dear participant:

As Mayor of Montréal, it gives me great pleasure to welcome the 2,000 delegates attending the conference on Information Systems and Technology, held by the Canadian Operational Research Society and the Institute for Operations Research and the Management Sciences.

The theme of this joint convention, *Bridging Continents and Cultures*, is particularly suited to Montréal, a multicultural city that has bridged the North American and European continents ever since its beginnings 356 years ago as a French colony in the New World.

This conference, too, is a vital link in the international bridge of knowledge, bringing together all groups with an interest in information systems and technology to discuss their views, debate issues and present research results. With distinguished speakers and tutorial leaders from around the world - Belgium, Cyprus, India, Italy, Poland and the United States to name just a few of the countries represented here - the Montréal meeting is truly an international forum for the operations and management sciences.

While I hope that your discussions and meetings are productive, I also would like to invite you to take in Montréal's many attractions. The city is a unique blend of cultures, a North American metropolis with a French flair for "joie de vivre". It is also the cultural heart of Québec and a world-class tourist destination that has much to offer in the areas of recreation and entertainment.

Some of the best of our 5,000 restaurants, responsible for Montréal's reputation as a culinary capital, are found in the historic and downtown areas; while aficionados of the arts may choose among 160 performance halls, some 150 theatre and dance troupes and 25 museums spread throughout the city.

Whatever you choose to do, I wish you an enjoyable stay and a most successful conference.

Pierre Bourque
Mayor

SCHEDULE OF SPECIAL EVENTS

SATURDAY, April 25	LOCATION	FROM	TO
Organization Science Workshop	Peribonca (QE)	8:00am	5:00pm
Edelman Rehearsal	Duluth (QE)	8:00am	5:00pm
IFORS Adminstrative Committee	Frontenac (BH)	8:30am	6:00pm
INFORMS Executive Committee Meeting	Studio 350 (QE)	1:00pm	5:00pm
SUNDAY, April 26			
Registration	Galerie Foyer (QE)	7:30am	2:00pm
Teach the First MS Course Workshop	St. Charles (QE)	8:00am	12noon
OR for Deregulated Power Industry Workshop	Matapedia (QE)	8:00am	12noon
Teacher Program	Saguenay (QE)	8:00am	4:00pm
Organization Science Workshop	Peribonca (QE)	8:00am	5:00pm
Franz Edelman Competition	Duluth (QE)	8:00am	6:00pm
INFORMS Board	Mackenzie (QE)	9:00am	5:00pm
Marketing OR Workshop	St. Charles (QE)	1:00pm	5:00pm
Nonparametric Methods Using Ranks Workshop	Matapedia (QE)	1:00pm	5:00pm
RASIG Roundtable	Gatineau (QE)	1:00pm	5:00pm
Presentation Skills Tutorial	St. Laurent (QE)	1:00pm	5:00pm
INFORMS General Membership Meeting	Jolliet (QE)	4:00pm	5:30pm
Nicholson Student Prize Session	Richelieu (QE)	4:00pm	6:00pm
Conference Registration	Galerie Foyer (QE)	4:00pm	8:00pm
Nominating Assembly	Chaudiere (BH)	5:00pm	6:00pm
MAS Council	Meetings Suite	5:00pm	7:30pm
Roundtable Reception/Dinner	Harricana (QE)	6:00pm	8:00pm
MSOM Reception	Lachine (BH)	6:15pm	7:15pm
Forum on Women in OR/MS Reception	St. Maurice (QE)	7:00pm	9:00pm
Student Reception	Duluth (QE)	7:00pm	9:00pm
Information Systems & Technology Conference Reception	St. Francois (QE)	7:30pm	8:30pm
Roundtable Meeting	Peribonca (QE)	8:00pm	11:00pm
MONDAY, April 27			
Board/Editors/Committee Chair Breakfast	Beaver Club (QE)	7:00am	8:00am
Conference Registration	Galerie Foyer (QE)	7:30am	5:00pm
Roundtable Meeting/Lunch	Peribonca (QE)	8:00am	5:00pm
INFORMS Board Meeting	Mackenzie (QE)	8:00am	5:00pm
Guest Breakfast	Montréalais (QE)	9:00am	10:00am
Welcoming Session & Awards	Grand Salon (QE)	9:45am	10:45am
Omega Rho Distinguished Lecture Plenary	Grand Salon (QE)	11:00am	12noon
OR Area Editors Lunch	Studio 378 (QE)	11:30am	1:00pm
Omega Rho Committee Meeting	Matapedia (QE)	12noon	1:00pm
Transportation Science Lunch	Studio 380 (QE)	12noon	1:00pm
JOC Lunch	Publications Suite	12noon	1:00pm
Section Subcommittee Lunch	Beaver Club (QE)	12noon	1:00pm
ACORD Lunch	Suite 2120 (QE)	12noon	2:00pm
Academic Practitioner Meeting	Studio 374 (QE)	2:45pm	4:15pm
Section/Society/Fora Meeting/Reception	Beaver Club (QE)	5:15pm	6:15pm
D.H. Wagner Prize Judges Panel	Studio 374 (QE)	5:30pm	6:00pm
CPMS Isolated Practitioner Workshop	Duluth (QE)	6:15pm	7:15pm
INFORMS On-Line Reception	St. Leonard (BH)	6:00pm	7:30pm
INFORMS General Reception	Grand Salon/Marquette	7:30pm	9:30pm
TUESDAY, April 28			
Chapter Breakfast	Suite 2120 (QE)	7:00am	8:00am
Conference Registration	Galerie Foyer (QE)	7:30am	5:00pm

Chapter Subcommittee Meeting	Suite 2120 (QE)	8:00am 9:00am
CPMS Council Meeting	Studio 380 (QE)	8:00am 12noon
Guest Breakfast	Montréalais (QE)	9:00am 10:00am
Franz Edelman Award Presentation	Jolliet (QE)	11:30am 12noon
Subdivision Committee Meeting	Studio 2120 (QE)	11:30am 5:00pm
Education Committee Meeting	Studio 374 (QE)	12noon 1:00pm
Franz Edelman Award Luncheon	Montréalais (QE)	12noon 2:00pm
WEDNESDAY, April 29		
Conference Registration	Galerie Foyer (QE)	7:30am 3:30pm
Guest Breakfast	Montréalais (QE)	9:00am 10:00am

SCHEDULE OF SUBDIVISION BUSINESS MEETINGS

SUNDAY, April 26	**LOCATION**	**FROM TO**
Railroad Applications SIG	Gatineau (QE)	5:00pm 6:00pm
Consulting Forum Organizational Meeting	St. Laurent (BH)	6:15pm 7:15pm
Section on Location Analysis	Marquette (QE)	6:15pm 7:15pm
Section on Logistics	Verdun (BH)	6:15pm 7:15pm
Section on Mgmt. Control Systems	Studio 350 (QE)	6:15pm 7:15pm
Section on Mgmt. of Productivity & Technology	Studio 359 (QE)	6:15pm 7:15pm
Minority Forum Organizational Meeting	St. Michel (BH)	6:15pm 7:15pm
Statistics & Quality Section	St. Leonard (BH)	6:15pm 7:15pm
Technical Section on Telecommunications	Outremont (BH)	6:15pm 7:15pm
College on Information Systems	St. Francois (QE)	6:15pm 7:15pm
MONDAY, April 27		
Forum on Women in OR/MS	Bersimis (QE)	12noon 1:00pm
Section on Applied Probability	St. Laurent (BH)	6:15pm 7:15pm
Section on Aviation Applications	Hampstead (BH)	6:15pm 7:15pm
Computer Science Technical Section	Lachine (BH)	6:15pm 7:15pm
Decision Analysis Society	Cote St. Luc (BH)	6:15pm 7:15pm
Section on Finance	Studio 350 (QE)	6:15pm 7:15pm
Section Group Decision & Negotiation	Trembles (BH)	6:15pm 7:15pm
Technology Management Section	St. Charles (QE)	6:15pm 7:15pm
Section on Mfg. Mgmt. & Service Ops. Mgmt.	Richelieu (QE)	6:15pm 7:15pm
College on Marketing	Studio 359 (QE)	6:15pm 7:15pm
Military Applications Society	Fundy (BH)	6:15pm 7:15pm
College on Organization Science	Studio 366 (QE)	6:15pm 7:15pm
Transportation Science Section	St. Laurent (QE)	6:15pm 7:15pm
TUESDAY, April 28		
Section on Accounting, Auditing & Tax	Studio 350 (QE)	6:30pm 7:30pm
College on Artificial Intelligence	Westmount (BH)	6:30pm 7:30pm
Section on Energy, Natural Resources & the Environment	St. Michel (BH)	6:30pm 7:30pm
College on Optimization	Studio 359 (QE)	6:30pm 7:30pm
Section on Public Programs & Processes	Frontenac (BH)	6:30pm 7:30pm
College on Simulation	Cartier (BH)	6:30pm 7:30pm
Section on Social Science Applications	Studio 366 (QE)	6:30pm 7:30pm
Forum on Education	Mont Royal (BH)	6:30pm 7:30pm

GENERAL INFORMATION

Badge Holder Recycling – INFORMS will have a box in the Registration area for attendees to return their badge holders.

E-Mail Centers - To stay in contact with the outside world during the meeting, e-mail terminals will be set up in Galerie 1 in the Queen Elizabeth.

Exhibits – Exhibits will be located in Galeries 2-3-4 in the Queen Elizabeth. Leading software developers and publishers will showcase the latest software products, technical reference materials and specialized services. Companies interested in exhibiting may contact Tanya Skorohod at 800-343-0062 or 401-274-2525, ext. 202 or at meetings@informs.org. Exhibit hours will be:

Monday	**9:00am - 5:00pm**
Tuesday	**9:00am - 5:00pm**
Wednesday	**9:00am - 12noon**

INFORMS has retained the services of a customs broker to handle Canadian customs formalities. A Customs & Shipping Guide will be sent to those exhibiting. The broker may be contacted at: Mendelssohn-Commercial, 514-987-2700, FAX 514-849-3446. Contacts: Mike Patterson or Gary Sheepwash.

Hotel Information & Accommodations - The Queen Elizabeth Hotel and the Montréal Bonaventure Hilton will host the Spring 1998 Montréal Meeting - technical sessions will be held at both. The Bonaventure Hilton is a short walk from the Queen Elizabeth. Blocks of rooms have been reserved at both hotels for attendees; rates at the Queen Elizabeth are $134C single and $154C double and $99US single. Rates at the Bonaventure are $137C single and $158C double, $101US single and $116US double. Rates do not include applicable taxes. US equivalents are based on January 1998 US exchange rates. Actual hotel rate of exchange at time of stay will apply. Space is limited - make your reservations by April 1. For reservations at the Queen Elizabeth, call 514-861-3511 or fax 514-954-2256. For reservations at the Bonaventure, call 514-878-2332 or fax 514-878-3881.

INFORMS Online - The preliminary and final programs can be found on INFORMS Online at http://www.informs.org. Information will be updated periodically. Check out the latest program information and print out your own customized program.

Job Placement Center - The INFORMS Job Placement Service, JPS, helps OR/MS professionals locate employment opportunities in academia, government and private industries. Employers from a wide variety of professional interest areas regularly participate in this program. It runs on a semi-annual basis, January-June and July-December. INFORMS JPS is now up and running for the Spring Montréal meeting. Go to http://www.informs.org/JPS/ and check out:

- On-line registration for applicants and employers;
- 24-hour access to job listings and applicant files;
- On-site interviewing facilities at INFORMS meetings;
- Hard copy booklets of all active participants;
- Low fees (free for student members).

To obtain additional information about this service, on-site interviewing arrangements or to obtain a paper copy application, you may contact our Customer Service Department at 800-446-3676 or 410-850-0300 or by email at jps@mail.informs.org.

Professional Lounge - A lounge for OR/MS professionals will be set up during the meeting and refreshments will be available. This is an ideal spot to network with those in your field or with others in unrelated professions.

Program - The preliminary program has been mailed to all authors with the February issue of *OR/MS Today*. The final program with abstracts will be distributed at the meeting. Members or authors who do not attend the meeting may purchase the final program for $15 by calling 800-446-3676 or 410-850-0300. Both the preliminary and final programs are on INFORMS Online, http://www.informs.org.

Special Services/Assistance - Attendees requiring special accommodations or services for hotel rooms, session rooms or special events may contact Julie Eldridge at 800-343-0062 or 401-274-2525, ext. 201, by fax at 401-274-3189 or via e-mail at julie.eldridge@informs.org no later than 2 weeks before the meeting.

Transportation - Dorval International Airport is located about 20 minutes from downtown Montréal. Buses from the Autocar Connaisseur Company provide shuttle service between Dorval and the hotels at $9C a person. A taxi costs a fixed fare of $24C.

Travel Arrangements - When traveling to Montréal, save 5-10% on American Airlines and Air Canada, or get the lowest available fares on any airline. Take an additional 5% off on American Airlines with a minimum 60-day advance purchase. We offer easy ticketless travel on most carriers and free flight insurance of $100,000. Call Conventions in America, CIA, the official travel agency for INFORMS at 800-929-4242 and ask for Group 560. Outside the US and Canada, call 619-453-3686, fax 619-453-7976 or visit their website at www.scitravel.com or find them on the Internet at flycia@scitravel.com. Reservation hours are Monday through Friday, 6:30am - 5:00pm Pacific Time. If you call directly or use your own travel agency, use these codes: American, 800-433-1790, Starfile 4748UK; Air Canada, 800-361-7585, CV 987548.

Avis Rent-a-Car is offering car rental discounts; call Avis at 800-331-1600, AWD J94901.

GUEST PROGRAM

Breakfast - A $25 registration fee includes a continental breakfast Monday - Wednesday, 9:00 – 10:00am as well as the General Reception on Monday evening. Guests may register by using the registration form in this program. The breakfasts are limited to registered guests only and guests must wear their yellow name badge for admittance.

MONTRÉAL INFORMATION

• **About Montréal** - Montréal is the second largest metropolitan centre in Canada and the largest French-speaking city outside France. Approximately one million seven hundred thousand people live on the Island of Montréal and more than three million in the greater metropolitan area. Even though French is the official language of the Province of Québec, approximately one million people in greater metropolitan Montréal have a mother tongue other than French. A total of 35 languages is spoken and 30 religions are practised by Montréalers who have ancestral links with 41 countries. English, the mother tongue of 18% of the population, is widely spoken. Other commonly heard languages are Italian, Greek, Chinese and Portuguese. Canada has converted from the imperial system of weights and measures to the metric system. Visitors will find weather reports given in Celsius; gasoline sold by the litre; milk and wine sold by the millilitre and litre. Food items are sold by gram and kilogram. Clothing sizes and fabric lengths are measured in centimetres and metres. Road speeds are posted in kilometres per hour.

• **Canadian Currency** - The Canadian monetary system is based on dollars and cents. Because of current monetary exchange rates, there is a difference in value between the Canadian and American dollar. While traveling in Canada, it is advised to use Canadian money to avoid any exchange problems. On January 1, 1998, 1$C= .70$US, approximately. Major credit cards are honored in all hotels as well as in most restaurants and department stores. Gas stations generally accept most credit cards. A federal tax (GST) of 7% is levied on most goods and services in Canada. In addition, a 7.5% provincial tax is levied on products and services. Non-residents can apply for a GST rebate on most goods (there are some exceptions) purchased for use outside Canada and on short-term accommodations such as hotel rooms. Details are given in the "GST Rebate for Visitors" booklet published by Revenue Canada, Customs and Excise. For information, call 800-668-4748 in Canada or 613-991-3346. Rebates may be claimed in person at participating Canadian Duty Free Shops or by completing and mailing in the rebate form. Provincial sales tax rebates are available for purchases exceeding $500. Contact Revenue Québec at 514-873-4692 or ask your retailer for the appropriate form.

• **Climate** - The weather varies tremendously, particularly in April, a transition month. Typically, the temperature varies between 5°C (41°F) and 15°C (59°F) at the end of April.

• **Customs Regulations**

Baggage - Clothing and personal effects of each visitor are admitted to Canada free of duty. Limited quantities of tobacco products may be brought in duty free by persons over 18 years of age in most provinces but 19 years in some provinces. Persons must be either 18 or 19 years of age to bring alcohol over the border. Items such as cameras, tape recorders, computers or sporting equipment should be registered with the customs service in the traveler's country of residence.

Personal Identification - Canada has an open border with the US. Therefore, citizens or legal, permanent residents of the US do not require passports or visas

and can usually cross the US/Canadian border without difficulty or delay. However, proof of citizenship is required. Documents such as a passport, birth certificate plus photo ID or other proof of citizenship are acceptable. Citizens of countries other than the US should have a passport and Alien Registration Receipt Card (US Form 1-551) also known as a green card.

For further information, please contact your nearest Canadian Consulate or the Canadian Embassy at 202-682-1740 prior to departure. It is the responsibility of the visitor to ensure that he/she has the necessary documents, including those required for entry into another country or for reentry into his/her own country prior to arriving in Canada.

REGISTRATION

• **Advance Registration (Deadline April 1, 1998)**

Attendees are urged to register in advance for the conference. Complete the advance registration form and mail to INFORMS Montreal, 2 Charles Street, Suite 300, Providence, RI 02904 by April 1. Fees may be paid by credit card (American Express, MasterCard, VISA only - fax to 401-274-3189) or by check or money order, payable to INFORMS Montreal '98. Registration payments may also be made via the Web at http://www.informs.org using your credit card - this is a secure server. The deadline for advance registration will be strictly enforced; all payment postmarked after the April 1 deadline will be charged the full, on-site registration fee. Registration materials will be available in the registration area.

For Canadian residents, advance registration may be made in Canadian dollars, paid by check or money order only.

• **On-Site Registration** - Meeting registration will be held in Galerie Foyer at the Queen Elizabeth during the following hours:

Sunday, April 26	**4:00pm - 8:00pm***
Monday, April 27	**7:30am - 5:00pm**
Tuesday, April 28	**7:30am - 5:00pm**
Wednesday, April 29	**7:30am - 3:30pm**

The registration fee allows admittance to all technical sessions, the General Reception and to the exhibit hall. Name badges MUST be worn to all INFORMS sessions, functions and events. Misplaced badges may be replaced at the registration desk by showing your receipt. Meals are not included in the registration fee. If you attend workshops or special paid functions, an additional fee is required. ALL ATTENDEES, INCLUDING SESSION CHAIRS AND SPEAKERS, MUST REGISTER AND PAY THE REGISTRATION FEE.

*** Registration will be held from 7:30am – 2:00pm in the Conference Level Foyer of the Queen Elizabeth for the Conference on Information Systems & Technology, the Franz Edelman Competition and the workshops.**

• **Rates**

Deadline Dates	**On/Before 4/1**	**After 4/1**
INFORMS Members	$180	$205
Non-Members	$220	$245
Student/Retired	$65	$65
Guests	$25	$25

• **Refund & Cancellation Policy** - Payments will be refunded only if a written cancellation is received in the INFORMS Rhode Island office no later than April 22. Cancellations may also be faxed to 401-274-3189 or e-mailed to meetings@informs.org and must meet this deadline.

SPECIAL EVENTS

CORS Events - CORS members are invited to participate in the following major CORS functions:

• **Student Prize Competition & The Practice Prize Competition** - Monday, April 27, from 1:00 - 2:30pm and from 4:30 - 6:00pm in the Joliette Room (Sessions MC13 & ME13).

• **The Harold Larnder Memorial Lecture**, featuring Paolo Toth of the University of Bologna, will take place on Tuesday, April 28 from 11:30am - 12:30pm in the Marquette Room.

• **The AGM** - Tuesday, April 28 at 3:15pm in the Marquette Room, (Session TD20), followed by an Award Session (TE20) during which all CORS prizes and awards will be presented. A Wine & Cheese Reception will conclude this session. All CORS members are welcome.

CPMS Isolated Practitioner Workshop -

CPMS, the Practice Section of INFORMS, sponsors workshops on topics of interest to isolated practitioners, i.e., Lone Rangers, of OR/MS. The 12th workshop in this series will address timely issues that affect the growing isolated practitioner community. All are welcome to participate in the workshop and discussion

to be held Monday evening, 6:15 -7:15pm in the Duluth Room. Wine and cheese will be served.

Forum on Women in OR/MS

• **Business Meeting & Luncheon** - Bring a bag lunch to the Business Meeting and luncheon on Monday, April 27. Everyone interested in issues related to women professionals in OR/MS may attend. Join us from 12noon - 1:00pm in the Bersimis Room

• **Reception** - The Reception for the Forum on Women in OR/MS will be Sunday evening in the St. Maurice Room, 7-9:00pm. Everyone is welcome to meet women researchers and practitioners in OR/MS.

General Reception - All participants and their registered guests are welcome to attend the General Reception on Monday night in the Grand Salon of the Queen Elizabeth from 7:30-9:30pm. ***For admittance, please present the ticket included in your registration packet.***

Nicholson Student Paper Prize Competition

Competition - This session features selected finalists in the Nicholson Student Paper Prize Competition. It represents an opportunity for faculty, professionals and other students to see some of the best research being performed by students. All are welcome, Sunday, 4:00 - 6:00pm in the Richelieu Room.

Spring Student Consortium – There will be 3 special sessions on Sunday, April 26, sponsored by the Student Affairs Committee, designed for Masters and Doctoral students considering a career in industry. The sessions will be held in the Bersimis Room. From 10:00am - 12noon, *"How to Succeed in Business: Tips for Success in Industry & Consulting;"* from 12noon - 1:30 pm, catered luncheon and brainstorming future spring consortia for students and from 1:30 - 3:00pm, *"What Every Management Consultant needs to Know About OR – What Every OR Practitioner Needs to Know About Management."* All graduate students nearing the end of their current degree interested in participating are welcome. Food will be available based on pre-meeting responses; if you plan to attend, please e-mail meetings@informs. org by April 17. All are welcome to participate!

Student Reception - For an opportunity to network and meet with other student attendees, this reception is open to all student registrants on Sunday evening from 7:00-9:00pm in the Duluth Room in the Queen Elizabeth. ***Please present the ticket in your registration packet for admittance.***

INFORMS GENERAL MEMBERSHIP MEETING

Special New Format - Please Join Us!

The INFORMS Executive Committee announces a new format for the General Membership Meeting, a wine and cheese affair on Sunday afternoon that welcomes all attendees. In Montreal, this meeting will be devoted to a new concept dubbed INFORMS 2000.

INFORMS 2000 is a proposal for a new National Conference format that focuses on OR/MS problem-solving in industry, government and non-profit organizations. It would highlight new application areas, hands-on software demonstrations, tutorials on new techniques and offer new approaches to the management of large-scale IT-based projects. Your Executive Committee and the Meetings Committee request your participation in an open discussion on how to successfully launch such a new meeting format. We need your ideas. This meeting may be either another meeting within our portfolio or one that replaces one of our two annual National meetings. We welcome your thoughts.

A short written report that details various internal INFORMS activities will also be available. The meeting will be held in the Jolliet Room of the Queen Elizabeth Hotel from 4-5:30pm on Sunday, April 26th. Please join us for discussion and good fellowship.

KEYNOTE & PLENARY ADDRESSES

Omega Rho Distinguished Plenary
Monday, April 27, 11:00am-12noon
Grand Salon

Beyond the Physics of Queueing
Richard C. Larson, MIT

Ever since a 1950's consultant with an OR bent placed mirrors next to elevators in high rises, the physics of queues has coped with a formidable opponent: the psychology of queueing. One person's 30-minute wait can be worth an admission ticket while another's can create anger and even violence. We reflect on these issues with a view toward practice, utilizing freely many examples from the everyday world. We include issues such as the multi-attributeness and nonlinearity of the utility of queue wait and the importance of queue environment. The concept of "social justice" can be defined for queues, has been found to be vitally important to customers and can even be measured by more traditional mathematical modeling methods of OR. We conclude by identifying strategies to reduce or even avoid queue stress, or if this fails, to engage creatively in a calculus of queue wait gaming.

CORS/SCRO Invited Keynote - Harold Lardner Memorial Lecture
Tuesday, April 28, 11:30am-12:30pm
Marquette Room

Models & Algorithms for Crew Management
Paolo Toth, University of Bologna

Crew management concerns building the work schedules (rosters) of crews to cover a set of timetabled trips. The problem is generally decomposed into two subproblems: crew-scheduling and crew-rostering. Different ways of modeling and solving the subproblems are outlined. Two main approaches, based on set-covering and graph-theoretical formulations, are illustrated. Computational results for real world railway applications are presented.

Invited Keynote
Tuesday, April 28, 11:30am-12:30pm
Grand Salon

SABRE's Practical Business Applications Solving Complex Business Problems Using Operations Research, Industrial Engineering & Information Technology
Thomas M. Cook, SABRE Decision Technology

Dr. Cook will discuss how SABRE combines the principles of OR, IE and IT to solve the complex business problems in the travel and transportation industry. He will review the major milestones in the company's history, from the early days when SABRE solved American Airlines' airline inventory problem with a technique called "yield management," to the more recent challenges faced as SABRE extended its solutions to the rail and hospitality industries. Finally, Dr. Cook will present a case study of an actual problem faced by a client and the OR-based approach used to solve it.

27th Annual Franz Edelman Award for Achievement in OR/MS Competition Presentations

Representing applications from process control, portfolio analysis, forecasting, logistics and decision sup-port planning, 7 finalists will vie for the 1998 Franz Edelman Award for Achievement in Operations Re-search and the Management Sciences. Stephen Strauss, Chair of the 1998 competition, announced the following finalists: Bosques, Arauco S.A.; Cerestar; Grantham, Mayo, Van Otterloo & Co., LLC; Johnston County (NC) Public Schools, Maristrans, Inc.; Pacific Lumber Co. and Sears.

Finalist presentations for the 1998 competition will be given on Sunday, April 26 at the Queen Elizabeth. Those interested in the practice of OR and MS are encouraged to attend the day-long presentation session. The cost is $95 and includes lunch and a post-presentation luncheon on Tuesday in the Montréalais Room. Results will be announced at a special award presentation, Tuesday, April 28 in the Jolliet Room.

This is the 27th year the prestigious $15,000 competition has been held. The award is jointly spon-sored by INFORMS and CPMS, the Practice Section of INFORMS. The Edelman award recognizes out-standing implemented work that has had a significant positive impact on the performance of the client organization. The top finalist receives a $10,000 first prize.

The work presented by this year's finalists covers a wide range of OR applications. Finalist information follows:

• **Bosques Arauco S.A. - Andres Weintraub, Rafael Epstein & Ramiro Morales;** *"Use of OR Systems in the Chilean Forest Industries."* One of the largest Chilean forest firms, Bosques Arauco employs 3 of 5 different optimization systems at different decision levels designed by a team from the University of Chile. They include ASICAM, a daily truck scheduling system; OPTICORT, a short-term harvesting system; PLANEX, a harvesting equipment and access road location optimization system; OPTIMED, a medium range planning tool and MEDFOR, a long term strategic planning tool. These systems will continue to evolve with time, as the needs of firms change and systems become increasingly sophisticated. The impact of these systems has been organizational and financial, with Bosques Arauco reporting a total savings of $5 mil-lion over a total annual timber production of $140 million. Similar results have been reported by other Chilean forest companies using these systems.

• **Cerestar - Kumar Rajaram, R. Jaikumar, Franz Behlau, Frans Van Esch, Corrie Heynen, Albert Kutner, Izzak Van De Wege & Ralph Kaiser;** *"Robust Process Control at Cerestar's Refineries."* Europe's leading manufacturer of made-to-order wheat- and corn-based starch products, Cerestar operates over 20 different types of industrial scale processes in 16 plants across 9 countries with annual sales exceeding $2 billion. A framework called Robust Process Control was developed to increase average throughputs and reduce through put variation without significant investments in new process technology. Running selected refineries at least 90% of the time, the implementation of this system has led to gains valued at over $11 million annually, representing a 27% increase in profits generated by these processes.

• **Grantham, Mayo, van Otterloo & Co., LLC - Dimitris Bertsimas, Christopher Darnell & Robert Soucy;** *"Portfolio Construction through Mixed Integer Programming."* An MIP approach was developed to construct port-folios "close" (in terms of sector and security exposure, liquidity, turnover and expected return) to target portfolios. The methodology controls frictional costs and does so with fewer stocks and requires fewer tickets. Grantham, Mayo & van Otterloo, an investment firm managing over $26 billion for 653 clients, currently uses this approach in the construction of 11 quantitatively managed portfolios representing over $8 billion in assets since October 1996. The number of names of securities has been reduced by an average 40-60% with only a marginal decrease in liquidity, while maintaining the turnover, performance and sector exposures of target portfolios; the costs of trading portfolios have also decreased annually by at least $4 million due to a 75-85% reduction in the number of tickets to trade portfolios and the ability to have a cost model in the objective function.

• **Johnston County (NC) Public Schools - Raymond G. Taylor, Michael L. Vasu & James Causby;** *"Integrated Planning for School and Community."* OR/Ed Laboratories and the Johnston County Public Schools created a planning system, Integrated Planning for School and Community, to forecast enrollments, to compare the enrollment projections to capacity, to find the optimal location for new buildings and to set distance-minimized boundaries for all schools to avoid overcrowding and to meet racial-balance guidelines. The implementation of the system has produced an increased success in the passage of bond issues, a quantifiable minimization of pupil transportation costs, and the

elimination of frequent school attendance boundary adjustments.

• **Maritrans, Inc. - Murthy Mudrageda, Frederic Murphy & Steven Welch;** *"Forecasting the Market for Jones Act Tankers."* When Congress passed the Oil Pollution Act of 1990, it mandated that all oil-carrying vessels above a certain size be double hulled. Maritrans saw the life of its barge fleet truncated when market conditions did not support the construction of new vessels. Among the decisions Maritrans faced was whether to sell its business in the Gulf of Mexico while the existing fleet had value, rebuild the fleet or operate until forced to retire. Maritrans built a computable economic equilibrium model to forecast and understand future market conditions in the Gulf and test alternative investment strategies. Using a transportation model to represent demand, data on the retirements of existing vessels and an estimated relationship between capacity utilization and price, market-clearing prices and flows were estimated. The company has now committed $75 million in capital expenditures based in part on the resulting forecast of price increases over the next several years.

• **Pacific Lumber Company - L. Russell Fletcher, Henry Alden, Dean P. Angelides, Scott P. Holmen & Matthew J. Etzenhouser;** *"Long-Term Forest Ecosystem Planning at Pacific Lumber."* In 1995, Pacific Lumber contracted with VESTRA Resources to develop a 120-year, 12-period forest ecosystem management plan for their properties to meet new Board of Forestry requirements. VESTRA produced their ecosystem planning express model, Ep(x), which couples geographic information systems with a database resource capability model and policy alternative model, which provide the inputs to a linear program. The model increased present net worth by over $320 million and generated a more optimal mix of high quality nesting and roosting spotted owl habitat acres.

• **Sears - Don Weigel & Buyang Cao;** *"Dispatching a Nationwide Technician Workforce Under Time Distance & Specialty Constraints: An Application of GIS & OR Techniques."* ESRI developed a geographic information system-based DSS to solve a technician dispatch problem for Sears. The system consists of a series of algorithms, including the construction of the origin and destination matrix, resource assignment and sequence and route improvement. It has resulted in decreased drive time, reduced technician overtime by 14%, increased completed calls by 4.6% and improved time performance to 95%.

Welcoming Session & Awards - Everyone is invited to attend the Welcoming Session on Monday, April 27 from 9:45 - 10:45am in the Grand Salon. Karla Hoffman, President of INFORMS, and Paul Mireault, General Chair of the Montréal Local Committee, will make opening remarks. The following awards and prizes will be given during this session: the INFORMS Prize for the Teaching of OR/MS Practice, the Philip McCord Morse Lectureship Award, the George E. Nicholson Student Paper Prize and the John von Neumann Theory Prize.

TECHNICAL PROGRAM

Conference on Information Systems & Technology - St. Francois Room & Studio 353

The Third Conference on Information Systems & Technology, CIST, chaired by Varghese Jacob and Ramayya Krishnan, will be held in conjunction with the INFORMS Spring Meeting in Montréal, Canada, April 26-29,1998. The conference is sponsored by the INFORMS College on Information Systems and the College on Artificial Intelligence. The conference web page is http://www.heinz.cmu.edu/~rk2x/cist.html. A distinctive feature of the conference, in addition to providing a forum for the entire gamut of IS research to be addressed, will be to help participants, researchers and practitioners alike leverage the interdisciplinary connections, both methodological and substantive, that exist in the INFORMS environment. To this end, the conference will be anchored around a set of high quality tutorial and keynote presentations presented by the leading experts in academia and industry. The following individuals have committed to making presentations:

***Rajiv Banker**, University of Texas, **John Henderson,** Boston University, **Robert Kraut**, Carnegie Mellon University, **John King,** University of California, **Paul Gray**, Claremont University, **Suresh Sethi** University of Texas, **Denny Hong-Mo Yeh,** Taiwan.*

These presentations will highlight and emphasize not only research in IS but also interdisciplinary linkages between IS and related disciplines. This conference requires an additional registration fee as indicated on the registration form. Attendees will be able to participate in all activities and sessions of the INFORMS Montréal Meeting.

Invited Tutorials

• MA19 Financial Models, Speaker: ***John M. Mulvey,*** *Princeton University,* **Chair:** ***Michele Breton***
Banks, insurance companies and other leading financial institutions often employ stochastic optimization for managing risks and seeking our opportunities. Five key elements are reviewed: organization-wide models, temporal risk measures, and generation of scenarios, dynamic investment strategies and solution algorithms. A long-term financial planning application highlights the issues.

• MD19 Parallel Computing, Speaker: ***Stavros A. Zenios,*** *University of Cyprus,* **Chair:** ***Teodor G. Crainic***
This tutorial will review parallel computing as it applies to problems in OR/MS. We will discuss parallel computing technology, algorithms and applications. Attendees will get a view of what combinations of algorithms and technology have been found to work best on general problem classes.

• ME19 Lift & Project Methods for Mixed Integer Programs, Speaker: ***Sebastian Ceria,*** *Columbia University,* **Chair:** ***Jean-Marie Bourjolly***
We present an algorithm that can be used for any integer program to generate lift-and-project cuts. These cuts rely solely on the fact that some variables in the model are integer constrained. Through extensive computational experiments, we show that they are quite effective when used within a B&C algorithm to solve general MIPs arising from a wide variety of applications.

• MA20 Column Generation Methods, ***Jacques Desrosiers,*** *École des HEC & GERAD,* **Chair:** ***Marius M. Solomon***
This tutorial first presents a historical perspective on column generation methods including relationships with alternative decomposition algorithms such as cutting plane, bundle, analytic center and Lagrangean relaxation. This is followed by some recent numerical experimentations on IP applications. A demo using the GENCOL optimizer is provided at the end of the presentation.

• MC20 Network Optimization: Learning from Recent Discoveries in Computer Science, Speakers: ***James B. Orlin, Ravindra K. Ahuja, Thomas L. Magnanti, MIT*** **Chair:** ***Stefano Pallotino***
We present 3 elegant, significant and relatively simple recent results from computer scientists: an improved maximum flow algorithm due to Goldberg & Rao; construction of graphs known as "light weight spanners" that simultaneously approximate optimal spanning trees and shortest paths; and a topic to be determined shortly before the conference.

• MD20 Operations Research & AIDs Policy Modeling, Speaker: ***Margaret L. Brandeau,*** *Stanford University,* **Chair:** ***Sophie Lapierre***
This tutorial describes how OR techniques can lead to improved decision making for HIV prevention and improved treatment of those who are infected. We present a number of models, covering a range of application areas and methodologies, to illustrate the use and potential of OR in this area.

• TA19 Intelligent Transportation Systems, Speaker: ***Hani Mahmassani,*** *University of Texas,* **Chair:** ***Michel Gendreau***
ITSs are predicated on the provision of real-time information to traffic controllers/fleet managers for optimal system operation. This presentation discusses challenging classes of OR problems that arise in conjunction with ITS technologies and gives an overview of recent developments in dynamic network assignment models for real-time ITS applications.

• TC19 Software for Linear & Integer Programming, Speaker: ***Robert Fourer, Northwestern University,*** **Chair:** ***Bruce L. Golden***
Having grown in variety and sophistication over the past decade, LP software is now available in a profusion of formats and packages. This presentation surveys current software for formulating, solving, analyzing and managing LPs, with or without integer variables. Recent trends in language, interface and algorithm design are emphasized.

• TD19 An Introduction to Stochastic Programming, Speaker: ***François Louveaux,*** *University of Namur,* **Chair:** ***Gilbert Laporte***
The aim of stochastic programming is to model and solve problems involving uncertain data. This tutorial will provide an introduction for newcomers to the field. The first part will discuss examples of applications and modeling issues related to uncertainty. Basic properties of stochastic programs and commonly used methods of solutions will then be presented. Finally, an introduction to current areas of research will be provided.

• TE19 Machine Scheduling Problems, Speaker: ***Jacek Blazewicz, Politechnika Poznanska,*** **Chair:** ***Chelliah Sriskandarajah***

This study is concerned with deterministic problems of scheduling tasks on machines (processors), one of the most rapidly expanding areas of combinatorial optimization. In general terms: a given set of tasks is to be processed on a set of available processors, so that all processing conditions are satisfied and a certain objective function is minimized (or maximized). It is assumed, in contrast to stochastic scheduling problems, that all task parameters are known a priori in a deterministic way. This assumption is well justified in many practical situations; yet it permits the solving of scheduling problems having a different practical interpretation from that of the stochastic approach. This interpretation is a valuable complement to the stochastic analysis and is often imposed by certain applications. We will emphasize the applications in computer systems; however, we point out some other interpretations, since tasks and machines may represent ships and dockyards, classes and teachers, patients and hospital equipment, or dinners and cooks.

• **TA20 Strategic OR/MS, Speaker:** ***Peter Bell,*** *University of Western Ontario,* **Chair:** ***Ann Langley***
Several major corporations now view their OR/MS work as a strategic asset. This tutorial introduces the concept of strategic OR/MS and presents examples from leading-edge organizations of both strategic OR/MS activities and strategic OR/MS problems. It will be argued that a strategic perspective of OR/MS provides many opportunities for future research.

• **TB20 Branch & Cut & Price, Speaker:** ***George L. Nemhauser,*** *Georgia Institute of Technology,* **Chair:** ***Paolo Toth***
Branch-and-cut (price) integrates B&B and cutting plane (column generation) methods for solving MIPs. At each node of the tree, cuts may be added (columns may be generated) to tighten (improve) the LP relaxation. Our presentation explains why and when these methods work and how to use them in practice.

• **TC20 An Introduction to Tabu Search, Speaker:** ***Michel Gendreau,*** *Université de Montréal and CRT,* **Chair:** ***James P. Kelly***
Over the past 10 years, tabu search has proven to be one of the most efficient heuristic techniques for tackling complex combinatorial problems. This tutorial is for newcomers to tabu search: basic concepts will be carefully reviewed and tips for developing successful tabu search heuristics provided.

Plant Tours - For further information, please contact Vedat Verter, 514-398-4661 or verter@management.mcgill.ca. For departure and return times, please check individual websites closer to the time of the meeting.

• **CAE Electronics Ltd., Monday, April 27, $15US:** CAE Electronics Ltd. is one of the world's leading advanced technology companies and Canada's foremost scientific systems and software enterprise. CAE Electronics Ltd. is the world leader in the design and manufacture of commercial Full Flight Simulators and Flight Training Devices but it also applies its realtime computer-based technology to complex simulation, training, control and monitoring tasks across a broad spectrum of civil and military aircraft; hydro and thermal power generation, transmission and distribution; air traffic management; maritime operations; space exploration and submarine detection systems. The firm's fully integrated design, manufacturing and test facilities employ 3,700 employees and are housed in a single complex situated in Ville Saint-Laurent. For more information,visit cae.cacae_electronics_ltd/cae_electronics_ltd.htm.

• **NORTEL, Tuesday, April 28, $15US:** NORTEL designs, manufactures, and supplies a breadth of products for digital networks of all kinds. Based in Canada, Nortel employs 67,000 people worldwide. The Saint-Laurent location manufactures electronic transmission products such as multiplexing equipment, fiber-optic, digital, microwave and voice frequency and the S/DMS TransportNode, which is used in the FiberWorld products. For more information, please visit nortel.com.

• **Canadair-Bombardier, Wednesday, April 29, $15US:** Currently the third most important civil aircraft manufacturer in the world, Bombardier Aerospace offers a diversified range of innovative products and services related to business aircraft, regional aircraft and amphibious aircraft. The Saint-Laurent location manufactures the components for various aircraft, including Canadair CL-415, Challenger, Canadair Regional Jet and Bombardier Global Express aircraft. For more information, please visit aero.bombardier.com. Please note that Canadair-Bombadier is located quite near Dorval Airport, so if you have a later afternoon or evening flight, it is a short distance to the airport.

Software Demonstrations

MA34, 8:45 - 9:30am

Roger Villeneuve, *MultiCIM Technologies, Inc., info@multicim.com* - **ABC Planner/AutoMod/AutoSched: Introduction to Discrete-Event Simulation & Finite-Capacity Planning & Scheduling**

Introducing our new entry level discrete-event simulation tool, ABC *Planner*, which synergizes the simulation power of AutoSimulations' AutoMod with the user-friendliness of Microsoft Excel. ABC *Planner* is a finite capacity planning and costing add-in to Excel used for detailed analysis of interactions between resources, products and activities over time. It generates dispatch lists, inventory and utilization graphs as well as customizable performance reports. We will also demonstrate the latest release of AutoMod and AutoSched, a fully featured finite-capacity planning and scheduling software.

MC34, 1:00- 2:30pm

Ben Bouillion, *Decisioneering; customerservice@decisioneering.com*
Strategy Under Uncertainty

Decisioneering has 3 main product lines, Crystal Ball, Crystal Ball Pro and Analytica. Crystal Ball picks up where Microsoft Excel spreadsheets end by giving you the ability to perform Monte Carlo analysis on spreadsheet models. Crystal Ball Pro's Optquest technology provides an evolutionary step to this process by determining the optimal choice for a given business decision based upon multiple Crystal Ball simulations. Analytica is the world's first general purpose, object-oriented, visual modeling tool.

Dan Smith, *Applied Decision Analysis, Inc.; hilb@adainc.com*
Introducing DPL 4.0, Decision Analysis Software

DPL is the professional DA software using influence diagrams, decision trees and spreadsheets. Graphical outputs include Rainbow Diagrams, Tornado Diagrams, Risk Profiles, Policy Trees, and Policy Summaries. New in DPL 4.0: A new Win95 interface, strategy tables, graphical value of perfect information and control and more!

MD34, 2:45 - 4:15pm

Sam Savage, *Duxbury Press; savage@leland.stanford.edu*
INSIGHT.xla Business Analysis Software for Microsoft Excel

Includes Monte Carlo, discrete-event simulation, time-series, Markov chains and decision trees, optimization models, including stochastic LP formatted to run with both Excel solver and What's Best!, (a small version of is included). See www.zdnet.com/ pcweek/opinion/0302/02mach.html for PC Week review.

Anton Rowe, *EPISOFT, Inc.;* anton@episoft.com - **The Best of Two Worlds With MLX / MLX: Mathematica Link for Excel**

Link the world's most popular spreadsheet to the world's leading computational engine. Excel provides the ease-of-use and interface ubiquity; Mathematica provides the computational power, high-quality graphics and extensability. You will be amazed at what you can develop inside a spreadsheet using MLX!

ME34, 4:30 – 6:00pm

Tom Baker, *Chesapeake;* teb@chesapeake.com - **New Developments in MIMI**

MIMI is an application environment for planning, scheduling and supply chain applications that combines operations research, expert systems, graphics and database technologies. We trace the evolution of MIMI over a period of 10 years and demonstrate some of the most recent developments in the areas of distributed computing, modeling wizards, and internet/intranet capabilities.

Kendra Moore, *Alphatech, Inc.; alpha.sim@alphatech.com*
ALPHA/Sim Software Simulation Tutorial

ALPHA/Sim is a general-purpose, discrete-event simulation tool. ALPHA/Sim allows a user to graphically build a simulation model, enter input data via integrated forms, execute the simulation model, and view the simulation results, within a single graphical environment. We describe how to use ALPHA/Sim to build, simulate, and analyze a simple manufacturing system. In addition, we describe some advanced features and list sample applications.

TA34, 8:00 - 9:30am

Edward S. Robins, *Arlington Software; robins@arlingsoft.com*
ERGO, A Comprehensive Decision Analysis Tool for Real World Problems.

ERGO is a new tool designed for large MCDA common business problems. These include procurement, risk analysis, Y2K, project monitoring/performance measurement, and personnel hiring/performance measurement. Using the latest in graphical interfaces, ERGO elicits and portrays data in a way the average manager can understand. Specialized loss functions provide a normative approach to the implementation of MAU,

with AHP and Fuzzy Logic modules for sub-decision making and prioritizing of criteria.

Bob Daniels, *Dash Associates;* rcd@dash.co.uk - **XPRESS-MP**
Release 10 of XPRESS-MP offers reengineered simplex optimizers and a new homogenous barrier algorithm. The MIP solver radically reduces the number of nodes required in the branch and bound search. The "top-end" models solve an order of magnitude faster. The XPRESS optimizers are now the fastest available across the board.

TB34, 9:45 – 11:15am

Gyana Parija, *IBM Optimization Solutions Developer*
Specifying & Solving Stochastic Systems with IBM's New Stochastic Solutions Product
We will demonstrate the power and flexibility of IBM's new Stochastic Solutions product for defining, modifying, and solving stochastic systems. The stand-alone stochastic solver, and the callable DLL will be shown, as well as the powerful, yet easy to use, capabilities for inputting SMPS, saving stochastic models, modifying stochastic distribu-Tions and solving the resulting models. This will be followed by a brief update on the rest of the Optimization Solutions products.

Joe Creegan, *Ketron Management Science; jcreegan@ketronms.com*
A Simple Interface for A Complex Modeling System
Ketron's Logistics Optimization System (LOPTIS) is a multiperiod mixed-integer modeling system that models industrial logistics from acquisition of raw materials through delivery of finished products. The simple MS Access interface that controls execution and provides model data management will be demonstrated.

TC34, 1:30 - 3:00pm

Bjarni Kristjansson, *Maximal Software, Inc.;* info@maximal-usa.com - **MPL & Optimization on the Internet**
Over the last few years, the Internet and the WWW have become increasingly more important in the computer world as a new way of interfacing with the user. We will discuss how the MPL Modeling System is currently being developed to give the user new ways to solve optimization problems through the Internet as well as the new MPL On-line Tutorial on the Web.

Younes Alaoui, *ILOG, Inc.;* alaoui@ilog.fr - **ILOG, CPLEX: The Merger Between Constraint-Based Scheduling & Linear Programming**
Many already realize the power of linear programming with CPLEX. Problems such as scheduling can be difficult to solve using only a linear model. ILOG constraint-based programming algorithms combined with the proven CPLEX linear algorithms is the solution for solving complex scheduling problems. We will explain the benefits of the merger of these 2 technologies.

TD34, 3:15 - 4:45pm

Sanjay Saigal, *Compass Modeling Solutions; info@modeling.com*
The AMPL Plus Mathematical Modeling Environment
When released in 1995, AMPL Plus represented a major step up in ease of use over the text-based (command-line) interface of AMPL. The recently released 32-bit version of AMPL Plus allows AMPL users to solve even larger "industrial-strength" models, faster. We present an overview of modeling with AMPL Plus, together with a discussion of its data-interface, project management, and application-building capabilities.

Mark Wiley, *LINDO Systems, Inc.; mwiley@lindo.com*
LINDO, LINGO, & What's Best! - Flexible Mathematical Modeling Tools for Windows
We will demonstrate LINDO Systems family of popular mathematical modeling packages for Windows. This includes LINDO, our linear and integer programming engine, a new release of LINGO, our integrated modeling language with linear/ nonlinear solvers; and What's Best!, our large scale linear/ nonlinear spreadsheet solver.

TE34, 5:00 – 6:30pm

Gautam Mitra, *UNICOM/ Brunel University; gautam.mitra@brunel.ac.uk* - **Integrating Mathematical Programming Tools**
Tools such as MPL provide a rich interactive environment for developing mathematical programming models. We illustrate a production application which uses MPL as an embedded component of a distributed programming/ modeling system. We also show software extensions which integrate client/server capability into MPL. The scope of extending this approach to Internet/Intranet computing paradigm is discussed.

David Krahl, *Imagine That, Inc.; extend@imaginethatinc.com*
Extend Tutorial
Extend from Imagine That, Inc. is a multidomain, hierarchical simulation modeling tool. It is based on a modern GUI and is extensible into many different areas of application including all discrete event and continuous systems. With over 10,000 copies sold, it is the most popular discrete event simulation software ever created.

Teacher Program - The middle/high school and community college math and science teachers program will be composed on introductory OR and computer application workshops. An introduction to OR/MS will be presented, followed by probability modeling, computer simulations, queueing or waiting line models and linear programming. Attendees are welcome to attend the general conference and each will receive copies of all program materials: videos, a subscription to OR/MS Today and copies of all software packages with instructions and teach/student activity guide. The program will be held on Sunday, April 26, from 8:00am - 4:00pm in the Saguenay Room.

TOURS

Visit Historic Québec City

Sunday, April 26-$65US

Join us for a day trip to Québec City, the only walled city in North America and the cradle of French civilization on this continent. Founded in 1608, Québec has retained its French language, character and way of life. A natural citadel, this was the site Samuel de Champlain chose for the fortress that controlled the river, and thereby controlled trade within Canada. Not far from the center of the old city are the Plains of Abraham, site in 1759 of a battle between the French and British armies that marked a turning point in the history of North America. Today Québec is a busy seaport, an important center of services and research, a cultural hot spot and the provincial capital. The old quarter (the Lower Town) has been declared a world heritage site by UNESCO in 1985. Restored architectural gems, such as Notre Dame church in the Place-Royale, surround cobblestone squares and narrow, winding streets stretching along the riverbank. Dominating the old quarter is the Citadel and the majestic Hotel Chateau Frontenac with its medieval-looking gables and turrets. In addition to transportation, the price covers a specialized guide in Québec City, a gastronomic lunch (tax and gratuities included) at one of Old Québec's restaurants, a stop at the 274-foot Montmorency Falls and some free time to shop and browse. Buses will leave the Queen Elizabeth Hotel at 8:00am and return at approximately 8:00pm. If there are not enough participants, the trip may have to be cancelled and those who will have signed up will be fully reimbursed.

An Afternoon at the Montréal Casino

Tuesday, April 28- $25US

The Casino de Montréal, one of the world's ten largest casinos, is spectacular in every way: a stunning building in an exceptional location! Inside, a magnificent atrium with six floors of excitement and warm, friendly service that is second to none. The casino is located on Notre Dame Island in the middle of the St. Lawrence River just ten minutes from the downtown conference hotels with a superb view of Mount-Royal and the downtown skyline. The following are included: bus transportation to and from the conference hotels, (departure: 2:00pm, return at approximately 6:00pm), 45 minutes of gaming demonstrations in the banquet room, followed by free time on the gaming floor; dessert, coffee and cocktails, a casino pin for all participants, a casino souvenir gift chip with a $5C value, offered in a drawstring pouch to be kept as a souvenir or redeemable for cash, payment in a food and beverage outlet or on the gaming floor and two promotional gifts offered by the casino as a door prize.

WORKSHOPS

• Breaking the Mold: Using Commercial Software & Experiential Learning to Teach the First Management Science Course

Matthew J. Liberatore, Robert L. Nydick, Villanova University

Sunday, April 26, 8:00am - 12noon

Our approach to teaching the first course in MS is predicated upon 2 beliefs: MS is more important to business education than ever and students can implement MS more easily than ever. What is required is a radical change in the way the first MS course is con-ducted. Spreadsheets offer important advantages in teaching MS. However, we offer a proven alternative to spreadsheets that synthesizes MS modeling, commercial software and experiential learning to drive a MS course that adds value to the curriculum.

We illustrate how to apply our integrated approach to 3 MS modules: mathematical programming, DA and simulation. Specifically, we demonstrate how to present a motivating example for each module using PowerPoint lecture materials linked with commercial software. The supporting software packages are LINGO and its modeling language for mathematical programming, Expert Choice for the AHP and Extend for simulation. This first pass at modeling provides the necessary groundwork for

developing more complex and realistic applications. The goal of each is to prepare the student to accept the challenge of successfully modeling an important problem within his or her own organization. We share lessons learned regarding the development of student projects that create value for organizations and present examples of successful student projects that have reached varying stages of implementation. Many of these might never have been attempted, let alone successfully completed, without the power that commercial software offers. The learning system we present enables us to state during the first class that our goal is to have every student complete one successful implementation within one year of completing the course. We believe that our approach leads to a paradigm shift: the focus changes from what could/ would be done with MS to what students can/will do with MS. This workshop will interest anyone who wishes to empower ordinary students to produce extraordinary results.

• OR for the Deregulated Power Industry
Bob Entriken, *Stanford University*
Sunday, April 26, 8:00am - 12noon

The electric power industries are now in an unprecedented period of change. One by one, they are being transformed from cost-conscious, regulated utilities to profit-conscious, competitive corporations. Not only does this constitute an about face in emphasis from the production side to the consumer side of the business, but also presents a wonderful opportunity for the use of OR.

New business problems are being created with each legislative act to deregulate and there is a strong need for OR analysts to fill the gaps. Further, the particular training and experience of our discipline makes us well equipped to absorb, understand and propagate the wealth of new techniques needed for utility companies to succeed in this new environment.

We review the latest international developments and explore new areas for R&D that these changes afford us. We will introduce a new set of simple yet demonstrative models that cover the essential aspects of the new business processes arising in our public utilities.

• Marketing Operations Research
Gregory S. Parnell, *Virginia Commonwealth University*
Sunday, April 26, 1:00 - 5:00pm

The marketing of OR/MS is a key skill that practitioners, either consultants or academic, must learn to obtain the opportunity to help decision makers or to obtain research sponsors. Unfortunately, very little of our formal education includes important OR/MS marketing concepts and communications skills. Most of us have learned by experience. The purpose of this workshop is to provide a framework for understanding the basic concepts for effective marketing of OR/MS to decision makers and research sponsors. Dr. Parnell will draw on his more than 25 years of experience as a decision maker (government), consultant (government and industry) and academic government and public university).

• The Rank Transformation as a Powerful Method of Analysis: Nonparametric Methods Using Ranks
Jay Conover, *Texas A&M University*
Sunday, April 26, 1:00 - 5:00pm

The emphasis is on nonparametric methods based on the ranks of the observations or on some scores based on ranks, such as normal scores. The close relationship between parametric and nonparametric methods is used as a theme, thus providing a unique perspective on why nonparametric methods are sometimes much more powerful than parametric methods. Also shown are non-normal distributions where parametric methods should be used because of their superior power over nonparametric methods. Experimental situations include the case of 2 or more independent samples (the one-way layout), 2 or more related samples (the two-way layout), testing for normality, rank correlation, rank regression methods, rank analysis of covariance, rank discriminant analysis and Fisher's randomization tests. Though no previous training in nonparametric statistics is needed to understand the material, even the expert in nonparametric statistics is likely to find a perspective on the subject they were not aware of previously.

Presentation Skills Tutorial
Sunday, April 26, 1:00 - 5:00pm
St. Laurent Room (QE)

The INFORMS Education Committee is sponsoring a tutorial, geared towards Ph.D. students and faculty members who are interested in improving their presentation skills. A Professor of Management Communications and two experienced professors of MS/OR will jointly present the tutorial. The first part of the tutorial will focus on basic presentation skills; the second part will deal with the delivery of case studies and the use of spreadsheets.

Section Workshop

8th Annual Workshop on Computational & Mathematical Organization Theory
Saturday & Sunday, April 25 - 26, 8:00am -5:00pm

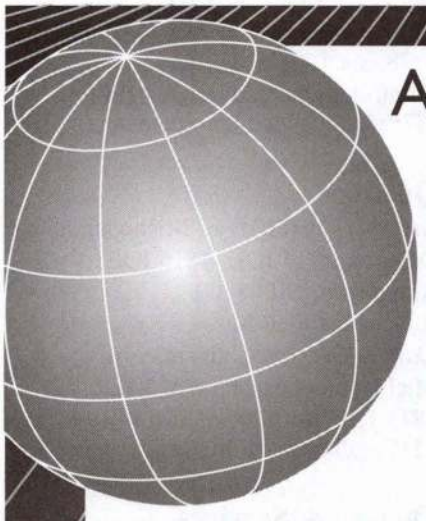
This workshop will explore advances in formal theories of organizations, new computational or network-based analysis tools for studying organizations and empirical tests of computational, mathematical or logical models. Presentations will be from a combination of invited and submitted papers. Participants need not present a paper. A special issue of the journal *Computational and Mathematical Organization Theory* will be published based on the best papers.

Rationale - Organizations can be usefully characterized as constraint-based adaptive systems composed of intelligent adaptive agents and technology, whose ability to act and be acted upon are structurally, culturally and cognitively constrained. Recent advances in cognitive science, artificial intelligence, complexity theory and social networks have provided us with richer and more precise models of intelligent agents, the processes they engage in and the structures in which they are embedded.

Organizational theorists, managers, engineers and social scientists interested in organizations and their performance now have the opportunity to combine these models with more traditional approaches to organizations. This allows the researcher to address issues where structural, adaptive and evolutionary issues are paramount; e.g., coordination, negotiation, organizational design, reengineering, organizational communication, organizational evolution, market restructuring and organizational learning. These opportunities are explored, largely through presentation and discussion of formal models and theories.

Topic areas for 1998 include organizational adaptation and learning, task analysis, organizations as multi-agent systems, models of trust and cooperation in organizations, the evolution of organizational form, formal application of complexity theory to organizations, dynamic systems, evolution of interorganizational networks, formal models of technology in organizations, information diffusion within and among organizations, docking of computational models and validation techniques for computational models.

If you are interested in presenting, send a title and extended abstract (2-3 pages) by March 1 to Kathleen Carley - carley+ @andrew.cmu.edu. Abstracts must be either an ascii only file or as a msword for Macintosh file saved in rtf format. All presenters are to send full papers for consideration in the CMOT journal to Kathleen Carley by May 5, 1998.



ADVANCED AMPL TUTORIAL

If you are a user of AMPL (or are a user of one of the other well-known math programming languages) and want to learn more about AMPL, you will want to attend this seminar!

PLACE AND TIME
- April 26, 1998 (Sunday)
- 7:00 PM until 9:30 PM
- Queen Elizabeth Hotel, Matapedia Room, Montreal, Quebec, Canada
- **No charge**, but reservations are requested

SPEAKERS
- Robert Fourer, Ph.D., Northwestern University
  AMPL author and developer
- David Gay, Ph.D., Lucent Technologies
  AMPL author and developer
- John Chinneck, Ph.D., Carleton University
  MProbe author and developer
- Sanjay Saigal, Ph.D., Compass Modeling Solutions
  Director of Technical Services

TOPICS INCLUDE
- New solver interface extensions
- Nonlinear analysis with MProbe
- Database access features
- Using external functions
- Implementing encryption
- Future plans for AMPL

Pre-Requisites Prior experience using AMPL or another math programming language.
Reservations Contact Melodee Heeger at 702-322-7600 or info@modeling.com

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INVITED CLUSTER CHAIRS

Advances in Microscopic Traffic Simulation

Jaime Barcelo, University Politecnica de Catalunya, Department d'Estadistica I Investigacio Operativa, Pau Gargallo 5, 08028 Barcelona, Spain; barcelo@eio.upc.es

Constraint Programming

Gilles Pesant, University de Montréal, Ctr. for Research on Transport., CP 128, succ. Centre-ville, Montréal, Quebec, Canada H3C 3J7; pesant@crt.umontreal.ca

DEA

Lawrence M. Seiford, University of Massachusetts, MIE, 219 ELAB, Amherst, MA 01003-2210; seiford@ecs.umass.edu

Discreet Programming

Warren Adams, Clemson University, Department of Math. Sci., Clemson, SC 29634-1907; wadams@clemson.edu

Dynamic Programming

Anton J. Kleywegt, Georgia Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205; anton@isye.gatech.edu

FMS

Kathryn E. Stecke, University of Michigan Business Sch., 701 Tappan St., Ann Arbor, MI 48109-1234; kstecke@mich.edu

Global Optimization

Pierre Hansen, HEC, 3000 Ch. Côte-Ste.-Catherine, Montréal, Québec, Canada H3T 2A7; pierreh@crt.umontreal.ca
Brigitte Jaumard, École Polytech. of Montréal, Department of Math. & IE, Montréal, Québec, Canada H3T 2A7; brigitt@crt.umontreal.ca

Health Applications

Sophie Lapierre, University du Québec a Montréal, CRT, Department des Sci. Admin., CP 6128, succ. Centre-ville, Montréal, Québec, Canada H3C 3J7; sophiel@crt.umontreal.ca
Frédéric Semet, University du Québec a Montréal, CRT, Department des Sci. Admin., CP 6128, succ. Centre-ville, Montréal, Québec, Canada H3C 3J7; frederic@crt.umontreal.ca

Linear Programming

Levent Tuncel, University of Waterloo, Department of Combinatorics & Optimization, Waterloo, Ontario Canada N2L 3G1; ltuncel@math.uwaterloo.ca

Logistics

Pierre Dejax, École Centrale Paris, Lab. Productique Logistique, Grande Voie des Vignes, 92295 Chatenay Malabry Cedex, France; dejax@pl.ecp.fr

Metaheuristics

Stefan Voss, Technical University Braunschweig, Informations-management, Abt-Jerusalem-Str.7, D-38106 Braunschweig, Germany; stefan.voss@tu-bs.de

Military Applications

Kevin Ng, National Defence Headquarters, OR & Analysis, Department of National Defence, 101 Colonel By Dr., Ottawa, Ontario, Canada K1A 0K2; kevinng@ora.dnd.ca

Multicriterion Decision Analysis

Jean-Marc Martel, University Laval, Fac. des sciences de l'adminstration, Ste.-Foy, Québec, Canada G1K 7P4; jean-marc.martel@fsa.ulaval.ca
Belaid Aouni, University Laval, Fac. des sciences de l'adminstration, Ste.-Foy, Québec, Canada G1K 7P4; Belaid.aouni@fsa.ulaval.ca

Networks

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Nonlinear Programming

Patrice Marcotte, University de Montréal, DIRO, CP 6128, succ. Centre-ville, Montréal, Québec, Canada H3C 3J7; marcotte@diro.umontreal.ca

Optimization Days

Teodor Gabriel Cranic, University du Québec a Montréal, CRT, Department des Sci. Admin., CP 6128, succ. Centre-ville, Montréal, Québec, Canada H3C 3J7; theo@crt.umontreal.ca
Michel Gendreau, University du Québec a Montréal, CRT, Department des Sci. Admin., CP 6128, succ. Centre-ville, Montréal, Québec, Canada H3C 3J7; michelg@crt.umontreal.ca

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Kevin Laframboise, Concordia University, 1455 de Maisonneueve Blvd., Montréal, Québec, Canada

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Scheduling
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Stochastic Programming
John Birge, University of Michigan, Department of IOE, Ann Arbor, MI 48109; jrbirge@engin.umich.edu

Telecom Network Planning
Patrick Soriano, University de Montréal, École des HEC & CRT, CP 6128, succ. Centre-ville, Montréal, Québec, Canada H3C 3J7; patrick@crt.umontreal.ca

SPONSORED CLUSTER CHAIRS

Applied Probability
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Artificial Intelligence & Decision Support
Haldun Aytug, University of North Carolina, Belk Coll. Of Business Admin., IOM Department, Charlotte, NC 28223; haytug@emailuncc.edu

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Group Decision & Negotiation
Marc Kilgour, Wilfrid Laurier University, Waterloo, Ontario, Canada N2L 3C5; mkilgour@mach1.wlu.ca
Melvin F. Shakun, NYU, Stern Sch. of Business, 44 W 4th St., New York, NY 10012-1126; mshakun@stern.nyu.edu

Location Analysis
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Logistics
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OR/MS in Forestry
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Andres Weintraub, University of Chile, Department of IE, Republica 701, Santiago, Chile; aweintra@dii.uchile.cl

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Anil Khurana, Boston University, Sch. of Mgmt. 595 Commonwealth Ave., Boston, MA 02215; akhurana@bu.edu

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Transportation Science
Bernard Gendron, University du Québec a Montréal, CRT, Department des Sci. Admin., CP 6128, succ. Centre-ville, Montréal, Québec, Canada H3C 3J7

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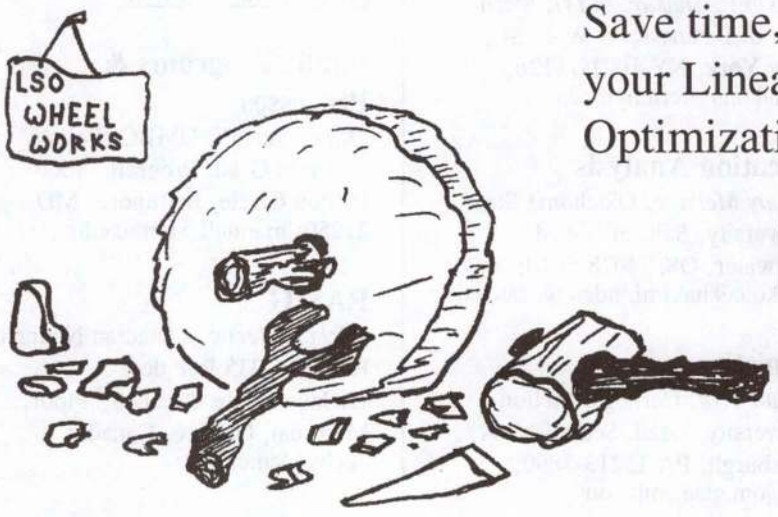

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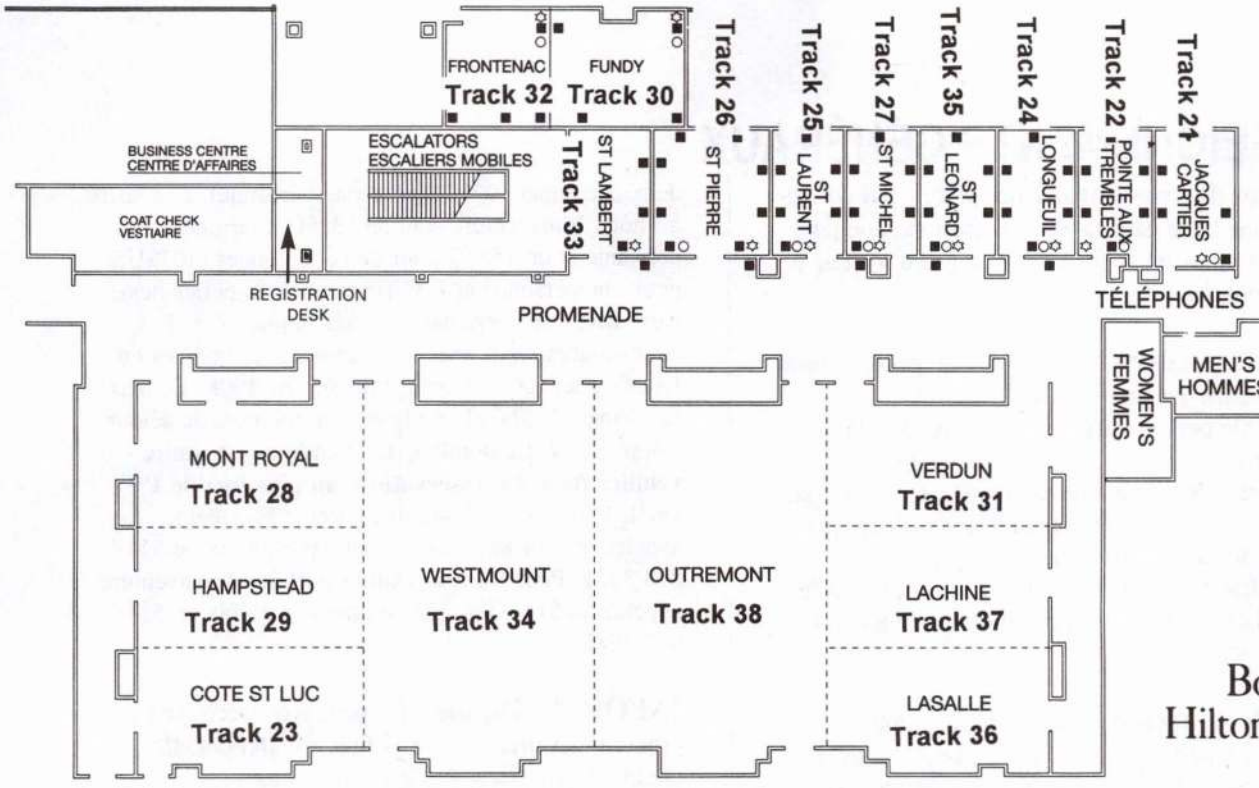

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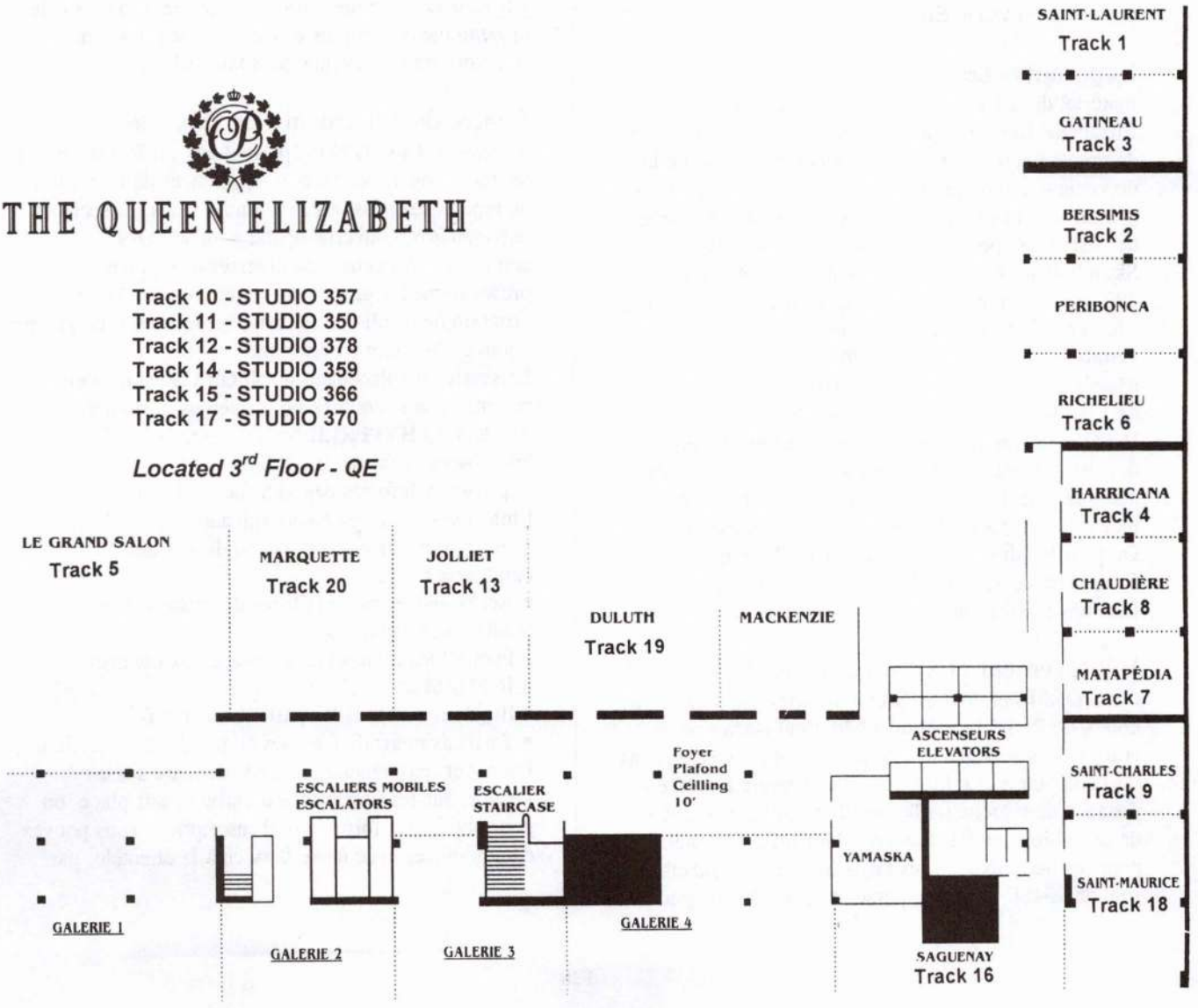

RENSEIGNEMENTS GÉNÉRAUX

Recyclage des insignes d'identité - INFORMS installera une boîte dans la zone d'inscription où les participants pourront déposer leur insigne d'identité à la fin du congrès.

Service de garderie - Un service de garderie sera dispensé par des personnes sûres et hautement qualifiées. On peut y inscrire les enfants âgés de 6 semaines à 14 ans. Si ce service vous intéresse, veuillez vous adresser au bureau du Rhode Island, par téléphone au 800-343-0062 ou au 401-274-2525, poste 202 ou encore par courrier électronique, HYPERLIEN mailto: meetings@informs.org d'ici le 2 mars; un engagement ferme doit être reçu au plus tard le 31 mars.

Centre de courrier électronique - Pour permettre aux participants de rester en contact avec le monde extérieur durant le congrès, des terminaux de courrier électronique seront mis en service dans la Galerie 1 du Reine Elizabeth.

Exposants - Les exposants présenteront leur matériel dans les Galeries 2, 3 et 4 du Reine Elizabeth. Les concepteurs et les éditeurs de logiciels de pointe exposeront les plus récents logiciels, de la documentation de référence technique et des services spécialisés. Les entreprises désireuses de faire partie des exposants peuvent communiquer avec Tanya Skorohod au 800-343-0062 ou au 401-274-2525, poste 202, ou encore écrire à meetings@informs.org. Voici l'horaire de la salle d'exposition :

Lundi	**9h-17h**
Mardi	**9h-17h**
Mercredi	**9h-12h**

INFORMS a retenu les services d'un courtier en douane qui se chargera de toute formalité auprès des douanes canadiennes. Un guide des douanes et des modalités d'expédition sera envoyé aux exposants. On peut joindre le courtier à : Mendelssohn Commercial, 514-987-2700, FAX 514-849-3446. Liaisons : Mike Patterson ou Gary Sheepwash.

Hébergement - Le Congrès conjoint 1998 d'INFORMS et de la SCRO à Montréal se tiendra aux hôtels Le Reine Elizabeth et Montréal Bonaventure Hilton - des sessions techniques seront présentées dans les deux hôtels. Le Montréal Bonaventure Hilton est à distance de marche du Reine Elizabeth. Des sections de chambres ont été réservées dans les deux hôtels pour les participants; les tarifs au Reine Elizabeth sont de 134$C pour une personne et de 154$C pour deux personnes (99$US pour une personne). Les tarifs à l'hôtel Bonaventure sont de 137$C pour une personne et de 158$C pour deux personnes (101$US pour une personne et 116$US pour deux personnes). Ces tarifs n'incluent pas les taxes applicables. Les équivalences en devises américaines sont établies en fonction des taux de change de janvier 1998. Le taux de change de l'hôtel en vigueur au moment du séjour s'appliquera. **Le nombre de chambres est limité - veuillez faire vos réservations au plus tard le 1er avril.** Pour les réservations au Reine Elizabeth, appelez au 514-861-3511 ou envoyez un fax au 514-878-3881. Pour les réservations à l'hôtel Bonaventure, appelez au 514-878-2332 ou envoyez un fax au 514-878-3881.

INFORMS Online - On peut avoir accès aux programmes préliminaire et final sur INFORMS Online, à http://www.informs.org. Les renseignements y sont mis à jour régulièrement. Vous y trouverez une information de première main sur le programme du congrès et vous pourrez imprimer votre propre programme personnalisé.

Centre de placement - JPS, le service de placement d'INFORMS, permet aux professionnels en recherche opérationnelle et en sciences de la gestion de repérer les possibilités d'emploi dans les secteurs universitaire, gouvernemental et privé. Des employeurs provenant de diverses disciplines professionnelles participent régulièrement à ce programme établi sur une base semestrielle, de janvier à juin et de juillet à décembre.
Le service de placement d'INFORMS est déjà en activité pour le congrès du printemps à Montréal. Accédez au HYPERLIEN
http://www.informs.org/JPS/
http://www.informs.org/JPS/ pour obtenir de l'information sur les points suivants :

- Inscription sur place des candidats et des employeurs;
- Accès jour et nuit aux listes des postes et aux dossiers des candidats;
- Possibilités d'entrevue sur place aux congrès d'INFORMS;
- Brochures de tous les participants actifs;
- Tarifs avantageux (service gratuit pour les étudiants)

Pour tout renseignement supplémentaire sur ce service, sur les possibilités d'entrevue sur place, ou pour obtenir un formulaire d'inscription, vous pouvez communiquer avec notre Service à la clientèle, par

téléphone au 800-446-3676, ou au 410-850-0300, ou par courrier électronique, jps@mail.informs.org.

Retrait de communication - Il faut aviser le bureau de Rhode Island par écrit de tout retrait de communication; on peut faire parvenir cette information par fax, au 401-274-8739, ou par courrier électronique à ginni.mcgee@informs.org, ou encore par la poste à 2 Charles St, Ste. 300, Providence RI 02904. Si vous êtes dans l'impossibilité d'assister au congrès, veuillez nous informer du retrait de votre communication. Les retraits reçus avant le 6 mars figureront dans le programme final du congrès; tous ceux reçus après cette date seront indiqués dans l'addenda du programme.

Salon des professionnels - Un salon à l'intention des professionnels en recherche opérationnelle et en sciences de la gestion sera mis en place - des rafraîchissements y seront servis. Vous pourrez ainsi échanger avec des confrères ou avec des personnes oeuvrant dans d'autres secteurs d'activité.

Programme - Le programme préliminaire a été posté aux auteurs avec le numéro de février de *OR/MS Today*. Le programme final de même que les résumés seront distribués au congrès. Les membres ou les auteurs qui n'assisteront pas au congrès peuvent acheter le programme final au coût de 15 $ en appelant au 800-446-3676 ou au 410-850-0300. On peut consulter les programmes préliminaire et final sur INFORMS Online, HYPERLIEN http//www.informs.org http//www.informs.org.

Services spécialisés et assistance - Les participants nécessitant des aménagements ou des services spécialisés pour les chambres d'hôtel, les salles du congrès ou les activités spéciales peuvent communiquer avec Julie Eldridge par téléphone au 800-343-0062 ou au 401-274-2525, poste 201, par fax au 401-274-3189 ou par courrier électronique à l'adresse julie.eldridge@informs.org au plus tard deux semaines avant le congrès.

Transport - L'aéroport international de Dorval est situé à environ 20 minutes du centre-ville de Montréal. Les autobus de la compagnie Autocar Connaisseur assurent la navette entre Dorval et les hôtels du congrès au coût de 9$C par personne. Pour le trajet en taxi, il faut acquitter un tarif fixe de 24$C.

Transport aérien - Pour vous rendre à Montréal, économisez de 5 à 10 % sur American Airlines et Air Canada ou obtenez les tarifs les plus bas sur tout transporteur aérien. Obtenez un rabais supplémentaire de 5 % avec tout achat anticipé d'un minimum de 60 jours. Nous offrons des voyages sans achat de billet sur la majorité des transporteurs et une assurance-transport gratuite de 100 000$. Appelez Conventions in America, CIA, l'agence de voyage officielle d'INFORMS, au 800-929-4242 et demandez le Groupe 560. À l'extérieur des États-Unis et du Canada, appelez au 619-453-3686, communiquez par fax au 619-453-7976, ou visitez notre site Web, HYPERLIEN http://www.scitravel.com www.scitravel.com ou encore écrivez-nous sur Internet, HYPERLIEN mailto:clycia@scitravel.com flycia@scitravel.com.On peut réserver du lundi au vendredi, de 6h30 à 17h, heure du Pacifique. Si vous appelez les transporteurs directement ou que vous faites affaire avec votre propre agence de voyage, utilisez les codes suivants: American, 800-433-1790, Starfile 4748UK; Air Canada, 800-361-7585, CV 987548.

Avis Rent-a-Car offre des rabais sur la location de voiture; appelez Avis au 800-331-1600, AWD J949018.

PROGRAMME DES PERSONNES ACCOMPAGNATRICES

Petit-déjeuner - Les frais d'inscription de 25 $ incluent le petit-déjeuner continental, du lundi au mercredi, de 8h30 à 9h30, ainsi que la réception générale du lundi soir. Pour s'inscrire, les personnes accompagnatrices peuvent utiliser le formulaire d'inscription inclus dans le programme. Les petits-déjeuners sont réservés aux personnes accompagnatrices inscrites; celles-ci doivent porter leur insigne d'identité jaune pour être admises.

CONFÉRENCES DE PRESTIGE ET PLÉNIÈRES

Conférence Omega Rho
Le lundi 27 avril, 11h à 12h
Grand Salon

La psychologie des files d'attente (Beyond the Physics of Queueing), *Richard C. Larson, MIT, 77 Massachusetts Ave., Cambridge, MA 02139*

Depuis qu'au cours des années 50, un consultant s'intéressant à la recherche opérationnelle a placé des miroirs à proximité des ascenseurs dans les gratte-ciel, la physique des files d'attente a dû faire face à un adversaire de taille : la psychologie de la file d'attente. Si une personne peut trouver justifiée une attente de 30 minutes pour l'achat d'un billet, chez une autre personne, cette situation peut provoquer de la colère et même engendrer de la violence. Nous abordons ces sujets dans une perspective pratique, en utilisant de nombreux exemples tirés de la vie quotidienne. Nous considérons certains facteurs comme les aspects multi-attributs, la non-linéarité de l'utilité du temps d'attente et l'importance de l'environnent de la file d'attente. Le concept de « justice sociale » peut s'appliquer aux files d'attente; il s'est révélé d'une importance capitale pour les clients et on peut même le mesurer à l'aide de méthodes de modélisation mathématique plus traditionnelles de RO. Nous conclurons en définissant des stratégies visant la réduction ou même l'élimination du stress des files d'attente, ou en cas d'échec, la poursuite de solutions créatives.

Conférence plénière
Le mardi 28 avril, 11h30 à 12h30
Grand Salon

Applications pratiques de SABRE pour la résolution de problèmes commerciaux complexes faisant appel à la recherche opérationnelle, au génie industriel et à la technologie de l'information (SABRE's Practical Business Applications Solving Complex Business Problems Using Operations Research, Industrial Engineering & Information Technology), *Thomas M. Cook, SABRE Decision Technology, 4255 Amon Carter Blvd, PO Box 619615, MD 4462, Ft. Worth, TX 75261-9616*

On expliquera comment SABRE combine les principes de la RO, du génie industriel et de la technologie de l'information pour résoudre des problèmes commerciaux complexes dans les secteurs du voyage et du transport. On passera en revue les faits marquants dans l'histoire de SABRE, de ses débuts quand elle a résolu le problème de gestion de stock du transporteur aérien American Airlines au moyen d'une technique appelée « yield management » jusqu'aux récents défis qu'elle a relevés en appliquant ses solutions aux industries du chemin de fer et de l'hôtellerie. Enfin, on présentera une étude de cas fondée sur un problème réel auquel était confronté un client et la méthode de RO qui a été utilisée pour le résoudre.

CORS/SCRO - *Paulo Toth, Université de Bologne, DEIS, Viale Risorgimento 2, Bologne, Italie, 40136*

Conférence Harold Larnder
Le mardi 28 avril, 11h30 à 12h30
Salle Marquette

INFORMATION SUR MONTRÉAL

• Montréal est la deuxième agglomération urbaine en importance au Canada et la plus grande ville d'expression française hors de France. Environ un million sept cent mille personnes vivent sur l'île de Montréal et la grande région métropolitaine compte plus de trois millions de résidants. Bien que le français soit la langue officielle du Québec, près d'un million de personnes habitant la grande région de Montréal ont une langue maternelle autre que le français. À Montréal, un total de 35 langues sont parlées et quelque 30 religions sont pratiquées par des citoyens originaires de 41 pays. L'anglais est largement répandu; c'est la langue maternelle de 18 % de la population. L'italien, le grec, le portugais et le chinois sont aussi parlés couramment. Le Canada utilise le système métrique des poids et mesures. Le visiteur constatera que les prévisions météorologiques sont données en degrés Celsius et que l'essence, le lait et le vin sont vendus au litre et millilitres et les aliments, au gramme et au kilogramme. Les tailles

des vêtements sont exprimées en centimètres et le tissu est vendu au mètre. Enfin, on affiche les distances et les limites de vitesse en kilomètres à l'heure.

• **Devises** - Le système monétaire canadien utilise les dollars et les cents. Compte tenu de la fluctuation actuelle des taux de change, il peut y avoir une différence entre la valeur des deux monnaies. Au Canada, il est recommandé d'utiliser l'argent canadien pour éviter tout problème de conversion. Au 1er janvier 1998, un dollar canadien valait approximativement 0,70 dollar américain. Les principales cartes de crédit sont acceptées dans tous les hôtels, ainsi que dans la majorité des restaurants et des grands magasins. La taxe fédérale (TPS) de 7 % est perçue sur la plupart des produits et services vendus au Canada. En outre, la taxe provinciale du Québec de 7,5 % est prélevée sur les produits et les services. Les non-résidents peuvent demander un remboursement de la TPS pour la plupart des produits (sauf exceptions) achetés pour fins d'utilisation à l'extérieur du Canada, ainsi que sur l'hébergement de courte durée, tels les hôtels. Vous trouverez de plus amples renseignements à ce sujet dans la brochure intitulée « Remboursement de la taxe aux visiteurs », publiée par Revenu Canada, Douanes et Accise, téléphone : 1 800 668-4748 (Canada) ou (613) 991-3346. Vous pouvez réclamer le remboursement de la taxe en présentant votre formulaire à une boutique hors taxes canadienne participante ou par retour du courrier. On peut aussi obtenir un remboursement de la taxe provinciale pour les achats de 500 $ et plus, soit en appelant Revenu Québec (514) 873-4692, soit en demandant le formulaire approprié au détaillant.

• **Climat** - Nos conditions climatiques varient énormément, particulièrement en avril qui est un mois de transition. Normalement, les températures devraient se situer entre 5°C (41°F) et 15°C (59°F) à la fin d'avril.

• **Douanes**

Bagages - Les vêtements et les effets personnels de chaque visiteur entrant au Canada sont exemptés de droits et de taxes. Des quantités limitées de produits du tabac peuvent être importées en franchise de droits et de taxes par les personnes de 18 ans ou plus dans la plupart des provinces et de 19 ans et plus dans d'autres provinces. Les visiteurs doivent avoir plus de 18 ans ou de 19 ans pour importer des boissons alcooliques en provenance de l'autre côté de la frontière. Les articles comme les appareils photo, les magnétophones, les ordinateurs et les articles de sport doivent être enregistrés par les voyageurs auprès du service douanier de leur pays de résidence.

Preuve d'identité - Le Canada a une frontière ouverte avec les États-Unis. Par conséquent, les citoyens et les résidents permanents des États-Unis n'ont pas besoin de passeport ni de visa et peuvent généralement franchir la frontière sans difficulté. Cependant, ils doivent présenter une preuve de citoyenneté. Sont acceptés le passeport, un certificat de naissance et une carte d'identité avec photo ou toute autre preuve de citoyenneté. Toute personne provenant d'un autre pays que les États-Unis doit être munie d'un passeport et d'une carte verte (formulaire américain 1-551). Pour de plus amples renseignements, veuillez vous adresser au consulat canadien le plus près ou à l'ambassade canadienne, au 202-682-1740, avant votre départ. Il appartient au visiteur de s'assurer, avant son entrée au Canada, qu'il a en sa possession les documents requis, y compris les documents nécessaires à son entrée dans un autre pays ou à son retour dans son pays d'origine.

INSCRIPTION

• **Pré-inscription (Date limite : le 1er avril 1998)**
Les participants sont priés de s'inscrire à l'avance à la conférence; la pré-inscription est moins chère, plus rapide et plus facile que l'inscription sur place. Il suffit de remplir le formulaire de pré-inscription et de le poster à INFORMS Montreal, 2 Charles Street, Suite 300, Providence, RI 02904 au plus tard le 1er avril. On peut acquitter ces frais par carte de crédit (American Express, MasterCard, VISA seulement - par fax au 401-274-3189) ou par chèque ou mandat, libellé à l'ordre de INFORMS Montreal '98. Vous pouvez aussi acquitter les frais d'inscription par carte de crédit sur le Web au http://www.informs.org - il s'agit d'un serveur sécuritaire. La date limite pour la pré-inscription sera rigoureusement respectée; toute inscription dont le cachet de la poste excède la date limite du 1er avril devra être acquittée au plein tarif de l'inscription sur place. On peut se procurer les documents d'inscription dans la zone d'inscription. Pour les résidents canadiens, le paiement des frais d'inscription doit être effectué en dollars canadiens, par chèque ou par mandat seulement.

• **Inscription sur place** - L'inscription au congrès se tiendra dans la Galerie 1 du Reine Elizabeth aux heures suivantes

Dimanche 26 avril	**16h - 20h***
Lundi 27 avril	**7h30 - 17h**

Mardi 28 avril	**7h30 - 17h**
Mercredi 29 avril	**7h30 - 15h30**

Les frais d'inscription incluent l'admission à toutes les sessions techniques, à la réception générale et à la salle d'exposition. Il FAUT porter son insigne d'identité à toutes les sessions et activités d'INFORMS. Pour remplacer un insigne d'identité perdu, on doit présenter son reçu au comptoir d'inscription. Les repas ne sont pas inclus dans les frais d'inscription. Pour les ateliers ou les activités spéciales, des frais supplémentaires sont exigés. TOUS LES PARTICIPANTS, Y COMPRIS LES PRÉSIDENTS DES SESSIONS ET LES CONFÉRENCIERS, DOIVENT S'INSCRIRE ET ACQUITTER LES FRAIS D'INSCRIPTION.

• **Frais d'inscription**

Dates limite	**Jusqu'au 1 avril**	**Après le 1 avril**
Membre d'INFORMS	180$	205$
Non-membre	220$	245$
Étudiant/Retraité	65$	65$
Personne accompagnatrice	25$	25$

• **Annulations et remboursements** - Les frais d'inscription ne seront remboursés que si le bureau de INFORMS Rhode Island reçoit une annulation écrite au plus tard le 22 avril. On peut aussi envoyer les annulations par fax au 401-274-3189 ou par courrier électronique à meetings@informs.org dans les délais prescrits.

ACTIVITÉS SPÉCIALES

Activités de la SCRO - Les membres de la SCRO sont invités à participer aux diverses activités de la SCRO durant le congrès. Les plus importantes de celles-ci auront lieu le mardi 28 avril.

• Prendre note que les sessions consacrées au Concours du meilleur étudiant et au Prix sur la pratique de la RO auront lieu le lundi 27 avril à la salle Joliette à 14h45 (sessions MC13 et ME13).

• La Conférence Harold Larnder sera donnée par le professeur Paulo Toth, Université de Bologne, Italie, à 11h30 dans la salle Marquette.

• L'Assemblée générale annuelle des membres aura lieu dans la salle Marquette à 15h15 (session TD20) et sera suivie d'une session de remise de prix (TE20) durant laquelle on distribuera les divers prix et distinctions décernés cette année par la SCRO. Une réception Vins et Fromages conclura cette session.

Atelier du CPMS pour les praticiens solitaires

- Le CPMS, la section qui s'intéresse aux applications pratiques des sciences de la gestion, commandite des ateliers portant sur des sujets d'intérêt pour les praticiens qui travaillent en solitaire, c.-à-d. les « Lone Rangers » de la recherche opérationnelle et des sciences de la gestion. Le 12e atelier de cette série portera sur des questions actuelles qui touchent la communauté des praticiens solitaires. Tous sont invités à participer à l'atelier et à la discussion, lundi soir, de 18h15 à 19h15. Vins et fromages seront servis.

Forum sur les femmes en recherche opérationnelle et en sciences de la gestion

• **Réunion-déjeuner** - Apportez votre lunch à la réunion-déjeuner qui se tiendra le lundi 27 avril, de 12h à 13h. Toute personne qui s'intéresse à la situation des femmes en recherche opérationnelle et en sciences de la gestion peut y assister. Venez nous voir!

• **Réception** - La réception du Forum sur les femmes en recherche opérationnelle et en sciences de la gestion aura lieu dimanche soir dans la salle Saint-Maurice, de 19h à 21h. Tous sont invités à venir rencontrer des chercheures et des praticiennes en recherche opérationnelle et en sciences de la gestion.

Réception générale - Tous les participants et les personnes accompagnatrices inscrites sont invités à assister à la réception générale, lundi soir, dans le Grand Salon de l'hôtel Le Reine Elizabeth, de 19h30 à 21h30. Veuillez présenter le billet inclus dans votre pochette d'inscription à l'entrée.

Nicholson Student Paper Prize - Cette session présente les finalistes sélectionnés pour le concours Nicholson Student Paper Prize. Il s'agit d'une excellente occasion pour les membres des facultés, les professionnels et d'autres étudiants de découvrir quelques-uns des meilleurs travaux de recherche réalisés par des étudiants. Tous sont les bienvenus, dimanche, de 16h à 18h dans la salle Richelieu.

Consortium du printemps des étudiants - Sous l'égide du Student Affairs Committee, trois sessions spéciales auront lieu le dimanche 26 avril, à l'intention des étudiants de maîtrise ou de doctorat qui envisagent une carrière dans l'industrie. Les sessions seront présentées dans la salle Bersimis : De 10h à 12h, Comment réussir en affaires - Conseils pour réussir dans l'industrie ou comme consultant (How to Succeed in Business: Tips for Success in Industry & Consulting); de 12h à 13h30 - Déjeuner et séance de

brainstorming en vue des prochains consortiums du printemps des étudiants, et de 13h30 à 15h - Tout ce que doit savoir un consultant en gestion au sujet de la RO/tout ce que doit savoir le chercheur opérationnel sur la gestion (What Every Management Consultant Needs to Know About OR-What Every OR Practitioner Needs to Know About Management). Tous les étudiants de deuxième et de troisième cycles qui arrivent à la fin de leurs études et qui sont intéressés à assister sont les bienvenus! Le nombre de repas offerts sera fonction des pré-inscriptions, mais tous sont invités à participer!

Réception des étudiants - Voici l'occasion de tisser des liens avec d'autres étudiants participants. Cette réception, qui se tiendra le dimanche soir de 19h à 21h dans la salle Duluth du Reine Elizabeth, est ouverte à tous les étudiants inscrits. Veuillez présenter le billet inclus dans votre pochette d'inscription à l'entrée.

Présentations en lice pour la 27e édition du Annual Franz Edelman Award for Achievement in OR/MS

Représentant diverses applications (gestion des procédés, analyse de portefeuille, prévisions, logistique et planification d'aide à la décision), sept finalistes rivaliseront pour l'obtention du Franz Edelman Award for Achievement in Operations Research and the Management Sciences1998. Stephen Strauss, président du concours de 1998 a annoncé les noms des finalistes : Bosques, Arauco S.A.; Cerestar; Grantham, Mayo, Van Otterloo & Co., LLC; Johnston County (NC) Public Schools, Maristrans, Inc.; Pacific Lumber Co. et Sears.

On pourra entendre les présentations des finalistes pour le concours de 1998 le dimanche 26 avril 1998 au Reine Elizabeth. Toute personne intéressée aux applications pratiques de la recherche opérationnelle et des sciences de la gestion est invitée à assister à la session d'une journée. Les frais sont de 95 $ par personne et incluent le déjeuner et une réception après les présentations. Les résultats seront annoncés lors d'une remise spéciale de prix, le mardi 28 avril.

C'est la 27e année qu'a lieu ce concours prestigieux dont les prix totalisent 15 000 $. Il est organisé conjointement par INFORMS et par le CPMS, la section d'INFORMS qui s'intéresse aux applications pratiques des sciences de la gestion. Le prix Edelman souligne les réalisations exceptionnelles ayant eu un impact considérable sur le rendement de l'entreprise cliente. Les travaux présentés cette année embrassent un large éventail d'applications de la recherche opérationnelle. Vous trouverez de plus amples renseignements sur les finalistes ainsi que les résumés de leurs présentations dans le programme anglais ou sur INFORMS Online, http://www.informs.org.

Session d'ouverture et de remise des prix - Tous sont invités à assister à la session d'ouverture, le lundi 27 avril de 9h45 à 10h45. Karla Hoffman, présidente d'INFORMS, et Paul Mireault, président du comité organisateur de Montréal, souhaiteront la bienvenue aux participants. Les prix suivants seront remis durant la session : le INFORMS Prize for the Teaching of OR/MS Practice, le Philip McCord Morse Lectureship Award, le George E. Nicholson Student Paper Prize et le John von Neumann Theory Prize.

Réception des membres d'INFORMS

Le comité exécutif d'INFORMS annonce que la réception des membres prendra la forme d'une dégustation de vins et fromages qui aura lieu le dimanche après-midi et à laquelle tous les participants sont conviés. À Montréal, la réception aura pour thème un nouveau concept appelé INFORMS 2000.

INFORMS 2000 est une nouvelle formule que nous proposons pour le congrès annuel et qui met l'accent sur la résolution de problèmes en RO et en sciences de la gestion dans l'industrie, le secteur gouvernemental et les organismes à but non lucratif. INFORMS 2000 accordera une place de choix aux nouveaux champs d'application, aux démonstrations pratiques de logiciels, aux exposés magistraux sur de nouvelles techniques et proposera de nouvelles approches aux gestionnaires de projets à grande échelle basés sur les techniques de l'information. Le comité exécutif et le comité des congrès vous invitent à soumettre des idées pour la mise en œuvre de ce nouveau concept. Nous comptons sur votre participation. Cette réunion pourrait s'ajouter aux activités déjà existantes ou remplacer l'un de nos deux congrès annuels. Nous attendons vos suggestions.

Vous pourrez aussi vous procurer un bref compte rendu qui décrit diverses activités internes d'INFORMS. La réunion se tiendra au Salon Joliet du Reine Elizabeth le dimanche 26 avril, de 16h à 17:30h. N'hésitez pas à vous joindre à nous pour échanger dans un esprit de franche camaraderie.

PROGRAMME TECHNIQUE

La Information Systems & Technology Conference

La troisième édition de la Information Systems & Technology Conference, présidée par Varghese Jacob et Ramayya Krishnan, se tiendra dans le cadre du Congrès conjoint d'INFORMS et de la SCRO à Montréal, Canada, du 26 au 29 avril 1998. La conférence est sous l'égide du College on Information Systems et du College on Artificial Intelligence d'INFORMS. La page Web de la conférence est à l'adresse http://www.heinz.cmu.edu/~rk2x/cist.html. En plus d'être un lieu d'échange sur la recherche dans les systèmes d'information, cette conférence a pour but d'aider les participants, les chercheurs et les praticiens à définir les liens interdisciplinaires qui existent dans l'environnement d'INFORMS.

À cette fin, la conférence s'articulera autour d'exposés de première qualité et de communications de prestige présentés par des experts provenant du milieu universitaire et de l'industrie, notamment: ***Rajiv Banker**, University of Texas, **John Henderson**, Boston University, **Robert Kraut**, Carnegie Mellon University, **John King**, University of California, **Paul Gray**, Claremont University, **Suresh Sethi**, University of Texas, **Denni Hong-Mo Yeh**, Taiwan*

Ces communications mettront l'accent non seulement sur la recherche dans les systèmes d'information mais aussi sur les liens interdisciplinaires entre les systèmes d'information et certaines disciplines connexes.

Pour assister à cette conférence, il faut acquitter des frais d'inscription supplémentaires, tel qu'il est indiqué sur le formulaire d'inscription. Les participants pourront prendre part à toutes les activités et sessions du Congrès conjoint d'INFORMS et de la SCRO.

Exposés magistraux

• MA19 Modèles financiers (Financial Models), conférencier: ***John M. Mulvey**, Princeton University*, **présidente:** ***Michèle Breton***

Les banques, les compagnies d'assurance et d'autres institutions financières d'importance ont souvent recours à l'optimisation stochastique pour la gestion des risques et la recherche de nouvelles possibilités à exploiter. On étudiera ici cinq éléments clés : les modèles à l'échelle de l'entreprise, les mesures du risque temporel, la génération de scénarios, les stratégies d'investissement dynamiques et les algorithmes de résolution. Une application de planification financière à long terme sera utilisée pour illustrer ces points.

• MD19 Calcul parallèle (Parallel Computing), conférencier: ***Stavros A. Zenios**, Université de Chypre*, **président:** ***Teodor G. Crainic***

Dans le cadre de cet exposé, on verra comment on peut appliquer le calcul parallèle aux problèmes de recherche opérationnelle et de sciences de la gestion. On traitera des technologies, des algorithmes et des applications du calcul parallèle. Les participants découvriront quelles combinaisons d'algorithmes et de technologies se sont révélées les plus efficaces pour résoudre les classes générales de problèmes.

• ME19 Méthodes « Lift & Project » pour les programmes mixtes en nombres entiers (Lift & Project Methods for Mixed Integer Programs), conférencier: ***Sebastian Ceria**, Columbia University*, **président:** ***Jean-Marie Bourjolly***

Nous présentons un algorithme qui peut être utilisé pour tout programme en nombres entiers en vue de produire des coupes de type « lift-and-project ». Ces coupes reposent uniquement sur le fait que certaines variables du modèle sont contraintes à être entières. Les résultats de vastes expériences numériques indiquent qu'elles sont efficaces lorsqu'on les utilise avec un algorithme « Branch & Cut » pour résoudre les programmes mixtes généraux en nombres entiers qui se présentent dans une grande diversité d'applications.

• MA20 Méthodes de génération de colonnes (Column Generation Methods), ***Jacques Desrosiers, École des HEC et GERAD*****, président:** ***Marius M. Solomon***

Dans une perspective historique, cet exposé présente d'abord les méthodes de génération des colonnes, y compris les relations avec d'autres algorithmes de décomposition comme les méthodes de coupe, les faisceaux, le centre analytique et la relaxation lagrangienne. Suivront quelques expériences numériques récentes sur les applications de la programmation en nombres entiers. Une démonstration faisant appel au logiciel GENCOL conclura la présentation.

• MC20 Optimisation de réseau : Que peut-on apprendre des récentes découvertes en informatique? (Network Optimization: Learning from Recent Discoveries in Computer Science), conférenciers: ***James B. Orlin, Ravindra K. Ahuja, Thomas L. Magnanti, MIT*****, président:** ***Stefano Pallotino***

Nous présentons trois récents résultats élégants, significatifs et relativement simples attribuables à des informaticiens : un algorithme de flot maximum amélioré de Goldberg et Rao; la construction de graphiques appelés « light weight spanners » qui estiment simultanément les arbres de recouvrement optimaux et les chemins les plus courts; et un troisième sujet qui sera déterminé peu de temps avant le congrès.

• **MD20 La recherche opérationnelle et la modélisation des politiques en matière au SIDA (Operations Research & AIDS Policy Modeling), conférencière:** ***Margaret L. Brandeau****, Stanford University*, **présidente:** ***Sophie Lapierre***
Dans le cadre de cet exposé, on explique comment les techniques de RO peuvent permettre d'améliorer la prise de décisions dans la prévention du SIDA et le traitement des personnes infectées. Un certain nombre de modèles, englobant divers champs d'application et méthodologies, seront présentés pour illustrer l'utilisation et les possibilités de la RO dans ce domaine.

• **TA19 Systèmes intelligents de transport (Intelligent Transportation Systems), conférencier:** Hani Mahmassani, *University of Texas*, **président:** ***Michel Gendreau***
Les systèmes intelligents de transport sont fondés sur l'acheminement d'information en temps réel vers les gestionnaires du trafic ou les gestionnaires de flottes de véhicules pour une exploitation maximale des systèmes. Cet exposé traite de classes exigeantes de problèmes de RO qui découlent des technologies de systèmes intelligents de transport et présente un aperçu des récents développements dans les modèles d'affectation dynamique du trafic pour les applications en temps réel des systèmes intelligents de transport.

• **TC19 Logiciels de programmation linéaire ou en nombre entiers (Software for Linear & Integer Programming), conférencier:** ***Robert Fourer****, Northwestern University*, **président:** ***Bruce L. Golden***
Les logiciels de programmation linéaire, qui ont gagné en diversité et en efficacité au cours de la dernière décennie, sont maintenant disponibles dans une profusion de formats. Cet exposé dresse l'inventaire des logiciels actuels qui permettent des opérations de formulation, de résolution, d'analyse et de gestion en programmation linéaire, avec ou sans variables entières. L'accent sera mis sur les dernières tendances dans les domaines du langage, des interfaces et de la conception d'algorithmes.

• **TD19 Introduction à la programmation stochastique (An Introduction to Stochastic Programming), conférencier:** ***François Louveaux****, Université de Namur*, **président:** ***Gilbert Laporte***
La programmation stochastique a pour but la modélisation et la résolution de problèmes comportant des données incertaines. Cet exposé propose une introduction à la programmation stochastique pour les non-initiés. Dans un premier temps, on présentera des exemples d'applications et des problèmes de modélisation associés à l'incertitude. On définira ensuite les propriétés de base des programmes stochastiques et les méthodes de résolution couramment utilisées. Enfin, on fera un bref survol des secteurs de recherche actuels.

• **TE19 Problèmes d'ordonnancement (Machine Scheduling Problems), conférencier:** ***Jacek Blazewicz****, Politechnika Poznanska*, **président:** ***Chelliah Sriskandarajah***
Cette étude porte sur les problèmes déterministes pour l'ordonnancement des tâches sur les machines (processeurs), un secteurs de l'optimisation combinatoire qui connaît une expansion très rapide. De façon générale, les problèmes se posent de la manière suivante. Un ensemble de tâches donné doit être traité sur un ensemble de processeurs disponibles, de façon que toutes les conditions de traitement soient remplies et qu'une certaine fonction objectif soit minimisée (ou maximisée). On suppose que, contrairement aux problèmes d'ordonnancement stochastiques, tous les paramètres des tâches sont connus à l'avance de façon déterministe. Cette hypothèse, comme nous le démontrerons plus tard, se justifie tout à fait dans bon nombre de situations pratiques. D'autre part, elle permet de résoudre des problèmes d'ordonnancement dont l'interprétation pratique diffère de l'approche stochastique. Cette interprétation est au moins un complément précieux à l'analyse stochastique et elle s'impose souvent pour certaines applications, par exemple dans le cas des systèmes de gestion des ordinateurs en place dans un environnement temps réel exigeant et dans de nombreuses applications industrielles. Nous mettrons ensuite l'accent sur les applications de ce modèle dans

les systèmes informatiques, par exemple, l'ordonnancement sur des processeurs parallèles et les interruptions de tâches. Cependant, nous parlerons aussi d'autres interprétations, puisque les tâches et les machines peuvent aussi représenter des navires et des chantiers navals, des classes et des enseignants, des patients et de l'équipement hospitalier ou des repas et des cuisiniers.

• **TA20 La recherche opérationnelle et les sciences de la gestion, des outils stratégiques (Strategic Operations Research/Management Science), conférencier:** ***Peter Bell, University of Western Ontario*****, présidente:** ***Ann Langley***
Plusieurs grandes entreprises considèrent maintenant leurs travaux en recherche opérationnelle et en sciences de la gestion comme des outils stratégiques. Cet exposé présente le concept d'utilisation stratégique de la recherche opérationnelle et de sciences de la gestion et donne des exemples d'activités stratégiques et de problèmes stratégiques en recherche opérationnelle et en sciences de la gestion dans des entreprises de pointe. On démontre qu'une perspective stratégique de la recherche opérationnelle et des sciences de la gestion fournit de nombreuses possibilités de recherche pour l'avenir.

• **TB20 Branch & Cut & Price , conférencier:** ***George L. Nemhauser, Georgia Institute of Technology*****, président:** ***Paolo Toth***
Les méthodes « Branch-and-cut (price) » combinent des méthodes « branch-and-bound » et des méthodes de coupe (génération de colonnes) pour résoudre des programmes mixtes en nombres entiers. À chaque noeud de l'arbre, on peut ajouter des coupes (des colonnes peuvent être générées) pour resserrer (améliorer) la relaxation PL. Notre présentation explique pourquoi et comment ces méthodes fonctionnent et comment les utiliser dans la pratique.

• **TC20 Introduction à la recherche avec tabous (An Introduction to Tabu Search), conférencier:** ***Michel Gendreau, Université de Montréal et CRT*****, président:** ***James P. Kelly***
Au cours des dix dernières années, la recherche avec tabous s'est révélée l'une des techniques heuristiques les plus efficaces pour s'attaquer à des problèmes combinatoires complexes. Cet exposé s'adresse aux nouveaux venus dans le domaine de la recherche avec tabous : on examinera les concepts de base et on fournira des conseils pour la mise en place d'heuristiques de recherche avec tabous efficaces.

Visites d'usine: Trois visites d'usine seront proposées durant le congrès. Les détails des visites seront affichés sur la page Web http://www.informs.org/.

• **CAE Électronique Ltée: Le lundi 27 avril en après-midi, 15$US -** CAE Électronique Ltée est l'un des chefs de file mondiaux dans les technologies de pointe et l'entreprise canadienne la plus en vue en matière de systèmes et de logiciels scientifiques. CAE Électronique Ltée est le leader mondial pour la conception et la fabrication de simulateurs de vol commerciaux et d'outils de formation de vol mais elle applique aussi sa technologie informatique en temps réel à des tâches complexes : simulation, formation, gestion et supervision pour un large éventail d'avions civils et militaires; production, transmission et distribution d'énergie hydraulique et thermique; gestion du trafic aérien; opérations maritimes; systèmes d'exploration et de détection sous-marines. Les installations de l'entreprise, où sont entièrement intégrées conception, fabrication et mise à l'essai et où travaillent 3 700 employés, sont situées dans un complexe indépendant situé à Ville Saint-Laurent, Canada Pour de plus amples renseignements, visitez le site http://www.cae.cacae_electronics_ltd/cae_electronics_ltd.htm

• **NORTEL Le mardi 28 avril, 15$US -** Nortel conçoit, fabrique et distribue une diversité de produits pour des réseaux numériques de toutes sortes. Établie au Canada, Nortel emploie 67 000 personnes à travers le monde. À l'usine de Saint-Laurent, on fabrique des produits de transmission électronique comme l'équipement de multiplexage (fibre optique, numérique, micro-ondes et fréquence vocale) et le S/DMS TransportNode, qui est utilisé dans les produits FiberWorld. Pour de plus amples renseignements, visitez le site http://www.nortel.com

• **Canadair - Bombardier: Le mercredi 29 avril en après-midi, 15$US**
Actuellement troisième constructeur aéronautique civil au monde, Bombardier Aéronautique propose une vaste gamme de produits et de services novateurs associés aux avions d'affaires, aux avions régionaux et aux avions amphibies. Aux installations de Saint-Laurent, on fabrique les composants pour divers avions, notamment le CL-415 de Canadair, le Challenger, le Regional Jet de Canadair et l'avion

Global Express de Bombardier. Pour de plus amples renseignements, visitez le site http://www.aero.bombardier.com

* Pour toute information sur ce programme, veuillez communiquer avec Vedat Verter au (514) 398-4661, ou à l'adresse verter@management.mcgill.ca

Programme aux enseignants - Le programme à l'intention des enseignants de mathématiques et de sciences des niveaux élémentaire, secondaire et collégial comprendra des ateliers d'introduction à la RO et d'applications informatiques. On présentera une introduction à la recherche opérationnelle et aux sciences de la gestion, ainsi que des modèles probabilistes, des simulations, des modèles de files d'attente et de programmation linéaire. Les participants sont invités à assister à la conférence générale; chacun recevra des exemplaires de tous les documents relatifs au programme: bandes vidéo, abonnement à *OR/MS Today* et exemplaires de tous les logiciels avec un mode d'emploi et un guide d'activité pour les étudiants. Le programme aura lieu le dimanche 26 avril de 8h à 16h au Salon Saguenay.

VISITES GUIDÉES

Rendez-vous à Québec
Le dimanche 26 avril - 65$US

Participez à une visite d'une journée dans la ville de Québec, la seule ville fortifiée d'Amérique du Nord et le berceau de la civilisation française sur ce continent. Fondée en 1608, Québec a conservé la langue, le caractère et le mode de vie à la française. Citadelle naturelle, elle a été le site choisi par Samuel de Champlain pour ériger une forteresse en vue d'exercer un contrôle le fleuve, et ainsi sur le commerce au Canada. À proximité du centre de la vieille ville se trouvent les Plaines d'Abraham, site de la bataille de 1759 opposant les armées française et britannique qui a été un point tournant dans l'histoire de l'Amérique du Nord. Aujourd'hui, Québec est un port actif, un centre de services et de recherche important, un foyer culturel vibrant et la capitale de la province qui porte le même nom. La Basse Ville a été déclarée patrimoine historique par l'UNESCO en 1985. Des joyaux architecturaux rénovés, telle l'église Notre-Dame à la Place Royale, bordent les rues étroites et tortueuses le long de la rive du fleuve. Surplombant la Basse Ville se trouvent la Citadelle et l'hôtel Château Frontenac avec ses pignons et ses tourelles d'allure médiévale. En plus du transport, le prix de la visite comprend les services d'un guide spécialisé à Québec, un repas gastronomique (taxes et service compris) dans un restaurant du vieux Québec, un arrêt aux spectaculaires chutes Montmorency de 83m et du temps libre pour faire des achats et explorer la ville. Le départ se fera de l'hôtel Reine Elizabeth à 8h, et le retour sera vers 20h. S'il n'y a pas suffisamment de participants, le voyage pourrait être annulé et ceux qui se seraient inscrits seront intégralement remboursés.

Un après-midi au Casino de Montréal
Le mardi 28 avril- 25$US

Classé parmi les dix plus grands casinos au monde, le Casino de Montréal a tout pour éblouir: site exceptionnel, architecture remarquable et décor à couper le souffle! Laissez-vous également séduire par la beauté de son atrium de six étages et l'accueil chaleureux de son personnel. Le Casino est situé sur l'île Notre-Dame au milieu du fleuve Saint-Laurent à dix minutes des hôtels du congrès avec une vue superbe du Mont-Royal et du centre-ville. Sont inclus dans le prix : le transport aller et retour à partir des hôtels du congrès (départ à 14h, retour à 18h pproximativement), 45 minutes de démonstration des jeux dans la salle de banquet, suivies de temps libre aux tables de jeu; dessert, café et cocktails; épinglette du casino offert à tous les participants; un jeton du casino d'une valeur de 5 $ CAN, présenté dans une pochette, qu'on peut garder en souvenir, échanger contre de l'argent comptant, de la nourriture ou des boissons ou utiliser aux tables de jeu; deux cadeaux promotionnels offerts par le Casino en guise de prix d'entrée.

ATELIERS

Toute personne intéressée peut consulter les résumés des ateliers dans le programme anglais ou sur INFORMS Online, http://www.informs.org.

(How to Get the Most Value) From an INFORMS Meeting

Welcome to the INFORMS Meeting. We describe will how you can get the most value of out an INFORMS meeting and from this program. It is designed for first-time attendee at an INFORMS meeting but others should also find it useful. INFORMS meetings and this program can be confusing and the INFORMS and local meetings committees want you to find the meeting a rewarding experience.

Why People Attend

The primary activity at an INFORMS meeting is to present professional work. We will describe how to get the most value out of the sessions. However, people have other reasons to attend the meeting and we describe how to make the meeting as valuable as possible for these purposes. These may include:

- networking with colleagues;
- recruitment;
- meeting with colleagues in a specialty (subdivision);
- displaying or exploring exhibits;
- meeting with a small number of colleagues on a specific topic;
- learning from other types of sessions, i.e., tutorials and panels;
- other activities, i.e., plant tours.

Networking

Informal Discussions - These other activities are important to most of our membership. In fact, networking is probably the major reason why many people attend. The major means of networking is informal discussions in the common areas between sessions, during the lunch break and after the daily set of sessions. There are usually one or two areas at the conference where attendees mingle. This may be near the registration area or near the exhibits, but is usually a large hall in close proximity to several of the sessions. Our members will often spend time in these areas for the simple purpose of finding colleagues. Other networking locations are around the coffee break locations.

General Reception - Another major means to network is at the General Reception on Monday night. This event is the major social meeting of conference. Generally, at least half of the attendees come to the general reception. Hors d'oevres are served buffet style and there is enough for a full meal if you choose not to dine afterward.

Business Meetings - The business meetings are another means to network. These are the meetings of INFORMS subdivisions, such as Manufacturing and Service Operations Management. Within these subdivisions, members develop strong professional relationships. The subdivision business meetings are held Sunday, Monday and Tuesday after the regular sessions and are a combination of business and socializing. The meetings provide an excellent way to meet colleagues with mutual interests and to join the "loop" of the subdivision.

Exhibits

The exhibit hall offers the chance to see recent publications and software. Vendors are eager to provide promotional copies and support to academics who are thinking about using their materials in their courses.

Program

Of course, the most important part of an INFORMS meeting is the professional program, and it is important to understand how the sessions and program are put together. Most meetings have a professional theme that many of the sessions are aligned with. Building on this theme, the local committee puts together a professional program based on three primary types of sessions: invited sessions, sponsored sessions and contributed sessions. Invited sessions are planned by the local programming committee and can be geared towards the theme of the meeting. Sponsored sessions are organized by the subdivisions; these can also be considered invited in that a session chair appointed by the committee invites each speaker. Finally, contributed sessions consist of papers submitted by authors directly to the INFORMS office in response to the Call for Papers. All papers are accepted for these sessions.

Invited sessions are organized into groups of sessions known as clusters. The clusters are generally related topics and are the basis from which the meeting planners develop the professional program. These clusters are in turn related to the theme. The clusters are of interest to attendees as they define topic areas that they may be interested in. To facilitate planning, individual sessions from these clusters are scheduled in one or more tracks. A track is a collection of sessions that meet in the same room throughout the conference. To find out more about the availability of sessions in a cluster, refer to the Master Track Schedule to determine the days and times during which a cluster is scheduled and the number(s) of track(s) containing the cluster of interest.

Master Track Schedule (Matrix)

The Master Track Schedule is an overall view of the program. Tracks are listed in the left-hand column; regular session times are listed across the top. Each regular session lasts approximately 90

minutes. There is one track per room. There can be one or more cluster topic per track. One can see from the track schedule, which tracks and their corresponding topics might be of interest. While a track might consist of more than one topic and some related topics can appear in different tracks, the tracks are a useful way to navigate the program.

Special Sessions

The program includes a number of special sessions. A plenary talk is given on a topic of broad interest to the membership and is the only presentation scheduled for a particular time period. Every meeting also has a number of tutorials, usually with a single speaker, devoted to a single topic. A tutorial gives an overview of the topic with a focus on the state-of-the-art knowledge or practice in the area. They are generally popular and well attended. A panel is developed to topics for discussion with several experts. They can involve or any other topic where the interaction will be useful to attendees.

Session Codes

The main body of the program lists the details of the tracks in chronological order. Each session is identified by a code to identify the day, session time and slot. A paper is referred to by this code and indicates the order it is to be presented in the session. For example, MA02.3 is the Monday session, time slot A, track 02, and third presentation. This code appears directly before the paper title and is also used to identify presentations in the Participant Index at the back of the program.

In the body of the program, sessions are listed by day and time with the title of the session, the sponsor or cluster, the type of session and the room where the session is held. The session chair's name, affiliation, mailing address and email address are then indicated, followed by the title and authors of each presentation. The lead author's information will include affiliation, mailing address and email address and co-authors are listed by name only. In the preliminary program, only abstract titles and authors are shown and in the final version, a 50-word abstract is included for each presentation.

Front Material

Many of the special sessions, such as the tutorials and plenary or keynote presentations, are described in further detail in the front material pages. It is useful to review this material. The front material also contains subdivision meeting schedules, details about the host city and hotel and information on the social functions. A hotel floor plan is included in the final program; this is crucial in navigating your way through the meeting.

Indexes

The program will include a participant index. This lists the speakers alphabetically and gives the session codes for each of their presentations.

Addendum

Be aware that there are changes to the program at the last minute. An addendum to the final program listing last minute changes will be distributed with registration materials.

While there are many sessions at the conference, popular sessions such as some tutorials may fill up quickly. It is best to arrive early. The technical sessions are also an excellent place to network, as there is time after each session to speak with presenters and request papers. It is a good idea to bring an ample supply of business cards with you.

INFORMS Online

The preliminary and final versions of the printed program are also available on INFORMS Online (http://www.informs.org). You can identify specific sessions and print them out in an individual, customized program, search sessions using keywords and in general, map out your particular meeting plans at a more sophisticated level. In general, it is important to try to plan as much as possible before you arrive at the meeting. Like many other endeavors, the value you get out of a meeting will depend on the effort you put into it. To this end, we recommend reviewing the program and technical sessions in advance. Navigating the meeting will then be an easy task.

DAILY PLANNER

MONDAY	TUESDAY	WEDNESDAY
Session MA 8:00 - 9:30	Session TA 8:00 - 9:30	Session WA 8:00 - 9:30
Welcoming Session **9:45 - 10:45**	Session TB 9:45 - 11:15	Session WB 9:45 - 11:15
Monday Omega Rho Plenary **11:00 - 12noon**	**Tuesday Keynotes** **11:30 - 12:30**	Session WC 12:30 - 2:00
Session MC 1:00 - 2:30	Session TC 1:30 - 3:00	Session WD 2:15 - 3:45
Session MD 2:45 - 4:15	Session TD 3:15 - 4:45	Session WE 4:00 - 5:30
Session ME 4:30 - 6:00	Session TE 5:00 - 6:30	

Monday 08:00-09:30

MA01 Transportation Science in Chile

Sponsor: TSS & IFORS
Sponsored Session
Chair: Andres F. Weintraub, Univ. of Chile, Dept. of IE, PO Box 2777, Republica 701, Santiago, Chile, aweintra@dii.uchile.cl

1) Confidence Intervals for the Subjective Value of Time, ***Marisa Yadlin***, Pontificia Univ. Catolica de Chile, Vicuna Mackenna 4860, Santiago, Chile, myadlin@mat.puc.cl, ***Joaquin De Cea***

Different formulations and solution algorithms are proposed for modeling interuban freight transportation systems. They are based on a simultaneous equilibrium approach on networks. the models are then empirically evaluated using data from the south macro-region in Chile. Comparisons are made on the basis of computational performance and quality of results.

MA02 Modeling in Airline Industry

Sponsor: TSS
Sponsored Session
Chair: Andrew I. Vakhutinsky, United Airlines, R&D WHQKB, PO Box 66100, Chicago, IL 60666-0100, avakhutinsky@ual.com

1) Flight Resequencing to Reduce Delays, ***Debra J. Hoitomt***, United Airlines, Inc., World Headquarters WHQKB, PO Box 66100, Chicago, IL 60666, dhoitomt@ual.com, ***Larry Stone***

A ground delay program, GDP, is a mechanism for slowing the rate of arrivals into a weather-affected airport. A GDP can wreak havoc for crews and passengers who fly through the airport to some other destination. We describe an algorithm to re-sequence flights, considering passenger connections and crew legalities.

2) Building Schedule Reliability with Airline Simulation, ***Steven Morley***, United Airlines, R&D WHQKB, PO Box 66100, Chicago, IL 60666-0100, smorley@ual.com, ***Nirup Krishnamurthy***, ***Srigopal Ramalingam***

This study focuses on improving the schedule reliability of a developing airline schedule. The simulation answers the questions: What will be the on-time performance if a given schedule is flown? Which flights will have problems departing on time? What is the minimum recommended ground time for each turn?

3) Domestic Maintenance Flow at United Airlines, ***Raj A. Sivakumar***, United Airlines, Inc., R&D WHQKB, PO Box 66100, Chicago, IL 60666, ***Ram Narasimhan***

Ensuring that aircraft flows are maintenance feasible is an import aspect of schedule development. We discuss the problem formulation, solution methodology and implementation experience of the domestic maintenance flow model at United Airlines.

4) AMPOWER: Advanced Manpower Planning System, ***Patrice O. Yapo***, United Airlines, R&D WHQKB, PO Box 66100, Chicago, IL 60666-0100, pyapo@ual.com, ***Eric Gelman***, ***Arvind Narayanan***, ***Amir Thobani***

We present a new manpower planning system developed at United Airlines. AMPOWER is composed of two modules: the Forecasting Models module which provides forecasts of various absenteeism factors that result in additional manpower need and the Manpower Optimization Model which distributes vacation, training, and new-hire needs over the planning horizon.

5) Free Flight Planning: What is Important?, ***Andrew I. Vakhutinsky***, United Airlines, R&D WHQKB, PO Box 66100, Chicago, IL 60666-0100, avakhutinsky@ual.com, ***Baoxing Tang***, ***Zaili Zhang***

Implementation of the free flight concept is expected to provide substantial benefits to the airline industry. We describe our results of the quantitative comparison performed for different flight planning and air traffic control models. Using these results we propose the most efficient ways to reduce fuel consumption and flight time.

MA03 VRP

Sponsor: TSS
Sponsored Session
Chair: Sam R. Thangiah, Slippery Rock Univ., AI & Robotics Lab., Comp. Sci. Dept., Slippery Rock, PA 16057, sam.thangiah@sru.edu

1) A Multi-Commodity Formulation for the Symmetric Capacitated Vehicle Routing Problem, ***Matteo Fischetti***, Univ. di Udine, Dept. di Matematica & Info., Via delle Scienze 206, Udine, 33100, Italy, fisch@dei.unipd.it, ***Juan Jose S. Gonzalez***, ***Paolo Toth***

We propose a B&C algorithm, based on a multi-commodity formulation, for the CVRPin undirected graphs. This formulation allows us to consider all the known constraints from the previous "classic" models, and to introduce additional inequalities. Computational experiments comparing our approach with the most effective algorithms from the literature are reported.

2) Implementation & Computational Results of a Branch & Cut Algorithm for the Vehicle Routing Problem with Time Windows, ***George Kontoravdis***, PO Box 8507, Austin, TX 78713-8507, condor@acm.org, ***Jonathan F. Bard***, ***Gang Yu***

We outline a B&C algorithm for minimizing the number of vehicles for the VRP with Time Windows. Valid inequalities along with computational results for standard literature data sets will be presented.

3) The Purchasing/Routing Problem with Preloading Options, ***R. Russell***, Univ. of Tulsa, 600 S. College, Dept. of Quant. Methods & MIS, Tulsa, OK 74104, russellra@centum.utulsa.edu

We address the purchasing/routing problem which involves an alternating sequence of full pickups and deliveries. The preloading option introduces dependencies between vehicle shifts. We discuss heuristic strategies and present computational results for propane gas distribution.

4) A Genetic Heuristic for the Team Orieentering Problem, ***Sam R. Thangiah***, Slippery Rock Univ., AI & Robotics Lab., Comp. Sci. Dept., Slippery Rock, PA 16057, sam.thangiah@sru.edu

The team orientering problem involves the routing of vehicles such taht the vehicle visits a set of customers, where each customer has a demand and a score associated with it, while not exceeding the capacity of the vehicle. The objective is to visit a set of customers that maximizes the score. We introduce a genetic heuristic for solving this problem.

MA04 Supply Chain Management

Contributed Session
Chair: Pankaj Chandra, Indian Inst. of Mgmt., Vastrapur, Ahmedabad, 380015, India, chandra@iimahd.ernet.in

1) Strategic Supply Chain Relations: The Impact of Technological Spillovers & Research Joint Ventures, ***Sudheer Gupta***, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A1G5, Canada, gupta@management.mcgill.ca, ***Richard J. Loulou***

2) Allocation Strategies & Performance of Supply Chains, ***Pankaj Chandra***, Indian Inst. of Mgmt., Vastrapur, Ahmedabad, 380015, India, chandra@iimahd.ernet.in, ***Devanath Tirupati***

We study how firms make allocations decisions under scarce supply conditions and evaluate their impact on performance of supply chains. We compare various rules that are used in allocating stocks by different industries.

3) Coordinating Supply Chain with Competition: Capacity Allocation in Semiconductor Manufacturing, ***Suman Mallik***, Univ. of PA, OPIM Dept., Wharton Sch., 1300 SH-DH, 3620 Locust Walk, Philadelphia, PA 19104-6366, mallik84@wharton.upenn.edu, ***Patrick T. Harker***

Many multi-divisional firms make their production/allocation decisions based on forecasts from divisions and/or plants. The process is often characterized by conflicts of interests between the center and the divisions. We present a generalization of our earlier model of capacity allocation under asymmetric information.

4) Choosing Coordination Methods for Supply Chains: Experiential Learning, ***Joyce S. Mehring***, Univ. of MA, Coll. of Mgmt., 1 University Ave., Lowell, MA 01854, joyce_mehring@uml.edu

Methods for coordinating supply chain activities range from standardization to targets and from plans to teams. The best choice is said to depend upon the extent of interdependence, uncertainty, and conflict among activities. In this context, we examine the coordination methods selected by participants in a variant of Siemen AG's Supply Chain Game and the supply chain's performance.

MA05 The Bullwhip Effect

Sponsor: MSOM
Sponsored Session

Chair: Karen L. Donohue, Univ. of PA, The Wharton Sch., OPIM, 1300 SH-DH, Philadelphia, PA 19104-6366, donohue@opim.wharton.upenn.edu

1) Quantifying the Bullwhip Effect in a Simple Supply Chain with Correlated Demand Processes, ***Jennifer K. Ryan***, Purdue Univ., Sch. of IE, W Lafayette, IN 47907, jkryan@ecn.purdue.edu, ***David Simchi-Levi, Y. Frank Chen***

An important observation in supply chain management, known as the bullwhip effect suggests that demand variability increases as one moves up a supply chain. In this paper we analyze the increase in variability in supply chains in which retailers face demands which are serially correlated, i.e., which are not independent from period to period.

2) Supply Chain Stability: Conditions for the Propagation of the Bullwhip Effect, ***Manuel Pedro Baganha***, Univ. de Lisboa, Fac. Economia, Rua Marques de Fronteira 20, Lisboa, 1070, Portugal, mbaganha@feunix.fe.unl.pt, ***Morris A. Cohen***

Market demand information is distorted by ordering decisions of material managers at each stage of the supply chain. We analyze the impact of batch size, leadtime and market demand variance on this "bullwhip" effect. Results are based on a comprehensive simulation study of a stochastic multi-echelon supply chain model.

3) The Bullwhip Effect in Personal Computer Supply Chains, ***Hirofumi Matsuo***, Univ. of TX, Grad. Sch. of Bus., Dept. of MSIS, Austin, TX 78712-1175, matsuoh@mail.utexas.edu, ***Nikhil T. Jain***

The demand of personal computers is characterized by life cycle curves. The challenge for manufacturers and retailers is to meet the peak demand and not to leave obsolescence inventory at the end of the cycle. This talk presents the mechanism and financial impact of the bullwhip effect across personal computer supply chains.

4) An Experimental Investigation of the Bullwhip Effect, ***Rachel Croson***, Univ. of PA, 1322 SH-DH, Dept. of OPIM, Wharton School of Bus., Philadelphia, PA 19104-6366, crosonr@opim.wharton.upenn.edu, ***Karen L. Donohue***

We report the results of an experimental study measuring how the institutional design of a supply chain impacts the magnitude and timing of the bullwhip effect in a multi-echelon system. In particular, we examine the empirical effects of individual incentives as well as various types of information access (e.g., consumer demand, chain inventory, etc.).

MA06 Design Issues in Manufacturing & Service

Sponsor: MSOM
Sponsored Session

Chair: Shanling Li, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, li@management.mcgill.ca

1) Flexibility & Adaptability in Staffing Policies in Assembly Lines, ***William W. Cooper***, Univ. of TX, Grad. Sch. of Bus., Dept. of MSIS, Austin, TX 78712-1175, ***Hirofumi Matsuo***, ***Sanjeev Bordoloi***

Two important considerations in knowledge-based assembly-heavy manufacturing where worker turnover rate is high and loss of productivity is expensive, are to "flex" workers across different work centers and to develop workers' knowledge base through proper training programs. We treat these issues in light of manufacturing "flexibility" and "adaptability," and provide a formulation for developing staffing policies.

2) Modeling a Capacity & Technology Problem in Service Networks, ***Devanath Tirupati***, Univ. of TX, Dept. of Mgmt., Austin, TX 78712, dev@uts.cc.utexas.edu

We consider a facilities location problem involving technology and capacity choices for providing a menu of services to multiclass customers characterized by limited wait tolerance and service time dependent price. We develop an optimization model that explicitly considers effect of operating policies to manage customer waits and balking behavior. We illustrate the scope of our approach with computational results based on a real world application.

3) A Material Handling System Selection Model for FMs, ***Jen Shang***, Univ. of Pittsburgh, Grad. Sch. of Bus., Pittsburgh, PA 15260, shang@katz.business.pitt.edu

A 2-phased method is proposed for MHS selection. At phase one, AHP narrows down the large number of output evaluation criteria. Phase two employs DEA to determine the most efficient system. A modification of the original model becomes imperative. Adopting the cross efficiency matrix along with goal programming procedure helps determine the best material handling system.

4) A Chicken-and-Egg-Problem? The Interaction Between Manufacturing System Design & Facility Layout, ***Russell D. Meller***, Auburn Univ., Dept. of ISE, 308 Dunstan Hall, Auburn, AL 36849-5346, rmeller@eng.auburn.edu

The facility layout problem is important since the layout is the substrate upon which the manufacturing system resides. Does the best choice of a manufacturing system depend on the facility layout? A case-study highlights the answer and a general model is proposed.

MA07 Development & Implementation of Manufacturing Systems: Problems & Research Directions

Sponsor: MSOM
Sponsored Session

Chair: Tali Freed, 14621 SW 87 CT, Miami, FL 33176, talifreed@aol.com

1) Integrated Development & Implementation of Manufacturing Execution Systems, ***Neil F. Kane***, Stanford Univ., Dept. of IE/EM, Stanford, CA 94305-4024, www-leland.stanfordedu/~kane

A Manufacturing Execution (WIP tracking/Inventory Control) System is the data collection engine for inventory status. Since the data is used by multiple functions within the organization, the development and implementation of an MES must be an integrated organizational effort. Minimization of time to perform WIP tracking tasks must be a conscious design choice.

2) Implementing Successful Planning Systems: The Importance of Project Management Expertise & Field Proven Research, ***Frank Chance***, 5852 Corte Margarita, Pleasanton, CA 94566, frank@chances.com http://www.chances.com

I discuss 2 hypotheses drawn from my experience developing and implementing Factory Explorer, a capacity, cost and cycle time analysis tool for manufacturing. The first is that project management expertise on the part of implementers is crucial to system success. Second, research opportunities abound, but field-proven results are all too scarce.

3) Design & Implementation of a Scheduling System: A Finger on the Pulse (Acceptance) & A Brain on Vital Signs (Performance Measures), ***Tali Freed***, 14621 SW 87 CT, Miami, FL 33176, talifreed@aol.com

This presentation includes a comprehensive description, accompanied by examples, of problems that are likely to be encountered during the development and implementation phases of a scheduling system. The presentation also identifies the problems where research can significantly contribute to better performance and more functionality in a scheduling system.

MA08 Panel: Publishing in IEEE Transactions in Envineering Management

Sponsor: Technology Management Section
Sponsored Session

Chair: Dundar F. Kocaoglu, Portland State Univ., Eng. Mgmt. Program, 1900 SW 4th Ave., Portland, OR 97201, kocaoglu@emp.pdx.edu

1) Panel: Publishing in IEEE Transactions in Engineering Management, ***R. Balachandra***, Northeastern Univ., 314 Hayden Hall, Boston, MA 02115, ***Frederick Betz***, ***Burton V. Dean***, ***Richard C. Dorf***, ***George F. Farris***, ***Cheryl Gaimon***, ***Eliezer Geisler***, ***Donald Gerwin***

The editor-in-chief and department editors of IEEE Transactions on Engineering Management will discuss publication strategies and directions of the journal. Brief presentations will be followed by a Question/Answer period.

MA09 Current Issues in New Product Development, Knowledge Transfer & Innovation

Sponsor: Technology Management Section
Sponsored Session

Chair: Michael K. Badawy, VA Tech., Pamplin Coll. of Bus., 7054 Haycock Rd., Falls Church, VA 22043, badawy@vt.edu

1) The Transfer of Knowledge in Organizations, ***Linda Argote***, Carnegie Mellon Univ., GSIA, Pittsburgh, PA 15213-3890

The paper argues that embedding knowledge in technology facilitates knowledge transfer within and across organizations. Data from manufacturing and services setting are drawn upon to illustrate the effects of embedding knowledge in technology on its transfer. The paper also argues that embedding knowledge in technology facilitates its transfer overtime.

2) Survey Methodologies for Meeting Customers' New Product & Innovation Needs, ***Lee Friedman***, Booz, Allen & Hamilton Inc.,

8283 Greensboro Dr., McLean, VA 22102-3838, friedman_lee@bah.com

Costomers surveys, if properly designed, administered, and analyzed, enable corporations to meet their customers' new product and innovation needs. I will discuss how to design these surveys, as well as critical sampling issues. I will also discuss how multivariate statistics can provide corporations with optimal diagnostic information for technology innovation.

3) Firm Innovativeness & CEO Characteristics, ***Elisabeth Lefebvre***, Ecole Polytech., Dept. of IE, Montreal, Quebec, H3C 3A7, Canada, ***Louis Lefebvre***

This presentation explores some correlates of firm performance, innovativeness, and CEO characteristics. Justifications for management as well as future research directions will be discussed.

4) Cross-Functional Teams for Effective Product Development, ***Michael K. Badawy***, VA Tech., Pamplin Coll. of Bus., 7054 Haycock Rd., Falls Church, VA 22043, badawy@vt.edu

This presentation focuses on the issues involved in managing cross-functional teams, identify barriers to implementation, and prepare a research agenda for enhancing team performance in new product development =settings.

MA10 Solving Scheduling Problems

Cluster: **Scheduling**
Invited Session
Chair: Kenneth R. Baker, Dartmouth Coll., Tuck Sch., Hanover, NH 03755-9000, kenneth.r.baker@dartmouth.edu

1) Minimizing Makespan for Two-Machine Flowshop Scheduling with Target Intervals: A Heuristic, ***Christopher N. Potts***, Univ. of Southampton, Fac. of Math Studies, Southampton, SO17 1BJ, UK, ***Jeffrey B. Sidney***, ***Chelliah Sriskandarajah***

The 2-machine flowshop with target intervals is a generalization of the 2-machine no-wait flowshop. The first operation of a job must be completed during a pre-specified time interval of the second operation's execution. A heuristic for minimization makespan with worst case performance ratio of (4/3) is presented.

2) A Branch & Bound Algorithm to Minimize Toal Weighted Tardiness in Flexible Flow Shops, ***Ya Yang***, Columbia Univ., Dept. of IE/OR, New York, NY 10025, yang@ieor.columbia.edu, ***Michael L. Pinedo***

We consider a flexible flow shop with s stages in series and multiple identical machines in parallel at each stage. We present a B&B algorithm which minimizes the total weighted tardiness of the n jobs. Several B&B schemes are discussed.

3) Generating Experimental Data for Scheduling Problems, ***Nicholas G. Hall***, OH State Univ., 301 Hagerty Hall, 1775 S College Rd., Columbus, OH 43210-1399, hall.33@osu.edu, ***Marc E. Posner***

We provide specific proposals for the generation of scheduling problems with dates, due dates, deadlines and precedence constraints. For precedence constraints, we provide the first generation scheme that achieves a uniform target density in the precedence constraint graph. Several case studies illustrate how our proposals can be implemented.

MA11 Just-in-Time Scheduling

Cluster: **Scheduling**
Invited Session
Chair: Jose A. Ventura, PA State Univ., Dept. of IME, 207 Hammond Bldg., University Park, PA 16802, javie@engr.psu.edu

1) JIT Scheduling in Parallel Cells, ***Alex J. Ruiz-Torres***, FL Gulf Coast Univ., Coll. of Bus., 19501 Treeline Ave. S, Ft. Myers, FL 33965-6565

We investigate the problem of scheduling in a parallel cellular system with sequence dependent setups where the objective is to minimize total earliness and tardiness penalties. A number of dispatching rules are developed and tested under a variety of experimental conditions including arrival rate and set-up time.

2) Earliness-Tardiness Scheduling on Parallel Machines, ***Sanjay Radhakrishnan***, i2 Tech, 909 E. Las Colinas Blvd., 16th Fl., Irving, TX 75039, sanjay_radhakrishnan@i2.com, ***Jose A. Ventura***

We consider the earliness-tardiness sheduling problem with non-common due dates and sequence dependent set-up times on parallel machines. An SA algorithm for minimizing the sum of the absolute deviations of job completion times from their corresponding due dates is proposed. Computational results are also provided.

3) A 2-Stage Hybrid Flowshop with Uniform Machines & Setup Times, ***Shanling Li***, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, li@management.mcgill.ca, ***Wanzhen Huang***

We consider a two-stage hybrid flowshop in a group technology environment. We assume that Stage 1 contains a single machine and Stage 2 contains multiple uniform machines. We develop 2 heuristic and effective sequencing rules. Both analytical and computational results are presented.

4) Insights & Algorithms for a Class of Scheduling Problems, ***Louis A. Martin-Vega***, Lehigh Univ., IMSE Dept., Mohler Lab 421, 200 W Packer Ave., Bethlehem, PA 18015, lam4@lehigh.edu, ***Wook-Sung Yoo***

Insights and algorithms are presented for minimizing the number of tardy jobs in certain scheduling environments. A general algorithm framework is presented for single workcenter problems. This framework is imbedded into a decomposition methodology to solve more complex problems with multiple workcenters. Experimental results derived from applications in semiconductor manufacturing environments are also discussed.

5) A Lagrangian Relaxation Method for Parallel Machine Scheduling with Additional Resource Constraints, ***Jose A. Ventura***, PA State Univ., Dept. of IME, 207 Hammond Bldg., University Park, PA 16802, javie@engr.psu.edu, ***Daecheol Kim***

We discuss the problem of scheduling jobs on parallel machines where the objective is to minimize total earliness and tardiness cost. A summary of 2 simple cases is presented. Lagrangian relaxation and subgradient optimization are used as solution procedure. Computational results are also provided.

MA12 Constraint Programming: Vehicle Routing

Cluster: **Constraint Programming**
Invited Session
Chair: Gilles Pesant, Univ. of Montreal, CRT, CP 6128, succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, pesant@crt.umontreal.ca

1) Solving a Hard Vehicle Routing & Loading Problem, ***N. Beldiceanu***, Parc Club Orsay Univ., 4 rue Jean-Rostand 91893, Orsay Cedex, 91893, France, bourreau@cosytec.fr, ***E. Bourreau***, ***E. Contejean***

We consider pickup and delivery problems both from a modelling and a solving perspective. We 1st show how to model and solve this problem with CHIP. In the 2nd part we extend the initial problem in order to take into account accessibility constraints for loading and unloading objects from the vehicles.

2) Solving a Dial-a-Ride Problem with Constraint Propagation, ***Eric Domenjoud***, INRIA-Lorraine & CRIN/CNRS, 615 rue du Jardin Botanique, BP 101, Cedex, 54602, France, Eric.Domenjoud@loria.fr

We present a method based on constraint propagation for solving a transportation problem for handicapped persons. The bus station needs to provide daily services for passengers. Each service requires a driver to pick up some passengers somewhere and send them to their destination, subject to vehicle capacity limitations and time constraints. The bus station hopes to optimally schedule its fleet of vehicles so as to reduce costs.

3) Generating Solutions for Real-World Vehicle Routing Problems, ***Philip Kilby***, Univ. of Strathclyde, Dept. of Comp. Sci., 26 Richmond St., Glasgow, G1 1XH, Scotland, UK, pjk@cs.strath.ac.uk, ***Patrick Prosser***, ***Paul Shaw***

The EU project "Green Trip" is providing a constraint-based toolkit for real-world vehicle routing and scheduling problems with complex side constraints. Current construction heuristics do not address these side constraints effectively. We present a new method, based on constraint programming, which takes side constraints into account. We describe its use on 2 real-world problems.

4) Heuristics for Large Constrained Vehicle Routing Problems, ***Yves Caseau***, Bouygues, 1 ave Eugene Freyssinet, St. Quentin, En Yvelines, 78061, France, ycs@challenger.bouygues.fr

We present a heuristic for solving very large routing problems that uses constraint programming for solving small TSPTWs. This heuristic can be extended into a Limited Discrepancy Search algorithm that produces, on smaller problems, very good results (best average result and many best known results on many Solomon's instances).

MA14 Dynamic Programming Approximation

Cluster: Dynamic Programming
Invited Session

Chair: Anton J. Kleywegt, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, anton.kleywegt@isye.gatech.edu

1) Dynamic Programming Approximations for Dynamic Resource Transformation Problems, ***Warren B. Powell***, Princeton Univ., Program in Stats & OR, CASTLE Lab., Princeton, NJ 08544, powell@princeton.edu, ***Gregory A. Godfrey***, ***Joel A. Shapiro***

We introduce the concept of a (discrete) dynamic resource transformation problem, and show how a number of problems in operations research can be visualized in this setting. After presenting a basic mathematical representation, we review differen t dynamic programming approximations that can be used to solve this system.

2) Price-Directed Cutting-Stock Systems, ***Daniel Adelman***, Univ. of Chicago, Grad. Sch. of Bus., 1101 E 58th St., Chicago, IL 60637, dan.adelman@gsb.uchicago.edu, ***George L. Nemhauser***

We present a price-directed scheme for controlling a cutting-stock system by functionally approximating the dynamic programming optimal value function. To achieve low scrap rates, it is desirable to delay cutting until a favorable set of orders has arrived. Hence, a tradeoff exists between timely order satisfaction and scrap minimization.

3) Neuro-Dynamic Programming & Differential Training, ***Dimitri P. Bertsekas***, MIT, Dept. of Elect. Eng. & CS, Cambridge, MA 02139, dimitrib@mit.edu, ***John N. Tsitsiklis***

We consider the approximate solution of stochastic optimal control problems using a neuro-dynamic programming/reinforcement learning methodology. We survey the existing methodology and we focus on the method of differential training that aims to improve the sensitivity to simulation and approximation error of the standard methods.

4) Dynamic Programming Approximations for Inventory Routing Problems, ***Anton J. Kleywegt***, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, anton.kleywegt@isye.gatech.edu, ***Vijay S. Nori***, ***Martin W. P. Savelsbergh***

In the inventory routing problem a central controller manages the distribution of products from a depot to a number of customers, using a fleet of vehicles, to minimize distribution and stockout costs. We propose a number of dynamic programming approximations, and discuss their application.

5) Applying Neuro-Dynamic Programming to Stochastic Vehicle Routing Problems, ***Nicola Secomandi***, Univ. of Houston, Dept. of Dec. & IS, 4800 Calhoun St., Houston, TX 77204-6282, nick@bau.cba.uh.edu, ***Edward P. C. Kao***

We consider a version of the VRP where customers' demands are uncertain. We formulate the problem as a Markov Decision Process and investigate the applicability of Neuro-Dynamic Programming methodologies in order to approximately compute suboptimal policies.

MA15 Optimization

Cluster: Nonlinear Programming
Invited Session

Chair: Abdelhamid Benchakroun, Univ. of Sherbrooke, Dept. of Math. & Info., 2500 blvd. Universite, Sherbrooke, Quebec, J1K 2R1, Canada, abdelhamid@benchakroun@dmi.usherb.ca

1) Smooth Representation of Epi-Lipschitzian Subsets of Rn, ***Marco Czarnecki***, Univ. of Montpellier, France

Closed epi-Lipschitzian subsets M of Rn are characterized as sets defined by a Lipschitzian inequality constraint {x in Rn: f(x)<0} for some function f from Rn into R which is Lipschitzian on Rn and smooth on the complementary of the boundary of M, which satisfies, for every x on the boundary, both the "nondegeneracy" condition that the Clarke's subdifferential does not contain 0, and the "normal representation" condition that its Clarke's normal cone is spanned by the subdifferential of f at x.

2) Network Expansion under Price Sensitive Demands, ***Henrique P. L. Luna***, Dept. Ciencia da Computacao UFMG, CP 702, Belo Horizonte MG, 30161-123, Brazil, pacca@dcc.ufmg.br, ***A. Ouorou***, ***Philippe Mahey***

We extend a model of multicommodity price equilibrium in telecommunication to cope with continuous and discrete changes in link capacities. The economic equilibrium problem is formulated by maximizing the net social benefit, that is measured by consumers welfare minus the link expansion costs and minus the operational and congestion costs associated with the toal flow circulating on each link...

3) No Title Supplied, ***Mounir Haddou***, Universite d'Orleans, France

No abstract supplied.

4) No Title Supplied, ***Naima El Farouq***, Universite Blaise Pascal, France

No abstract supplied.

MA16 Semidefinite Programming & Its Applications

Cluster: Linear Programming
Invited Session

Chair: Masakazu Kojima, Tokyo Inst. of Tech., Dept. of Math. & Comp. Sci., Oh-Okayama Meguro, Tokyo, 152, Japan, kojima@is.titech.ac.jp

1) Detecting the Duality Status of Semidefinite Optimization Problems by Self-Dual Embedding, ***Tamas Terlaky***, Delft Univ. of Tech., Dept. of Tech. Math. & Info., Fac. of ITS, Mekelweg 4, Delft, 2600 GA, The Netherlands, t.terlaky@twi.tudelft.nl, ***Etienne de Klerk***, ***Cornelis Roos***

Because of semidefinite programming duality theory is weaker than that of linear programming, by solving the primal-dual pair only partial information can be obtained in some cases of infeasibility, nonzero optimal duality gaps, etc. A comprehensive treatment of these duality issues is presented by using self-dual embedding problems.

2) Semidefinite Programming & Graph Bisection, ***Stefan E. Karisch***, Tech. Univ. of Denmark, Dept. of Math. Modeling, DTU Bldg. 321, Copenhagen, DK-2100, Denmark, sk@imm.dtu.dk, ***Jens Clausen***, ***Jesper Larsen***, ***Franz Rendl***

Semidefinite programming provides tight relaxations for combinatorial optimization problems such as graph partition problems. We are going to review recent results on the approximation and exact solution of graph bisection problems using semidefinite programming. We will also present numerical results.

3) An Efficient Algorithm for Minimizing a Sum of P-Norms, ***Guoliang Xue***, Univ. of VT, Dept. of Comp. Sci., Burlington, VT 05405, xue@cs.uvm.edu, ***Yinyu Ye***

We study the problem of minimizing a sum of p-norms where p >= 1 is a fixed real number. We transform the problem into standard conic form. We construct two logarithmically homogeneous self-concordant barrier functions for this problem. Using both barrier functions, we present a primal-dual potential reduction algorithm to compute an epsilon-optimal solution in polynomial time that is independent of p.

MA17 OR/MS in Sports

Cluster: Optimization Days
Invited Session

Chair: Keith A. Willoughby, Univ. of Saskatchewan, Coll. of Commerce, Saskatoon, SK, S7J 5A7, Canada, willoughby@commerce.usask.ca

1) Review of College Football Rankings for the 1990's: A Critical Analysis, ***Rick Wilson***, OK St. Univ., Stillwater, OK 74074, rlwilsn@okway.okstate.edu

College football rankings have been a topic of much interest both in the public press and in academic publications. Many different methods have been proposed for ranking teams. The college football seasons of the 1990's provide a rich testbed for comparing and contrasting the main techniques proposed to date.

2) The Use of Video Within a Database Management System: The Creation of Third Generation Statistics for an NHL Team, ***Kevin J. Leonard***, Univ. of Toronto, Dept. of Health Admin., Toronto, Ontario, M5S 1A8, Canada, k.leonard@utoronto.ca

The use of a statistical database management system by an NHL team is discussed. We begin with an illustration of the type of information commonly recorded on hockey players. The research and development of new video and computer technology have enabled the expansion of these statistics both in the capture and in the analysis to a category called Third Generation Statistics.

3) Modeling Curling as a Markov Process, ***Kent J. Kostuk***, Federated Cooperatives Ltd., Saskatoon, SK, Canada, kjk340@engr.usask.ca, ***Keith A. Willoughby***

Markov process have been used to model a variety of sports such as jai alai and baseball. Curling has a scoring structure similar to baseball, suggesting that it can also be modelled as a Markov process. Utilizing the Markovian model, we explore the marginal benefits of comparative strategies.

4) Where You Should Aim If You Want to Beat Patrick Roy, ***William Hurley***, Royal Military Coll. of Canada, Dept. of Bus. Admin., Kingston, Ontario, K7K 5L0, Canada, hurley-w@rmc.ca, ***Jack Brimberg***

We examine the geometry of a shooter with an imperfect aim trying to score on a goaltender. Among other results, we show that if the shooter is bad enough, he or she ought to aim at the middle of the goalie's chest protector. Otherwise, he or she ought to aim for a corner. We also consider dynamic aspects of the problem.

MA18 Building Reusable Software Components for Heuristic Search

Cluster: Metaheuristics
Invited Session

Chair: Stefan Voss, Tech Univ. of Braunschweig, Inst. for Bus. Sci., Abt-Jerusalem-Str. 7, Braunschweig, D-38106, Germany, stefan.voss@tu-bs.de

1) Tutorial: Building Reusable Software Components for Heuristic Search, ***Stefan Voss***, Tech Univ. of Braunschweig, Inst. for Bus. Sci., Abt-Jerusalem-Str. 7, Braunschweig, D-38106, Germany, stefan.voss@tu-bs.de, ***Andreas Fink***, ***David L. Woodruff***

We review the goals, challenges and prospects concerning the reuse in the field of heuristic search. Even today, advanced heuristic approaches for various problems from discrete and combinatorial optimization are usually implemented from scratch. We discuss the crucial problems that have so far prevented us from having a "heuristics stockroom"...

MA19 Tutorial: Financial Models

Invited Session

Chair: Michele Breton, École des HEC, 5255 Decelles, Montréal, Québec, H3T 1V6, Canada

1) Tutorial: Financial Models, ***John M. Mulvey***, Princeton Univ., Sch. of Eng. & Applied Sci., Princeton, NJ 08544, mulvey@macbeth.princeton.edu

Banks, insurance companies and other leading financial institutions often employ stochastic optimization for managing risks and seeking out opportunities. Five key elements are reviewed: organization-wide models, temporal risk measures, generation of scenarios, dynamic investment strategies and solution algorithms. A long-term financial planning application highlights the issues.

MA20 Tutorial: Column Generation Methods

Invited Session

Chair: Marius M. Solomon, Northeastern Univ., 360 Huntington Ave., Boston, MA 02186

1) Tutorial: Column Generation Methods, ***Jacques Desrosiers***, Ecole des HEC & GERAD, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, jacques@crt.umontreal.ca

We present a historical perspective on column generation methods including relationships with alternative decomposition algorithms such as cutting plane, bundle, analytic center and Lagrangean relaxation. This is followed by some recent numerical experimentations on integer programming applications. A demonstration using the GENCOL optimizer is provided.

MA21 Decision Analysis/Bayesian Methods for Simulation

Sponsor: College on Simulation
Sponsored Session

Chair: Stephen E. Chick, Univ. of MI, Dept. of IOE, 1777 IOE Bldg., Ann Arbor, MI 48109-2117, sechick@engin.umich.edu personal.engin.umich.edu/~sechick/

1) Optimal Computing Budget Allocation for Stochastic Simulation, ***Chun-Hung Chen***, Univ. of PA, Dept. of Systems Eng., Philadelphia, PA 19104-6315, chchen@seas.upenn.edu, ***Liyi Dai***, ***Karen L. Donohue***, ***Enver Yucesan***

The Operational Personnel Risk Assessment Model, OPRAM, uses Monte Carlo simulation to assess the risk of personnel shortages by analyzing personnel resources and air force obligations. By using this model, we can better define and balance the personnel mix and deployment capability while continuing the process of downsizing.

2) A Decision-Theoretic Approach for Selecting the Best System, ***Stephen E. Chick***, Univ. of MI, Dept. of IOE, 1777 IOE Bldg., Ann Arbor, MI 48109-2117, sechick@engin.umich.edu personal.engin.umich.edu/~sechick/

3) Slice Samplers to Simulate Posterior Distribution, ***Paul Damien***, Univ. of MI, Bus. Sch., Ann Arbor, MI 48109-2117

MA22 Decision Analysis I

Contributed Session

Chair: Zvi Covaliu, George Washington Univ., MS Dept., SBPM, 2115 G Street NW, Washington, DC 20052, covaliu@research.circ.gwu.edu gwis2.circ.gwu.edu/~covaliu

1) On the Concept of Efficiency in Decision Analysis, ***Ercan Tirtiroglu***, Univ. of MA, 285 Old Westport Rd., N Dartmouth, MA 02747-2300, etirtiroglu@umassd.edu, ***Dogan Tirtiroglu***

In covering Bayes' theorem and its application in the context of decision trees, several (most of them introductory-level) textbooks refer to the ratio, EVSI/EVPI, as "efficiency," giving little attention to its interpretation and/or significance. We attempt to address this issue, offering an exposition of efficiency and its informational value.

2) CE Value Functions for Decision Analysis, ***Ronald E. Davis***, San Jose State Univ., 1 Washington Sq., BT 750, San Jose, CA 95192-0069, davis_r@cob.sjsu.edu www.cob.sjsu.edu/facstaff/davis_r/

Since certain equivalent dollar values are often more meaningful to practitioners than expected utilities, we report on a library of callable custom functions converting well-known probability distribution types into dollar equivalents based on distribution parameters and risk tolerance. The functions reported are based on exponential utility.

3) Modeling Quality & Purity of Information in Decision Analysis, ***Roberto Ley-Borras***, Inst. Tecnologico de Orizaba, Oriente 9 No. 852, Orizaba Ver, 94320, Mexico, ley@itorizaba.edu.mx

We can model the quality of additional information as a property independent of the current state of information and value structure of the problem, and use a quality index for measuring its accuracy. We can model information acquisition impurities (side effects) using different levels of model completeness and modeling effort.

4) Bayes Sequential Decision Making in Project Management, ***Zvi Covaliu***, George Washington Univ., MS Dept., SBPM, 2115 G St NW, Washington, DC 20052, covaliu@research.circ.gwu.edu gwis2.circ.gwu.edu/~covaliu, ***Refik Soyer***

We propose and illustrate a framework for optimal, sequential decisions on scheduling and "crashing" of activities in PM. It explicitly models dependence among uncertain resources and activities and makes Bayesian inference about future activities based on accummulated observations. Graphical tools are used to model several typical PM situations.

MA23 Probability Forecasting: The Legacy of Allan Murphy

Sponsor: Decision Analysis Society
Sponsored Session

Chair: James E. Smith, Duke Univ., Box 90120, Durham, NC 27708-0120, jes9@mail.duke.edu

1) Probability Forecasting: The Legacy of Allan Murphy, ***Robert L. Winkler***, Duke Univ., Fuqua Sch. of Bus., Durham, NC 27708-0120, rwinkler@mail.duke.edu

Allan Murphy was instrumental in moving forward probability forecasting, forecast verification and the use and value of forecasts. His interdisciplinary contributions spanned conceptual issues, methodology development, empirical studies, behavioral experiments, development of decision-making models and applications. We highlight his work and discuss important current research issues in probability forecasting.

MA24 Multicriterion Decision Analysis I

Cluster: Multicriteria Decision Analysis
Invited Session

Chair: Thomas Hanne, Fern Universitaet Hagen, 2 Postfach 940, Luetkenheider Str.2, Hagen, 58009, Germany, thomas.hanne@fernuni-hagen.de

Co-Chair: Tomas Gal

1) Interactive Decision Maps: Concept, Mathematical Basis, Software, Applications, ***A.V. Lotov***, Comp. Ctr. of Russian Acad. of Sci., Dept. Math Methods for Econ., Vavilov st, 40, Moscow, 117967, Russia, lotov@ccas.ru, ***V. A. Bushenkov***, ***A.V. Chernov***, ***G.***

K. Kamenev

The IDM technique is a graphic multiple criteria decision support tool which displays efficient trade offs and helps by this to find preferable decisions from large varities of decision alternatives by identifying a preferable feasible goal. THE IDM technique is based on convolution of linear inequalities systems (proposed by J.B. Fourier) and on approximation of convex bodies by polytops.

2) A Multiple Objective Planar Location Problem with a Line Barrier, ***Kathrin Klamroth***, Clemson Univ., Dept. of Math. Sci., Clemson, SC 29634, klamroth@mathematik.uni-kl.de, ***Margaret M. Wiecek***

We study the multiple objective median problem with a linebarrier. As this problem is non-convex but specially-structured, a reduction to a series of convexoptimization problems is introduced. Algorithms for finding the efficientset of the original bi-criteria problem with different measures of distance are proposed.

3) Psychological Stability of Solutions to MCDM Problems, ***Ignacy Kaliszewski***, Systems Research Inst., Polish Acad. of Sci., Ul Newelska 6, Warsaw, 01-447, Poland, ***Wojtek Michalowski***

The MCDM literature usually relies on a concept of Pareto-optimality and efficiency in selecting solutions suitable for a consideration by a decision maker. A seminal work by Simon introduced a new concept of satisfying solution which was adopted to some extent by the MCDM research. The research in the area of behavioral decision...

MA25 Control of Queueing Systems I

Sponsor: **Applied Probability Section**
Sponso:ed Session

Chair: Rhonda L. Righter, Santa Clara Univ., Dept. of Decision & Info. Sci., Santa Clara, CA 95953, rrighter@scu.edu

1) The Stochastic Machine Minimization Problem with Hard Deadlines & Arrivals, ***Nah-Oak Song***, Univ. of MI, Dept. of EECS, Ann Arbor, MI 48109, teneket@eecs.umich.edu, ***Demosthenis Teneketzis***

Stochastic machine minimization problems are motivated by resource allocation issues in communication networks and image formation systems. We formulate an infinite horizon stochastic machine minimization problem with hard deadlines and arrivals. We determine qualitative properties of machine allocation policies that minimize the expected number of machines used throughout the infinte horizon.

2) Scheduling & Control of Queueing Networks via Fluid Models, ***Gideon Weiss***, Haifa Univ., Dept. of Stats., Haifa, 31905, Israel, gweiss@stat.haifa.ac.il

A congested queueing network in a transient state can be approximated by a fluid network, in which discrete parts (customers) are replaced by fluid, and stochastic processing times by deterministic flows. We discuss algorithms for optimal control of the fluid networks, implementation to discrete networks, and asymptotic optimality.

3) Bicriterion Optimization of Switching Policies for M/G/1 Queues with Batch Arrivals, ***Eugene A. Feinberg***, SUNY, Harriman Hall, Stony Brook, NY 11794-3775, efeinber@fac.har.sunysb.edu

We consider a M/G/1 queue with batch arrivals and with a removable server. The server may be turned on and off any time but there are setup costs and startup and shutdown times. We describe the set of Pareto optimal policies for the following two criteria: the average operating costs and average delay.

4) Scheduling Multicast Switches, ***Rhonda L. Righter***, Santa Clara Univ., Dept. of Decision & Info. Sci., Santa Clara, CA 95953, rrighter@scu.edu, ***Zhen Liu***

In multicast transmissions users broadcast their data to an arbitrary subset of other users. In each time slot at most one cell from each input can be transmitted to each output. We give properties of policies that stochastically maximize the departure process.

MA26 Statistical Inference in Queues: A Tutorial

Cluster: **Queueing**
Invited Session

Chair: Les D. Servi, GTE Labs., 40 Sylvan Rd., Waltham, MA 02254, ldsO@gte.com

1) Parameter Estimation & Partially Observable Systems, ***U. Narayan Bhat***, SMU, Dept. of Statistical Sci., PO Box 750240, Dallas, TX 75275-0240, nbhat@mail.smu.edu

Statistical interference is an oft-neglected aspect in queueing theory. We provide an overview of significant research that has appeared in the literature on parameter estimation and hypothesis testing with reference to queueing systems. Some recent results on estimation when underlying processes are not fully observable will also be included.

2) Using Transactional Data to Infer System Performance, ***Daryl J. Daley***, Australian Ntl. Univ., Sch. of Math. Sci., Stochastic Analysis Group, Canberra Act, 0200, Australia, daryl@maths.anu.edu.au, ***Les D. Servi***

Queueing inferencing re-examines classical queueing theory problems using transactional data as distinct from structural information about the system components. It exploits the increasingly available data and inexpensive computing. It permits examination of systems that in a classical setting are intractable. Examples from telecommunication and banking will be provided.

MA27 Queueing Issues I

Contributed Session

Chair: Barry A. Pasternack, CA State Univ., Dept. of MS/IS, Fullerton, CA 92834, bpasternack@fullerton.edu

1) Rough Asymptotic Behavior of Tandem M/G/infinity Queues, ***Tim Zajic***, Univ. of MN, Sch. of Math. 127 Vincent Hall, 206 Church St. SE, Minneapolis, MN 55455, zajic@math.umn.edu http://www.math.umn.edu/~zajic

We derive results regarding the asymptotic behavior of M/G/infinity queues by utilizing their representation in terms of Poisson random measures and in turn adapting recent asymptotic behavior results for empirical processes to the setting of Poisson random measures.

2) Queues with Variable Number of Servers, ***Tao Yang***, Dalhousie Univ., Dept. of IE, Halifax, Nova Scotia, B3J 2X4, Canada, yangt@tuns.ca, ***Hui Li***

In modern communication networks such as the broadband intergrated services digital network, it is possible to re-negotiate the bandwidth of a virtual channel during the course of a communication session. Motivated by this situation, we study the steady-state behavior of an M/M/s queueing system in which the number of servers varies according to the demands.

3) Discount Pricing for Rental Systems, ***Albert Y. Ha***, Yale Univ., Sch. of Mgmt., 135 Prospect St., New Haven, CT 06511-3729, albert.ha@yale.edu

We consider the problem of determining when to offer discounts for a rental system with stochastic demand and rental time. We formulate the problem as a control problem of an M/M/S/S queueing system and analyze the structure of the optimal policy. Numerical results will be presented.

4) Designing a Multi-Campus Help Desk System, ***Barry A. Pasternack***, CA State Univ., Dept. of MS/IS, Fullerton, CA 92834, bpasternack@fullerton.edu

In this paper we develop a methodology for determining staffing requirements at technology help desks for a multi-campus educational system. We present both an efficient method for calculating service measures for an M/M/k system and a greedy algorithm for performing the staffing allocation. A comparison is made between centralized and decentralized staffing plans.

MA28 Teaching OR/MS in Spreadsheets

Sponsor: **Forum on Education**
Sponsored Session

Chair: Ronald H. Wright, Le Moyne College, Dept. of Bus. Admin., Syracuse, NY 13214, wright@palm.lemoyne.edu

Co-Chair: Salwa Ammar

1) What Do Spreadsheets Offer OR/MS Majors?, ***Jeffrey D. Camm***, Univ. of Cincinnati, QAOM Dept., Coll. of Bus. Admin., Cincinnati, OH 45221-0130, cammjd@email.uc.edu

The benefits of using spreadsheets in undergraduate and MBA core courses in management science have been well discussed. In this session we will discuss the use of spreadsheets for OR/MS majors. In particular, we will demonstrate the advantage of the integrative nature of the spreadsheet environment for more complex analyses.

2) Development of a Spreadsheet Add-In for Waiting Line Analysis, ***Armann Ingolfsson***, Univ. of Alberta, Fac. of Bus., Edmonton, Alberta, T6G 2R6, Canada, armann.ingolfsson@ualberta.ca ualberta.ca/~aingolfs/

The development of a spreadsheet add-in for analysis of waiting lines will be described. The aim is to make powerful tools available to unsophisticated users. Design goals are seamless integration with the spreadsheet, terminology that is as transparent as possible, and anticipating common mistakes made by "naive" users.

3) Can Business School Statisticians Teach with Spreadsheets?, *Salwa Ammar*, Le Moyne College, Bus. Dept., Syracuse, NY 13214, ammars@palm.lemoyne.edu, ***Ronald H. Wright***

Spreadsheets are increasingly commonplace in OR/MS courses. They haven't had the same impact in statistics courses. We will present a successful implementation of the use of spreadsheets in an undergraduate course and discuss how to overcome some of the perceived difficulties and emphasize the benefits of using spreadsheets.

MA30 Student Prize Competition

Sponsor: Aviation Applications Section
Sponsored Session
Chair: Frederick Wieland, The MITRE Corp., 1820 Dolley Madison Blvd., MS W282, McLean, VA 22102, fwieland@mitre.org

1) Issues in Airspace Resource Allocation: The User-Optimized Traffic Flow Problem, ***Jennifer R. Goodhart***, Univ. of CA, 4135 Etcheverry Hall, Berkeley, CA 94720-1777, goodhart@ieor.berkeley.edu, ***Candace A. Yano***

The FAA projects passenger air taffic to increase by 50% over the next 10 years. Our skies and airports are already becoming congestd, causing delays and heavy loads on the air traffic management system. The Air Transport Association estimates the cost of delays to US air carriers in 1994 at $3.5 billion. This figure is based on 6 million flights and incorporates losses during gate, taxi and enroute stages of flight...

2) The Traffic Flow Management Rerouting Problem in Air Traffic Control: A Dynamic Network Flow Approach, ***Sarah Stock Patterson***, MIT, 125 University Rd., Brookline, MA 02416-4545, ***Dimitris Bertsimas***

We address the problem of determining how to reroute aircraft in the air traffic control system when faced with dynamically changing weather conditions. The overall objective is the minimization of delay costs. We present an integrated mathematical programming approach that consists of several methodologies. In computational experiments, the solutions returned are within 1% of the corresponding lower bounds.

3) The Air Traffic Flow Management Problem with Enroute Capacities, ***Sarah Stock Patterson***, MIT, 125 University Rd., Brookline, MA 02416-4545, ***Dimitris Bertsimas***

Throughout the US and Europe, demand for airport use has been increasing rapidly, while airport capacity has been stagnating. Over the last 10 years, the number of passengers has increased by more than 50% and is expected to continue increasing at this rate. Acute congestion in many major airports has been the unfortunate result. We build a model that takes into account the capacities of the National Airspace System as well as at the airports...

MA31 Concurrent Engineering

Cluster: Logistics
Invited Session
Chair: Laurent Villeneuve, Ecole Polytech. of Montreal, Dept. Math. & Gen. Ind., CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, laurent.villeneuve@mailsrv.polymtl.ca

1) Accelerated Design & Production in a Concurrent Engineering Environment: Models & Results, ***Jean-Paul Kieffer***, DIAM-IUSPIM Univ. d'Aix-Marseille, Domaine Univ. de St. Jerome, Av Escadrille Normandie Niemen, narseille, Cedex, 13397, France, ***Pierre Ladet, Louis Lefebvre, Diane Riopel, Laurent Villeneuve***

This research project was started in January 1997. The academic and industrial partners are from France and Canada. During the first stage, attention has been focused on the engineering process models for concurrent engineering, and on the organization and co-ordination of actor's networks involved in concurrent engineering processes. In this session, aims, research axis and the preliminary results on some enterprise cases will be presented.

2) Markov-Modulated Queueing Networks: Diffusion Limits & Their Applications, ***Hong Chen***, HKUST & Univ. of British Columbia, Fac. of Comm., BRAMSS, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, honchen@uxmail.ust.hk, ***Jian-Qiang Hu, Muckai K. Girish***

The diffusion limit theorem is developed for queueing systems with Markov-modulated arrival and service processes. For the Markov-modulated single-server queue, two approximations are proposed based on the diffusion limit theorem: one is the diffusion approximation and the other is the interpolation approximation in which the heavy traffic limit and the light traffic derivatives are combined using Pade approximation.

3) Industrial Activities Analysis, Based on the Concept of Shill-Networks, in a Concurrent Engineering Context, ***Xavier Boucher***, DIAM-IUSPIM, Univ. d'Aix-Marseille III, Domaine Univ. de St. Jerome, Av. Escadrille Normandie Nieme, Marseille, Cedex 13, 13397, France, ***Catherine Cerezuela, Jean-Paul Kieffer***

This paper will state that the success of concurrent engineering relies not only on a project management dynamics, but also on skill-network dynamics. We propose various useful concepts to represent skill-networks, as networks of activities and competencies. This representation can be used to diagnose problems in cooperative situations within industrial professions.

4) A Comparative Study of Modeling Tools, ***Selma Limam***, IPI, INPG, LAG, Domain Univ. BP 46, Saint martin-d'Heres, Cedex, 38402, France, ***Pierre Ladet, Victoria Ormijana, Laurent Villeneuve***

The case of a financial enterprise is studied. The aim is to propose improvements concerning working processes and relationships between actors. A reengineering methodology is applied in 5 steps: identification, modeling, analysis, proposition of improvements, and testing of critical processes. Simulation and Petri nets are used as modeling and analysis tools. The 2 approaches are compared in order to evaluate their performances.

5) Towards a Methodological Guide to Implement Concurrent Engineering, ***Amelie Brodeur***, Ecole Polytech., Dept. of Math. & Gen. Industry, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, villeneuve@mailsrv.polymtl.ca, ***Catherine Cerezuela, Diane Riopel***

A methodological guide to implement concurrent engineering is presented. The goals of this guide are to identify enterprises concerned by concurrent engineering principles; identify processes, for an enterprise, on which concurrent engineering principles could be applied; and help the enterprise to choose methods and tools of concurrent engineering according to the selected processes.

MA32 Metaheuristics for Location & Routing Problems

Contributed Session
Chair: R. Ramesh, SUNY, 325H Jacobs Mgmt. Ctr., Buffalo, NY 14260, rramesh@acsu.buffalo.edu

1) The Traveling Salesman Problem: A Tabu Search & Ejection Chain Approach, ***R. Ramesh***, SUNY, 325H Jacobs Mgmt. Ctr., Buffalo, NY 14260, rramesh@acsu.buffalo.edu, ***Sudip Bhattacharjee***

We develop a solution methodology for the TSP, using an implementation of embedded neighborhood structures based on the notion of ejection chains, within the broad framework of TS. This method provides a combinatorial leverage effect in searching the TSP solution space. Simulation results are compared with optimal values.

2) A Simulated Annealing-Based Solution Approach to Location-Routing Problems with Traveling Salesman Problem-Based Hub Interactions, ***Ripu Daman Singh***, PA State Univ., 710 S Atherton St., Apt. 508, State College, PA 16801, singh@marie.psu.edu, ***Tom M. Cavalier***

LRPs are NP-hard problems involving simultaneous location of hubs, assignment of customers to hubs and formation of routes to service the customers from hubs. An SA-based heuristic will be presented for solving a class of LRPs in which the hubs interact via a TSP route.

3) Long-Term Implementation of a Tabu Search Algorithm for the Location Routing Problem, ***Dilek Tuzun***, Lehigh Univ., Mohler Lab # 200, Bethlehem, PA 18015, dit2@lehigh.edu, ***Laura I. Burke***

Location routing problem (LRP) is an important logistics problem with many practical applications. We present the results of a 2-phase tabu search heuristic for the LRP and discuss long term implementation aspects of this algorithm.

4) An Evolutionary Algorithm for Vehicle Routing, ***Robert T. Sumichrast***, VA Polytech. Inst. & State Univ., 1007 Pamplin Hall, Blacksburg, VA 24061-0235, rsumichr@vt.edu, ***Ina Samanta Markham***

A special form of the vehicle routing problem is solved using an evolutionary algorithm. It is assumed that a number of trucks is owned and operated by a company. The trucks are scheduled to minimize material and transportation costs. Test results will be compared to other methods.

MA33 Finance I

Contributed Session
Chair: L. Douglas Smith, Univ. of MO, Sch. of Bus. Admin., 8001 Natural Bridge Rd., St. Louis, MO 63121, ldsmith@gbay.umsl.edu

1) Integrated Models for Risk Management on Portfolios of

Automobile Leases, *L. Douglas Smith*, Univ. of MO, Sch. of Bus. Admin., 8001 Natural Bridge Rd., St. Louis, MO 63121, ldsmith@gbay.umsl.edu, ***Ya Jung Wu***, ***Dolly Matthew***

Nonstationary Markovian models depict changing patterns of state transitions as a lease ages. A dozen logistic and regression models represent alternative events and attendent losses on termination of a lease. We discuss how these models are integrated into a system for risk management in a major US financial institution.

2) Real Option Model for Managing Energy Price Risk, *Thomas Murphy*, Air Liquide America Corp., 2700 Post Oak Blvd., Houston, TX 77056, tom.murphy@airliquide.com, ***William G. Foote***

A real option model of an energy-intensive industrial gas manufacturing facility shows the optimal strategy for managing energy price risk. The model establishes the interaction between real and financial options, and determines both value-at-risk and the optimal strategy for managing it. This is especially important as we approach deregulation.

3) Indirect Inference: Scenario Generation Using the Bootstrap, *Thomas R. Willemain*, RPI, CII 5207, Troy, NY 12180-3590, willet@rpi.edu, ***Omer F. Demirel***

Traditional (direct) inference focuses on properties of estimators computed from bootstrap replicates. Indirect inference focuses on properties of the replicates themselves, i.e., their resemblance to independent replicates. Applications of indirect inference include trace-driven simulation and automatic scenario generation for risk assessment in finance and training human operators in complex tasks.

MA35 Internet Applications

Contributed Session

Chair: Moncef Belhadjali, Norfolk State Univ., 2401 Corprew Ave., Norfolk, VA 23504, mbelhadjali@vger.nsu.edu

1) Database Querying on the World Wide Web, *Joseph G. Davis*, Univ. of Wollongong, Dept. of Bus. Systems, Northfields Ave., Wollongong, NSW 2522, Australia, joseph.davis@uow.edu.au

The WWW can be considered to be a huge semi-structured database. Existing Web search techniques have significant deficiencies with respect to robustness, flexibility and precision. We develop and implement a domain specific, object-relational database approach to querying the Web.

2) Internet, Intranet & OR: Are There Any Implications?, *Frank Lampe*, Univ. of Bremen, Hochschulring 40, Bremen, 28199, Germany, lampe@zfn.uni-bremen.de

The number of companies using the Internet grew at 50.5% between January and July 1997. 23% of all Internet hosts are commercial. I want to answer the question what implications this development will have on the employment, functions and development of OR -at present and in the near future.

3) Introducing Internet Services in a Developing Country: Experiences in Kenya, *David L. Bakuli*, Univ. of Nairobi - Kenya, 107 Riverglade Ave., Amherst, MA 01002, bakuli@asqnet.org

Advances in IT have generated immense investment opportunities in developed countries but not in developing countries, which have unreliable telecommunications infrastructure. Drawing from experience working for an Internet service provider in Kenya, I discuss this implication on university education, the business community and the general economy.

4) A Taxonomy of Internet Decision Support Systems, *Moncef Belhadjali*, Norfolk State Univ., 2401 Corprew Ave., Norfolk, VA 23504, mbelhadjali@vger.nsu.edu, ***Bel G. Raggad***

The Internet is widely utilized in education. A growing number of students and faculty rely on it to perform a variety of tasks. We design a taxonomy equivalent to Alter's classification of DSSs, through a study of Internet tasks and expected support.

MA36 Network Flow Problems

Cluster: Networks

Invited Session

Chair: Dorit S. Hochbaum, Univ. of CA, 4135 Etcheverry Hall, Dept. of IE/OR, Berkeley, CA 94720, dorit@hochbaum.berkeley.edu

1) Solving Convex Cost Dual Network Flow Problems, *James B. Orlin*, MIT, E53-357, Cambridge, MA 02139, jorlin@eagle.mit.edu web.mit.edu/jorlin/www/, ***Ravindra K. Ahuja***, ***Dorit S. Hochbaum***

We say that a math programming problem is a dual network flow problem if each constraint is of the formx(i)-x(j) <à(i,j) for each (i,j) in A. We consider dual network flow problems in which the objective is a separable convex function. We show how to transform this convex cost dual network flow problem into a convex cost (primal) network flow problem, thus reducing it to a well-solved problem.

2) Polynomial Algorithm For The Convex Dual of Network Flow, *Dorit S. Hochbaum*, Univ. of CA, 4135 Etcheverry Hall, Dept. of IE/OR, Berkeley, CA 94720, dorit@hochbaum.berkeley.edu, ***Ravindra K. Ahuja***, ***James B. Orlin***

We show how to reduce the convex dual of a network flow problem to a polynominal number of minimum cut problems. The reduction aslo applies in the presence of constraints involving three variables of the form x(i)-x(j) <à(i,j) + z(i,j). The reduction utilizes the technique of solving integer monotone programs and a scaling technique that reduces a convex problem to its linear objective counter part.

3) Solving Max Flow & Min Cut Without Flows, *Dorit S. Hochbaum*, Univ. of CA, 4135 Etcheverry Hall, Dept. of IE/OR, Berkeley, CA 94720, dorit@hochbaum.berkeley.edu

We introduce a new algorithm for the max flow min cut problem that relies on a new certificate of optimality. The certificate provides at each iteration a superoptimal solution to a problem we call the maximum s-excess problem. The running time of the new algorithm, which is based on the 1964 algorithm of Lerchs and Grossman, is O (mn log n).

MA37 Design of Survivable Networks

Cluster: Telecom Network Planning

Invited Session

Chair: Patrick Soriano, Ecole Polytech., Univ. of Montreal, CP 6128 Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, patrick@crt.umontreal.ca

1) Optimizing Reserve Capacities of Partially Equipped SDH Networks, *Christelle Wynants*, Univ. Libre de Bruxelles, SMG, Boul. de Triomphe CP 210/01, Bruxelles, 1050, Belgium, cwynants@ulb.ac.be, ***Michel Gendreau***, ***Rene Seguin***

2) Polyhedral Properties of the Network Restoration Problem, *Yi Wang*, MIT, E40-149, 77 Mass Av, Cambridge, MA 02139, yiwang@mit.edu, ***Thomas L. Magnanti***

We present a mixed integer programming formulation and develop polyhedral properties for the problem of economically assigning spare capacity to the edges of a telecommunication network so that interrupted flow can be rerouted if any single link fails. In particular, we completely characterize the convex hull of a special case.

3) Network Restorability Design Using Preconfigured Trees, Cycles & Mixtures of Pattern Types, *W. D. Grover*, TR Labs., 800 Park Plaza, 10611-98 Ave., Edmondon, Alberta, T5K 2P7, Canada, grover@trlabs.ca, ***D. Stamatelakis***

4) Designing Survivable Networks with Multiple Self Healing Rings, *Patrick Soriano*, Ecole Polytech., Univ. of Montreal, CP 6128 Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, patrick@crt.umontreal.ca, ***Bernard Fortz***, ***Martine Labbe***, ***Christelle Wynants***

MA38 Telecommunications Network Design & Expansion

Sponsor: TST

Sponsored Session

Chair: Steven Chamberland, Ecole Polytech. of Montreal, CRT/Dept. of Math. & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, steven3@crt.umontreal.ca

1) A Capacitated Facility Location Problem for Fiber-to-the-Curb Planning, *David Mazur*, JHU, Dept. of Math. Sci., Baltimore, MD 21218-2682, mazur@mts.jhu.edu, ***Tamra Carpenter***, ***Leslie A. Hall***

Given a discrete set of facility types, we consider placing facilities and assigning customers to facilities subject to a distance constraint. We present results on integer programming approaches to this problem, including cutting plane and column generation algorithms, and describe work on other special cases arising in telecommunications planning.

2) Topological Expansion of Multiple Ring Networks, *Steven Chamberland*, Ecole Polytech. of Montreal, CRT/Dept. of Math. & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, steven3@crt.umontreal.ca, ***Brunilde Sanso***

We consider a model and propose a tabu heuristic for the topological expansion problem that includes the location of new modular switches, their configuration, the update of the access network and the expansion of the backbone network with a multiple ring topology. In the model, we consider that several access

rates can be used, such as DS-3 and OC-3.

3) Optimization Based Algorithms for Finding Minimum Cost Ring Covers in Survivable Networks, ***Jeffery L. Kennington***, SMU, Dept. of Comp. Sci. & Eng., Sch. of Eng. & Applied Sci., Dallas, TX 75275-0122, ***V. S. S. Nair***, ***Mohammed H. Rahman***

An algorithm is presented to solve the minimum cost ring cover problem defined as follows: given a graph G with working capacities for each edge, find the least cost cover over all ring covers of G. Optimal solutions are obtained for small problems and good (but not provable optimal) designs are obtained for large problems.

4) Hybrid Heuristic for the Topological Update of 2-Level Networks with Modular Switches, ***Steven Chamberland***, Ecole Polytech. of Montreal, CRT/Dept. of Math. & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, steven3@crt.umontreal.ca, ***Brunilde Sanso***

We propose a mixed integer programming formulation and two resolution approaches (tabu and hybrid heuristics) for the general network updating problem. The problem is to update the access, the backb one and the switch locations and their configuration. In the model the choice of multiplexers in the access and the backbone and of different port and base types is included.

Monday 09:45-10:45

MW05 Welcoming Session & Awards

Chair: To be announced

Monday 11:00-12:00

MO05 Omega Rho Distinguished Lecture: Beyond the Physics of Queueing

Invited Session

Chair: Paul H. Mireault, École des HEC, Dept. of IT, 3000 ch. Côte-Ste-Catherine, Montréal, Québec, H3T 2A7, Canada, paul.mireault@hec.ca

1) Omega Rho Distinguished Lecture: Beyond the Physics of Queueing, ***Richard C. Larson***, MIT, 77 Massachusetts Ave., Cambridge, MA 02139

Ever since a 1950's consultant with an OR bent placed mirrors next to elevators in high rises, the physics of queues has coped with a formidable opponent: the psychology of queueing. One person's 30 minute wait can be worth an admission ticket while another's can create anger and even violence. We reflect on these issues with a view toward practice, utilizing freely many examples from the everyday world...

Monday 13:00-14:30

MC01 Travel Demand Models

Sponsor: TSS & IFORS

Sponsored Session

Chair: David E. Boyce, Univ. of IL, Dept. of Civil & Materials Eng, 842 W. Taylor St., Chicago, IL 60606-7023, dboyce@uic.edu

1) Efficiency & Nested Logit Models, ***Sven Erlander***, Linkoping Univ., Dept. of Math, Linkoping, S-58187, Sweden, sverl@mai.liu.se, ***Jan T. Lundgren***

Logit and nested logit models are frequently used in transportation analysis to describe and predict the choice between alternatives (destination, modes, route). We show how these models can be derived making assumptions of efficient choice behavior according to the efficiency principle.

2) A Travel Choice Model with Detailed Network Access, ***James E. Hicks***, Univ. of IL, 1201 Newmark Civil Eng. Lab, 205 N Mathews Ave. MC 250, Urbana, IL 61801, je-hicks@uiuc.edu, ***Mounir M. Abdel-Aal***

A combined travel choice model is formulated which explicitly considers the detailed choice of access route from subareas within zones (i.e., households in the limit) to the primary transportation network. Resulting network flows approximate those which would be determined by conventional methods using these subareas as the basic travel demand unit.

3) Modeling Auto Occupancy as an Endogenous Variable, ***Maya Tatineni***, Univ. of IL, Dept. Civil & Materials Eng., 842 W Taylor St., Chicago, IL 60606-7023, tatineni@uic.edu, ***David E. Boyce***

Typically, auto occupancy rates are input to the travel modelling process as fixed factors to convert person trips to vehicle trips. We present a model to forecast the auto occupancy rates as endogenous travel choices based on ride sharing decisions.

4) Validation of a Regional Travel Forecasting Model: A Progress Report, ***David E. Boyce***, Univ. of IL, Dept. of Civil & Materials Eng, 842 W. Taylor St., Chicago, IL 60606-7023, dboyce@uic.edu, ***Maya Tatineni***, ***Ronald W. Eash***

The study design for the implementation and validation of a detailed regional travel forecasting model is described. The model seeks to forecast origin-destination, mode and auto route choices for the Chicago Region, and is being estimated with a household travel survey for 1989-1991.

MC02 Computer Science & Transportation Science I

Sponsor: TSS & IFORS

Sponsored Session

Chair: Ismail Chabini, MIT, 77 Massachusetts Ave., Room 1-263, Cambridge, MA 02139, chabini@mit.edu

1) High Performance Computing of Dynamic Network Models, ***Sridevi Ganugapati***, MIT, 77 Massachusetts Ave., Cambridge, MA 02139, ***Ismail Chabini***

We investigate the development of high performance computing implementations of solution algorithms for the following transportation problems in dynamic networks: paths processing and dynamic traffic assignment. We consider various solution algorithms and implementation strategies. We analyze these implementations and quantify their performance in solving realistic problem instances.

2) Software Design Aspects of DynaMIT: Dynamic Network Assignment for the Management of Information to Travelers, ***Michel Bierlaire***, MIT, 3 Cambridge Ctr., Ste. 208, Cambridge, MA 02142, mbi@mit.edu, ***Chris Greamo***, ***Haris N. Koutsopoulis***

DynaMIT is a distributed software system for prediction-based guidance generation. It has an object-oriented and client-server design and is organized around processes (e.g. prediction), modules (e.g. supply) and components (e.g. network topology). The use of CORBA for the integration of the various elements into a distributed system allows for optimization of the allocation of these elements to processors for improved computational performance.

3) On-Line Dynamic Shortest Paths Computation for Real-Time Transportation Applications, ***Ismail Chabini***, MIT, 77 Massachusetts Ave., Room 1-263, Cambridge, MA 02139, chabini@mit.edu

We report on results of 3 approaches we adopted to speedup the on-line computation of dynamic shortest paths for real-time transportation applications. These include development of optimal, in the execution time sense, sequential algorithms, the exploitation of high performance computing platforms and the exploitation of hierarchical structures that exit in transportaion networks to develop better specialized algorithms...

MC03 Vehicle Routing I

Contributed Session

Chair: Hal Bowman, Morgan State Univ., 4600 Waterfall Ct. C, Owings Mills, MD 21117, hbowman@morgan.edu

1) Parcel Pickup Vehicle Assignment Using Predictions of Upcoming Demand, ***Hal Bowman***, Morgan State Univ., 4600 Waterfall Ct. C, Owings Mills, MD 21117, hbowman@morgan.edu

A method is presented for incorporating information about upcoming demands into an algorithm for assigning orders to pick-up vehicles.

2) An Operations Model for Tractor-Trailer Pickup Delivery Operations, ***Wen Zhang***, NJIT, Inst. for Transportation, University Heights, Newark, NJ 07102, wxz2209@megahertz.njit.edu, ***Lazar N. Spasovic***

We present an operation planning model for tractor-trailer pickup and delivery operation with time-windows. An efficient optimization based heuristic is developed to solve the model. The model was applied to a real world case study.

3) Real-World Issues in Distribution Planning, ***Sundararajan Arunapuram***, Manugistics, 1 Bala Plaza, Ste. 200, Bala Cynwyd, PA 19004-1401, sundar_arunapauram@manu.com, ***Srinivas Rajagopal***

We discuss some complex features encountered in real-world distribution planning problems, i.e., multiple time windows, multiple modes, cross-decks, etc. Broadly described as VRPs with several complicating constraints, these problems typically range in size from several hundred nodes to a few thousand. MANUGISTICS uses a combination of heuristic and optimal algorithms to tackle such problems.

MC04 Inventory Management I

Contributed Session

Chair: Timothy L. Urban, Univ. of Tulsa, QM/MIS Dept., 600 South College Ave., Tulsa, OK 74104-3189, urban@utulsa.edu

1) A Production-Inventory Model Subject to Imperfect Production Process with Scrapped Defective Items, ***Dennis E. Kroll***, Bradley Univ., IMET Dept., Peoria, IL 61625, dek@bradley.edu, ***Chen-Sin Lin***

We study the economic production quantity model subject to an imperfect production process. We assume that the production deteriorates during the production run. As a result, some proportion of items produced are defective. These defective items cannot be reworked and must be disposed with additional cost.

2) Economic Lot Size Model with Period-Dependent Inventory Costs, ***Vernon N. Hsu***, George Mason Univ., 4400 University Dr., Fairfax, VA 22030, vhsu@som.gmu.edu

We consider a variant of economic lot size models where inventory costs are period-dependent in the sense that the inventories in a certain period may carry different costs depending on the various periods of their original production. We develop a DP algorithm for solving the problem.

3) Minimizing Average Ordering & Holding Costs Subject to Service Constraints, ***Tamer Boyaci***, Columbia Univ., IEOR Dept., 500 W 120th St., Mudd Bldg., Rm. 331, New York, NY 10027, boyaci@ieor.columbia.edu, ***Guillermo Gallego***

We study 2 alternative formulations of the (Q,r) model. The first minimizes average holding and ordering costs under a minimum fill rate constraint; the second adds a time average fill rate constraint. We derive basic qualitative properties and develop algorithms to compute the optimal (Q,r) pair for both models.

4) Controlling Displayed Inventories, ***Timothy L. Urban***, Univ. of Tulsa, QM/MIS Dept., 600 South College Ave., Tulsa, OK 74104-3189, urban@utulsa.edu

It has long been acknowledged that displayed inventory has an effect on sales for many retail products. We present generalizations of existing inventory models that account for this effect on sales, recognizing the effect of less-than-full shelves as well as making an explicit distinction between displayed inventory and backroom inventory.

MC05 Supply Chain Management

Sponsor: MSOM

Sponsored Session

Chair: Warren H. Hausman, Stanford Univ., IE/EM Dept., Terman Eng. Ctr., Stanford, CA 94305-4024, hausmanw@leland.stanford.edu

1) Rocket Science Retailing, ***Marshall Fisher***, Univ. of PA, The Wharton Sch., Philadelphia, PA 19104, fisher@wharton.upenn.edu, ***Ananth Raman***

The "rocket science" movement transformed Wall Street by applying mathematical models from academia to transaction data on trades. Will POS data combined with recent advances in retail inventory modeling create the same revolution in retailing? We report preliminary results from a multi-year field study designed to answer this question.

2) Intra-Organizational Supply Chain Coordination for Service Parts Logistics Systems: A Military Systems Field Study, ***Morris A. Cohen***, Univ. of PA, The Wharton School, Philadelphia, PA 19104-6366, cohen@opim.wharton.upenn.edu, ***Karen L. Donohue***, ***Vinayak V. Deshpande***

We report on the results of a military service parts logistics system field study. The system is reengineering its internal customer/supplier relationships. We analyze stock/service tradeoffs, alternative supply policies and the optimal assignment of polices to parts/systems groupings in this environment of long lead times and high performance requirements.

3) Coordinated Shipment & Stock Rebalancing in a 2-Level Supply Chain, ***Ki Ling Cheung***, KHUST, Dept. Info. & Systems Mgmt., Clear Water Bay, Kowloon, Hong Kong, imcheung@usthk.ust.hk, ***Hau L. Lee***

We examine the benefits of 2 information-based innovations in a supply chain with one supplier serving multiple retailers located in close proximity. One uses information on the retailer's inventory positions to coordinate supplier shipments to enjoy the economies of scale in shipments. The other uses the same information to unload shipments to retailers, so as to re-balance their stocking positions.

4) Safety Stock Placement in Supply Chains with Nonstationary Demand, ***Stephen C. Graves***, MIT, 77 Massachusetts Ave., E40-439, Cambridge, MA 02139-4307, sgraves@mit.edu, ***Sean P. Willems***

We present an optimization to determine where to place decoupling inventories, so-called strategic inventories, across a production/distribution supply chain subject to nonstationary demand. The nonstationary demand may reflect product life-cycle considerations or cyclic demand behavior. The optimization minimizes inventory holding costs subject to a service constraint for satisfying end item demand.

MC06 Operations Management in Health Services

Sponsor: MSOM

Sponsored Session

Chair: Stefanos A. Zenios, Stanford Univ., Grad. Sch. of Bus., Stanford, CA 94305-5015, stefzen@leland.stanford.edu

1) Modeling & Analyzing the Impacts of Telemedicine, ***Sam Clark***, Vector Research Inc., 2536 Packard, Ann Arbor, MI 48104, clarks@vrinet.com

The Healthcare Complex Model was developed in response to the need for prospective analysis of telemedicine planning, policy and resource allocation issues. This is a discrete event simulation model of the flow and treatment of patients within a complex of healthcare facilities of varying provider mixes and clinical capabilities.

2) What's the Problem Worth? Finding Optimal Funding Levels for HIV Prevention Programs, ***Margaret L. Brandeau***, Stanford Univ., IE-EM Dept., Terman Bldg., Stanford, CA 94305-4024, brandeau@stanford.edu soe.stanford.edu/ieem/faculty/brandeau.html, ***Christina Friedrich***

We analyze optimal funding of HIV prevention programs (maximum number of lives saved per dollar spent). We consider several different types of production functions (defined as reduction in the disease transmission rate per dollar spent), and characterize the optimal solution. We apply the analysis using data from actual prevention programs.

3) Optimization of a Linear-Quadratic Model with Volume-Dependent Sensitivity & Repopulation: A Rationale for Concomitant Boost Therapy, ***Lawrence M. Wein***, MIT, Sloan Sch. of Mgmt., Rm. E53-343, Cambridge, MA 02139, lwein@mit.edu, ***Amy Cohn***

We construct a model of a spherical tumor with a necrotic core, where radiation causes the tumor to change its size, sensitivity and rate of repopulation. Control theory is used to find the radiotherapy protocol that minimizes the final number of clonogenic tumor cells subject to a normal tissue constraint.

4) Should Dialysis Filters be Reprocessed?, ***Stefanos A. Zenios***, Stanford Univ., Grad. Sch. of Bus., Stanford, CA 94305-5015, stefzen@leland.stanford.edu, ***Prahsant C. Fuloria***

We use dynamic programming to derive and characterize the optimal reprocessing decisions for dialysis filters. Our framework includes a deterministic diffusion model for dialysis, and assumes that reprocessing reduces the effectiveness of the filters. We illustrate, using dialysis data, that reprocessing is optimal under fairly conservative assumptions.

MC07 Panel: Production Scheduling - Research Agendas that Bridge Theory & Practice

Sponsor: MSOM

Sponsored Session

Chair: Kenneth N. McKay, Memorial Univ. of Newfoundland, Fac. of Bus. Admin., St. John's, NF, AIB 3X5, Canada, kenmckay@plato.ucs.mun.ca

1) Panel: Production Scheduling - Research Agendas that Bridge Theory & Practice, ***Michael L. Pinedo***, NYU Stern Sch. of Bus., OR Dept., Tisch Hall, 40 W 4th St., Ste. 7-08, New York, NY 10012-1118, mpinedo@stern.nyu.edu, ***Reha Uzsoy***, ***Scott Webster***

This session focuses on: types of research agendas which are feasible, research topics which are felt to be high impact and challenges which must be overcome while conducting this type of research. Three researchers who are bridging the gap will lead the discussion and enter into a dialog with the audience.

MC08 International Issues in Technology Management

Sponsor: Technology Management Section

Sponsored Session

Chair: Dundar F. Kocaoglu, Portland State Univ., Eng. Mgmt. Program, 1900 SW 4th Ave., Portland, OR 97201, kocaoglu@emp.pdx.edu

1) Developing Countries & Technology Management in High-Technology Industries, ***Dilek C. Karaomerlioglu***, Case Western Reserve Univ., Ctr. Regional Econ. Issues, 311 Wickenden Hall, Cleveland, OH 44106, dxk15@po.cwru.edu

We focus on biotechnology and polymer industries in a sample of developed and developing countries. By observing their development such as their output, R&D investment, and technology in the last decade, we will examine what factors and policies are in effect in these countries to support their high-tech industries and economic development.

2) A Report on State-of-the-Art Multicultural Project/Team Management, ***Dragan Milosevic***, Portland State Univ., Eng. Mgmt. Program, Portland, OR 97207-0751, dragan@emp.pdx.edu

Are American project/team management practices universally applicable? According to our literature review, the time has come to discard the belief of American project/team management practices being universally applicable. Instead, the belief should be replaced with a new paradigm that project/team management is culture-bound. This paper provides a close look at the paradigm.

3) Do Standardized Project Management Practices Work?, ***Dragan Milosevic***, Portland State Univ., Eng. Mgmt. Program, Portland, OR 97207-0751, dragan@emp.pdx.edu, ***Lane Inman***

How far is the corporate world in the process of standardizing project and team management practices? What are the benefits of the standardization? These two research questions are central to our research that included over 160 companies across United States and Canada. Our findings offer some thought-provoking conclusions.

MC09 Technology & Standards

Sponsor: Technology Management Section
Sponsored Session

Chair: Sanjay Jain, NYU, 7-153 Tisch Hall, 40 West 4th St., New York, NY 10012, sjain0@stern.nyu.edu

1) Leveraging Architectural Leadership: The Case of Adobe System, ***Mary Tripsas***, Univ. of PA, The Wharton Sch., 2000 SH-DH Hall, Philadelphia, PA 19104, tripsas@wharton.upenn.edu

The combination of "open" architectural standards and industry convergence has stripped many firms of internal architectural control by imposing external standards that significantly constrain design choices. We examine how a firm can establish and leverage architectural leadership through an examination of Adobe Systems and the page description language market.

2) Coupling the Technical & Institutional Faces of JANUS in Network Industries, ***Arun Kumaraswamy***, Rutgers Univ., Sch. of Bus., Rm. 207 BSB, Camden, NJ 08102, akumaras@crab.rutgers.edu, ***Raghu Garud***

We argue that the dichotomous two stage dominant design model needs to be recast to explain continual change occurring in network industries. Instead of the dichotomous model, we propose a dualistic model and illustrate this=model employing data from the workstation market of the computer industry.

3) Standards, Modularity, & Innovation: The Case of Medical Practice, ***Richard N. Langlois***, Univ. of CT, Economics U63, Storrs, CT 06269-1063, langlois@uconnvm.uconn.edu, ***Deborah A. Savage***

Most analyses of path dependence have focused on the compatibility of physical components. Few in this tradition have looked at standards as coordinating human behavior rather than connecting technology. We view standards as social institutions that help coordinate human activity, and explicate this perspective in the context of medical practice.

4) Forging The Rules: Organizational Actors & Standards Strategy, ***Sanjay Jain***, NYU, 7-153 Tisch Hall, 40 West 4th St., New York, NY 10012, sjain0@stern.nyu.edu

In network-based industries, firms that influence the creation of compatibility standards can gain competitive advantage. Firms can adopt an "open" approach, making their standards freely available, or they can take a "closed" approach, geared towards rent appropriation. I explore the choices made by firms in the local area networking industry.

MC10 New Scheduling Algorithms

Cluster: Scheduling
Invited Session

Chair: Nicholas G. Hall, OH State Univ., 301 Hagerty Hall, 1775 S College Rd., Columbus, OH 43210-1399, hall.33@osu.edu

1) Algorithms for Lot Streaming & Scheduling Multiple Products in 2-Machine No-Wait Flowshops, ***Chelliah Sriskandarajah***, Univ. of Toronto, Dept. of MIE, 5 King's College Rd., Toronto, Ontario, M5S 3G8, Canada, chellia@mie.utoronto.ca, ***Edouard Wagneur***

The problem of simultaneous lot streaming and scheduling of multiple products in two-machine no-wait flowshops is studied in the context of minimizing makespan. Each "product" consists of many identical items requiring lot streaming, which is the process of creating a prespecified number of sublots. Efficient algorithms are developed to solve this problem.

2) On Minimizing Late Jobs in Single Machine Scheduling, ***Stephane Dauzere-Peres***, Ecole Des Mines de Nantes-Dept Automatiq, et Productique - 4 Rue Alfred, La Chantrerie - BP 20722, Nantes Cedex 3, F44307, France, dauze@auto.emn.fr, ***Marc Sevaux***

An original and efficient MILP formulation is proposed, using some properties of the problem. Several cuts can be used to strengthen that formulation and to obtain better bounds by LP relaxation. A B&C algorithm is derived, whose efficiency will be discussed through some numerical experiments.

3) The Restricted List Coloring Problem: New Results, ***Wieslaw Kubiak***, Memorial Univ. of Newfoundland, Fac. of Bus. Admin., St. John's, NFL, A1B 3X5, Canada, wkubiak@morgan.ucs.mun.ca

We will discuss new complexity results and algorithms for the restricted list coloring problem proposed by de Werra for timetabling.

4) Sensitivity Analysis for Scheduling problems, ***Nicholas G. Hall***, OH State Univ., 301 Hagerty Hall, 1775 S College Rd., Columbus, OH 43210-1399, hall.33@osu.edu, ***Marc E. Posner***

We demonstrate how to derive a variety of sensitivity analysis results for deterministic scheduling problems. Results include computational complexity classifications, bounds on parameter modifications that leave the optimal solution unchanged, and bounds on optimal cost change. Some of the methodology presented extends to general integer programming problems.

MC11 Deterministic Machine Scheduling Models

Cluster: Scheduling
Invited Session

Chair: Chung-Lun Li, Washington Univ., Olin Sch. of Bus., CB 1133, St. Louis, MO 63130, lichung@wubmail.wustl.edu

1) Optimal Discrete-Valued Control for Manpower Planning & Scheduling, ***Xiaoqiang Cai***, Chinese Univ. of Hong Kong, Dept. of Systems Eng., Shatin NT, Hong Kong, xqcai@se.cuhk.hk, ***H. W. J. Lee***

It is very important for those at high management levels to obtain optimal solutions for their manpower planning problems. We novelly post, and thus solve, such a problem as an optimal discrete-valued control problem in discrete time.

2) A Genetic Algorithm for Multiprocessor Task Scheduling, ***Ceyda Oguz***, Hong Kong Polytechnic Univ., Dept. of Mgmt., Hung Hom Kowloon, Hong Kong, msceyda@polyu.edu.hk, ***X. Qi***, ***Y. F. Fung***

We consider the multiprocessor task sheduling in a hybrid flow-shop environment. We present a GA to find a schedule that minimizes makespan. We discuss the computational results to analyze the performance of the genetic algorithm.

3) The Complexity of Scheduling Starting Time Dependent Tasks with Release Times, ***Qing Ding***, Hong Kong Polytech. Univ., Dept. of Mgmt., Hung Hom, Kowloon, Hong Kong, msqding@polyu.edu.hk, ***T. C. Edwin Cheng***

We consider a family of problems of scheduling a set of starting time dependent tasks with release times and increasing/decreasing processing rates on a single machine to minimize the makespan. We present a series of the computational complexities of this class of scheduling model.

MC12 Constraint Programming: Scheduling

Cluster: Constraint Programming
Invited Session

Chair: Wim Nuijten, ILOG S.A., 9 Rue de Verdun, Gentilly, 94253, France, nuijten@ilog.fr

1) Workforce Management Using Constraint Programming & Local Search, ***David Lesaint***, British Telecom, BT Lab., Intell. Systems Research, Ipswitch Suffolk, IP38QH, UK, lesaind@info.bt.co.uk

Provision of service to business and residential customers, network maintenance and fault repair are some of the core activities of large telecommunications companies. We have developed a fully automated scheduling system for BTs workforce of 25,000 field technicians. The system can both generate predictive

work schedules and adjust such schedules reactively...

2) One Model & Different Solvers for Hoist Scheduling Problems, ***Robert Rodosek***, Imperial Coll., IC-Parc, William Penney Lab., London, SW7-2AZ, UK, rr5@doc.ic.ac.uk, ***Mark G. Wallace***

We present a robust approach to solve HSPs based on an integration of CLP and MIP. By contrast with previous dedicated models and algorithms for solving classes of HSPs, we define only one model and run different solvers. The robust approach is achieved by using a CLP formalism. We show that the models for different classes of industrial HSPs are very similar in the CLP language...

3) Heuristic Constraint-Based Algorithms for Preemptive Scheduling Problems, ***Claude M. Le Pape***, Bouygues-Direction Scientifique, 1 Ave. Eugene Freyssinet, St. Quentin Yvelin, F 78061, France, clp@challenger.bouygues.fr, ***Philippe Baptiste***

A preemptive construction site scheduling application led us to develop several constraint propagation and optimization algorithms for the resolution of preemptive scheduling problems. We present a comparative study of 20 algorithms on the preemptive job-shop scheduling problem, as well as the results obtained on the actual application.

4) ILOG Scheduler: Constraint-Based Scheduling in Practice, ***Wim Nuijten***, ILOG S.A., 9 Rue de Verdun, Gentilly, 94253, France, nuijten@ilog.fr

We present the constraint-based software library ILOG Scheduler together with several examples of fielded applications implemented with ILOG Scheduler. We identify which properties of Scheduler contributed to the success of the different applications. It is shown that Scheduler's combination of constraint programming and OR techniques is often crucial to these successes.

MC14 Dynamic Programming

Cluster: **Dynamic Programming**
Invited Session

Chair: Anton J. Kleywegt, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, anton.kleywegt@isye.gatech.edu

1) Understanding Bias Optimality in MDPs, ***Enrique Lemus-Rodriguez***, Univ. Autonoma Metropolitana, 6201 Cecil Green Park Rd., Rm. 237, Vancouver, BC, V6T 1Z1, Canada, enrique@markov.commerce.ubc.ca, ***Martin L. Puterman***

Looking for a better understanding of the concept of bias optimality, we present results for the unichain case which show that the first and second optimality equations possess the same structure, and hence, the extensive theory on average optimality may be extended to study bias optimality.

2) Bias Optimality in a Two-Class Queueing System, ***Mark Lewis***, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, lewis@isye.gatech.edu, ***Hayriye Ayhan***, ***Robert D. Foley***

Consider a finite capacity queueing system with a Poisson arrival process and exponential service times. Arriving customers offer a reward and are one of 2 types. We focus on describing the structure of stationary optimal policies and extending this to distinguish between multiple gain optimal policies using bias optimality.

3) Characterizing & Finding Efficient Solutions in Infinite Horizon Dynamic Programming, ***Robert L. Smith***, Univ. of MI, Dept. of IOE, 2895 IOE Bldg., Ann Arbor, MI 48109, rlsmith@umich.edu, ***Irwin E. Schochetman***

We define an infinite horizon dynamic programming policy as efficient if it is optimal to each of the states through which it passes. A forward algorithm is presented for finding such solutions for general time-varying deterministic problems. Conditions are discussed under which they are respectively average and overtaking optimal.

4) Constrained Discounted Markov Decision Process & Hamiltonian Cycles, ***Eugene A. Feinberg***, SUNY, Harriman Hall, Stony Brook, NY 11794-3775, efeinber@fac.har.sunysb.edu

We show that the Hamiltonian cycle problem is a special case of the following problem for a discounted Markov decision process with side constraints and with finite state and action sets: find an optimal deterministic stationary policy. We use this fact and develop new mathematical programs for the TSP.

MC15 Complementarity

Cluster: **Nonlinear Programming**
Invited Session

Chair: Richard W. Cottle, Stanford Univ., Dept. of EE & OR, Terman Engineering Ctr., Stanford, CA 94305-4023, cottle@soe.stanford.edu

1) The LCP & Regular Triangulations of a Point Set, ***Walter D. Morris***, George Mason Univ., Dept. of Math. Sci., Fairfax, VA 22030, ***Jesus de Loera***

There is a bijection between the set of regular triangulations of the set of columns of a matrix [M*T,I] and the set of "combinatorially different" vectors q for which the system $y = Mx+q$, $x>=0$, $y>=0$ has a problem, in particular to the problem of recognizing Q-matrices, are presented.

2) Minimum-Support Solutions for the Ill-Posed Linear Complementarity Problem, ***Olvi L. Mangasarian***, Univ. of WI, Comp. Sci. Dept., 1210 W Dayton St., Madison, WI 53706-1685

Guided by Occam's Razor of machine learning that "simplest is best", we seek least-residual solutions of possibly unsolvable LCPs with minimal number of nonzero components. We establish existence of such vertex solutions for Q0 matrices (LCP is solvable if feasible) and prescribe an exact penalty method for solving it.

3) Frictional Contact Mechanics & Complementarity Problems, ***Jong-Shi Pang***, JHU, Dept. of Math. Sci., Whitehead Hall, Baltimore, MD 21218-2682, jsp@vicpl.mts.jhu.edu

We discuss the import roles complementarity plays in many frictional contact problems arising from engineering mechanics. In particular, complementarity is synonymous with the well-known Signorini normal contact condition; the frictional constraints on the tangential forces lead to some interesting new classes of complementarity problems whose treatment requires non-traditional analysis.

4) Interior-Point Methods for Complementarity Problems, ***Stephen J. Wright***, Argonne National Lab., Dept. of Math. & Comp. Sci., 9700 S Cass Ave., Bldg. 5, Argonne, IL 60439, wright@mcs.anl.gov

The theory of interior-point methods for linear complementarity problems (LCPs) was developed intensively between 1989 and 1994. We algorithms, and discuss the most promising extensions to nonlinear complementarity. We show how the "complementarity viewpoint" is continuing to influence the development of optimization algorithms.

MC16 Properties of Some Algorithms for Linear Programming & Extensions

Cluster: **Linear Programming**
Invited Session

Chair: Osman Guler, UMBC, Dept. of Math. & Stats., Baltimore, MD 21228, guler@math.umbc.edu

1) Condition Number Complexity of the Ellipsoid Algorithm for Solving a Convex Program, ***Robert M. Freund***, MIT, Bldg. E40-149A, 77 Massachusetts Ave., Cambridge, MA 02139, rfreund@mit.edu, ***Jorge R. Vera***

We re-examine the ellipsoid algorithm for solving a convex program in conic linear form. We show that the complexity of finding an epsilon optimal solution depends only on n, the log of the "condition number" for convex programs (as developed by Renegar), and the log of epsilon.

2) On the Nesterov-Todd Direction for General Conic Problems, ***Michael J. Todd***, Cornell Univ., Sch. of OR/IE, Rhodes Hall, Ithaca, NY 14853-3801, miketodd@cs.cornell.edu, ***Raphael A. Hauser***

In interior-point methods for LP, the linear system defining the standard primal-dual direction converges to a nonsingular limiting system; moreover, it defines the Newton step for a certain nonlinear function. We investigate to what extent these properties remain true for the Nesterov-Todd direction for general conic and SDP problems.

3) Superlinear Convergence of Potential-Reduction Algorithms, ***Reha H. Tutuncu***, Carnegie Mellon Univ., 6113 Wean Hall, Dept. of Math. Sci., Pittsburgh, PA 15213, reha@nirvana.math.cmu.edu

Interior-point algorithms that have the desirable property of asymptotic superlinear convergence are often based on path-folllowing ideas. Even the algorithms that use potential functions ensure fast local convergence by restricting their later iterates to some neighborhoods. We investigate the possibility of developing globally and superlinearly convergent pure potential-reduction algorithms.

MC17 Timetabling

Cluster: **Optimization Days**
Invited Session

Chair: Michael W. Carter, Univ. of Toronto, Dept. of MIE, Toronto, Ontario, M5S 3G8, Canada, carter@mie.utoronto.ca

1) An Experiment in Web-Based Timetabling, ***George White***,

Schl. of Info. Tech. & Eng., Univ. of Ottawa, Ottawa, K1N 6N5, Canada, white@site.uottawa.ca

The new web based delivery channels promise another revolution in the way that services are implemented. Rather than ship disks to clients a service provider can simply mount the application on a web server and provide clients with a URL. We will discuss an experiment in providing examination scheduling services via the web.

2) Combining Constraint Programming & Local Search to Solve a High School Timetabling Problem, ***Gilles Pesant***, Univ. of Montreal, CRT, CP 6128, succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, pesant@crt.umontreal.ca, ***Rene Seguin***, ***Patrick Soriano***

We present an algorithm combining constraint programming and local search methods in order to solve a real-world school timetabling problem. Constraint propagation guides the construction of the timetable whereas local search attempts to resolve constraint violations which may still arise.

3) A Comparison of Annealing Techniques for Academic Course Scheduling, ***Saleh Elmohamed***, Syracuse Univ., 111 College Pl., CST Bldg., NE Parallel Arch. Ctr., Syracuse, NY 13244, saleh@npac.syr.edu, ***Paul Coddington***, ***Geoffrey Fox***

We have tackled a case of academic course scheduling. We have investigated a variety of approaches based on simulated annealing, and the use of a rule-based preprocessor to provide a good starting point for the annealing. The best results were obtained using SA with adaptive cooling and reheating as a function of cost,...

4) Recent Developments in Practical Timetabling, ***Gilbert Laporte***, Ecole des HEC, Univ. of Montreal, CRT, CP 6128, Station A, Montreal, Quebec, H3C 3J7, Canada, gilbert@crt.umontreal.ca

Over the past 30 years or so, a wide variety of algorithms have been proposed for solving the course timetabling problem and its' variants. We report on some recent developments and trends in this area with emphasis on work that has actually been implemented in a college, high school or university. We concentrate on articles published since 1980.....

MC18 Metaheuristics

Cluster: **Metaheuristics**
Invited Session
Chair: David L. Woodruff, Univ. of CA, GSM, Davis, CA 95616, dlwoodruff@ucdavis.edu

1) Tabu Search Integrated into Branch & Bound, ***Arne Lokketangen***, Molde Coll., Britveien 2, Molde, 6400, Norway, arne.lokketangen@himolde.no, ***David L. Woodruff***

We describe computational experiments concerned with incorporating TS in B&B algorithms. Information is exchanged between the search and the branch and bound to enhance each. Computational results are reported for 0-1 MIPs using XPRESS-MP for the B&B and modified version of reactive TS for those nodes selected as a starting point for heuristic search.

2) A Parallel Vocabulary Building Metaheuristic for Graph Partitioning, ***Michel Toulouse***, Univ. of OK, Sch. of Comp. Sci., 200 Felgar St., Rm. 114, Norman, OK 73019, toulouse@cs.ou.edu

We provide a new metaheuristic for graph partitioning based on vocabulary building. Multiple initial graphs are created whose nodes come from different partial partitions. A parallel search then exchanges good partitions among graphs, inducing the graphs to self-modify. Computational results are reported that show the promise of the method.

3) Crew Scheduling & Vehicle Routing for Garbage Collection Problems, ***Joachim R. Daduna***, FH Wirtschaft Berlin, Badensche Str. 50-51, Berlin, D-10825, Germany, daduna@fhw-berlin.de, ***Stefan Voss***

Usually capacitated arc routing problems (CARP) assume given crews and trucks being scheduled as units. Here we propose to separate the CARP for the vehicle and the duty scheduling problem. An integrated solution approach incorporating intelligent search is proposed allowing reasonable savings over conventional approaches.

4) Data Mining via Clustering With Data Driven Metrics, ***David L. Woodruff***, Univ. of CA, GSM, Davis, CA 95616, dlwoodruff@ucdavis.edu

We review work on maximum likehood based clustering with no metric given a priori. This is contrast to the large OR literature where distances between data points are assumed to be known in advance. The resulting optimization problems are difficult, but computational results suggest that maximum likelihood methods are effective and offer support for statistical analysis of the results.

MC19 Bridging Continents & Cultures

Contributed Session
Chair: Heiner E. Muller-Merbach, Univ. Kaiserslautern, PF 30 49, Kaiserslautern, D-67653, Germany, hmm@sozwi.uni-kl.de www-bior.sozwi.uni-kl.de/

1) Socrates vs. Confucius: Schools of Thought from the West & the East, ***Heiner E. Muller-Merbach***, Univ. Kaiserslautern, PF 30 49, Kaiserslautern, D-67653, Germany, hmm@sozwi.uni-kl.de www-bior.sozwi.uni-kl.de/

Bridging Continents and Cultures: ought to be related to the roots, i.e. the Western culture with the presocratics: Socrates, Plato and Aristole versus the Eastern culture with: Confucius and Mencius, Lao-Tse and Tschaung-Tse. Western and Eastern roots are different and so are today's scientific approaches.

2) Fuzzy Logic: A Case Study of Cultural Factors in Modeling, ***John N. Hooker***, Carnegie Mellon Univ., GSIA, Pittsburgh, PA 15213,jh38+@andrew.cmu.edugsia.cmu.edu/afs/andrew/gsia/jh38/jnh

The role and acceptance of mathematical modeling are influenced by cultural factors that are not well understood in the OR community. We attempt to broach the issue with a case study of fuzzy logic. An alternative is proposed to the popular explanations for its early acceptance in Asia.

MC20 Tutorial: Network Optimization - Learning from Recent Discoveries in Computer Science

Invited Session
Chair: Stefano Pallottino, Univ. of Pisa, Dept. of Comp. Sci., Corso Italia 40, Pisa, Italy, pallo@di.unipi.it

1) Tutorial: Network Optimization - Learning From Recent Discoveries in Computer Science, ***Ravindra K. Ahuja***, MIT, E53-361 Sloan Sch. of Mgmt., 50 Memorial Dr., Cambridge, MA 02139, ahuja@mit.edu, ***Thomas L. Magnanti***, ***James B. Orlin***

We present 3 elegant, significant and relatively simple recent results from computer scientists: an improved maximum flow algorithm due to Goldberg & Rao, construction of graphs known as "light weight spanners" that simultaneously approximate optimal spanning trees and shortest paths and a topic to be determined shortly before the conference.

MC21 Supply Chain Management

Sponsor: **College on Simulation**
Sponsored Session
Chair: Christopher Hane, CAPS Logistics, Inc., 2700 Cumberland Pkway, Atlanta, GA 30339, chane@caps.com

1) Collaborative Supply Chain Design Using Optimization & Simulation, ***Christopher Hane***, CAPS Logistics, Inc., 2700 Cumberland Pkway, Atlanta, GA 30339, chane@caps.com, ***Andrew Sudar***

Supply chain design models are making decisions worth millions of dollars, usually without integrated analysis of the variability of the proposed system. This talk will demonstrate how two best-of-breed software vendors, CAPS Logistics and Systems Modeling, are providing an easy-to-use interface that supports collaboration between optimization and simulation models.

2) Investment & Subcontracting Under Demand Uncertainty, ***Jan A. Van Mieghem***, Northwestern Univ., Kellogg Sch. of Mgmt., 2001 Sheridan Rd., Evanston, IL 60208-2001, vanmieghem@nwu.edu

We study subcontracting and outsourcing by analyzing the investment strategies of two firms, contractor and subcontractor, that have the option to cooperate in the face of uncertain market demands. The main model is a two stage stochastic game using the incomplete contracts approach. First investment decisions are made. In the second stage...

3) An Applied LP/MIP Model of a Supply Chain Network, ***Dan Cahill***, Schneider Logistics, Inc., 3101 S Packerland Dr., PO Box 2666, Green Bay, WI 54306, dcahill@schneider.com, ***Zahir Balaporia***, ***Jennifer Jancik-Bailey***

The authors completed an application of AMPL + and CPLEX to model a complex supply chain network with multiple business units and many product types. The modeling effort produced an accurate and detailed baseline model of 1996 operations. The validated model was used to solve facility location problems, present alternative network formulations to improve service and reduce distribution costs and provide increased visibility into the supply chain.

4) Supply Chain Mangement: Integrating Inventory & Transportation, ***Lap Mui A. Chan***, Hong Kong Poly Technic Univ.,

Dept. of Mgmt., Kowloon, Hong Kong, mslmchan@smtpgwy.polyu.edu.hk, ***Ana Muriel, David Simchi-Levi***

We analyze the problem faced by companies that rely on LTL (Less than TruckLoad) carriers for the distribution of products across their supply chain. In this case, the timing and routing of shipments need to be coordinated so as to minimize system-wide costs, including inventory, transportation and shortage costs, by taking advantage of economies of scale offered by the carriers. ...

MC22 Random Utility Models

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Michel Regenwetter, Duke Univ., Fuqua Sch. of Bus., Durham, NC 27708-0120, regenwet@mail.duke.edu

1) Binary Probabilities & the Linear Signed Order Polytope, ***Peter C. Fishburn***, AT&T Bell Labs., Rm. 2C 354, 180 Park Ave., Florham Park, NJ 07932, fish@research.att.com

Signed orders are orderings of items and their anti-items that reflect relative likes and dislikes for the items. We consider relationships between binary choice probabilities on the set of items and anti-items, and probability distributions on the set of linear signed orders.

2) Classes of Binary Relations as Media & Submedia, ***Jean-Claude Falmagne***, Univ. of CA, MBS Sch. of Sciences, Irvine, CA 92697, jcf@aris.ss.uci.edu

Subjects are often asked to produce repeatedly binary relations (semiorders, quasi orders, etc.) representing judgments concerning commodities or individuals. A particular semigroup of transformations has been proposed by Falmagne as a tool for analyzing this type of temporal evolution. We pursue the study of this semigroup and review some applications.

3) Cumulative Discrete Choice, ***Amit Pazgal***, Washington Univ., One Brookings Dr., CB 1133, St. Louis, MO 63130, pazgal@wuolin.wustl.edu, ***Itzhak Gilboa***

We present a discrete choice model in which consumer's impression of each alternative is based on her memory of past experiences, and is stochastically updated after consumption. Furthermore, the consumer may sometimes be "dormant," selecting the previously chosen option out of inertia. It is proven that both "active" and "dormant" cases lead to convergence of the choice frequencies with probability 1.

4) Random Utility Models & Social Welfare, ***Michel Regenwetter***, Duke Univ., Fuqua Sch. of Bus., Durham, NC 27708-0120, regenwet@mail.duke.edu

In subset voting respondents pick a subset containing any number of alternatives from a fixed set. We merge "approval voting" and the "single transferable vote" from political science, the "weak utility model" from mathematical psychology and "social welfare orderings, Borda and Condorcet winners" from social choice theory.

MC23 The Practice of Probability Assessment

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Thomas Eppel, Decision Insights Inc., 2062 Business Center Dr., Ste. 110, Irvine, CA 92612, TomEppel@aol.com

1) Framing & Assessing Models of the Needs of Computer Users, ***Eric Horvitz***, Decision Theory Group 9S/1, Microsoft Research, One Microsoft Way, Redmond, WA 98025, horvitz@microsoft.com

The Lumiere project centers on the construction of Bayesian models of the goals and needs of users of computers. Lumiere prototypes served as the basis for the Office Assistant in the Microsoft Office '97 suite. I discuss the framing of distinctions and relationships and the assessment of probabilities in the Lumiere models.

2) Experiences with Probability Elicitation, ***Robert F. Bordley***, General Motors, R&D Ctr., Bld. 30500 Mound Rd., Warren, MI 48090-9055, robert_bordley@notes.gmr.com

Much of the success of DA arises from the logical structuring it brings to a problem. However, in some contexts, quantifying subjective beliefs can also be of significant value. We focus on practical experiences associated with assessing subjective probabilities.

3) Imputing Uncertainty Distributions from Expert Judgments, ***Stephen C. Hora***, Univ. of HI, 200 W Kawili St., Hilo, HI 96720-4091, shora@pahuleka.uhh.hawaii.edu

Probability elicitation should be conducted on values that are conceptually observable. When parameters are not observable, indirect methods of probability elicitation may be used. Some methods are discussed that have been used to quantify nuclear accident models.

4) Expert Assessment of Flammable Gas Risks, ***Thomas Eppel***, Decision Insights Inc., 2062 Business Center Dr., Ste. 110, Irvine, CA 92612, TomEppel@aol.com, ***Detlof von Winterfeldt***

Some high-level nuclear waste tanks at DOE's Hanford site have the potential for gas releases and possible detonations or burns. We summarize the methodology and results of an expert elicitation about these risks and demonstrate the benefits of using specialized software in the elicitation process.

MC24 Multicriterion Decision Analysis II

Cluster: Multicriteria Decision Analysis
Invited Session

Chair: Thomas Hanne, Fern Universitaet Hagen, 2 Postfach 940, Luetkenheider Str.2, Hagen, 58009, Germany, thomas.hanne@fernuni-hagen.de

Co-Chair: Tomas Gal

1) Demographic vs. Kohonen Clustering Algorithms: Convergence & Rests Discrepancy, ***Jan Mrazek***, Development Tech. Services, Bank Info Warehouse, 245 Consumers Rd., Willowdale, M2J 1R3, Canada, jmrazek@sympatico.ca

The purpose of discovering clusters is to partition a database of records so that records that have similar characteristics are grouped together. From the standpoint of multicriteria optimization we maximize the Eucledian distances between clusters and minimize the distances among records within each cluster. Intelligent Miner, a leading IBM Data Mining tool.....

2) Root-Mean-Square Division in Games Under Uncertainty, ***M. E. Salukvadze***, Georgian Academy of Sci., Inst. of Control Systems, 34 k Gamsakhurdia Ave., Tbilisi, 380060, Georgia, msaluck@ics.kheta.georgia.su, ***A. Eliashvili, A.L. Topchishvili, A.o. Remizov***

A concept of a guaranteed root-mean-square division in cooperative games of two persons without side payment under uncertainty is considered. Uncertainities are disturbances, parasitics, noises, troubles and other uncertain factors such that only ranges of these factors are known. A concept of a guaranteed root-mean-square division is stated, its properties and problems of existence and construction in some particular cases are investigated.

3) Multicriteria Analysis of Production Systems, ***Petr Fiala***, Univ. of Econ., Dept. of Econometrics, W. Churchill sq. 4, Prague 3, 13067, Czech Rep., pfiala@vse.cz

Production systems are focused on transformation of inputs into outputs. The purpose of production systems is to enrich society through the production of functionally desirable, highly reliable, economically affordable, environmentally safe, top quality products. The objectives are often conflicting. There are basic types of production systems. Product oriented systems are used to achieve a smooth and rapid flow of large volumes of products.

MC25 Control of Queueing Systems II

Sponsor: Applied Probability Section
Sponsored Session

Chair: Rhonda L. Righter, Santa Clara Univ., Dept. of Decision & Info. Sci., Santa Clara, CA 95953, rrighter@scu.edu

1) Virtual Partitioning for Robust Resources Sharing, ***Sem C. Borst***, Bell Labs, Lucent Tech., 700 Mountain Ave., PO Box 636, Rm. 2C-122, Murray Hill, NJ 07974-0636, sem@research.bell-labs.com, ***Debasis Mitra***

We consider Virtual Partitioning, a scheme for sharing a resource among several traffic classes. The scheme assigns lower priority to classes which exceed their nominal capacity allocation, thus protecting the behaving classes. We develop computational algorithms for the case of hetergeneous traffic. The results show that the scheme is efficient, fair, and robust.

2) Control of Queues with Decentralized Information, ***Ulrich Rieder***, Univ. Ulm., Abteilung Mathematik VII, Dept. of OR, Ulm, D-89069, Germany, rieder@mathematik.uni-ulm.de

We consider Markov Decision Processes with two decision makers. At first, we intgroduce two methods of reducing the decentralized problem to a centralized one. Then we derive monotonicity results for a centralized queueing problem by means of the reduced models.

3) Majorization Orders of Weighted Trees & Dependence Comparisons of Correlated Queues, ***Haijun Li***, Washington State Univ., Dept. of Math., St. Louis, MO 63130, ***Susan Xu***

We study dependence structures of a multiserver queue whose input process is a multivariate, correlated compound renewal process. We view parameters of the input process as a weighted tree and introduce several majorization orders

among weighted trees. We show that majorization orders imply correlation orders of various performance vectors in difference senses. Our results are useful to establish performance bounds for the parallel, correlated GI/G/1 system whose exact analysis is intractable.

4) Submodular Returs & Greedy Heutistics for Queueing Scheduling Programs, ***Kevin D. Glazebrook***, Univ. of Newcastle, Dept. of Stats., Newcastle Upon Tyne, NE1 7RU, UK, kevin.glazebrook@newcastle.sc.uk

We consider a class of controlled stochastic systems in which one of the key issues is the determination of which subset of all possible demand (job, customer) types will be allowed access to the system. Under stated assumptions the optimum system-wide performance is a nondecreasing submodular function of the subset chosen. These results motivate the use of greedy heuristics for the solution of a range of job selection and scheduling problems.

MC26 Input Modeling for Stochastic Analysis I

Cluster: Queueing
Invited Session
Chair: Donald Gross, George Mason Univ., Dept. of OR & Eng., Fairfax, VA 22030, dgross1@gmu.edu

Co-Chair: Sudha Jain

1) Distribution Estimation Using Transforms, ***William G. Marchal***, Univ. of Toledo, Dept. of IS & Ops., Toledo, OH 43606, wmarchal@uoft02.utoledo.edu, ***Carl M. Harris***

We present a method to derive distribution estimates using rational Laplace transform representations. This results in generalized hyperexponential, phase-type, and/or Coxian estimates for arbitary data. An attractive algorithm is used to greatly simplify computations.

2) Fitting Ph & MAP Processes & Their Use in (Time-Dependent) Queueing Processes, ***Michael R. Taaffe***, Univ. of MN, Dept. of OMS, Fac. of IE, 372 Mgmt. & Econ. Bldg., Minneapolis, MN 55455, taaffe@maroon.tc.umn.edu, ***Mary A. Johnson***, ***Paul Surya***

We review fitting procedures for Phase-type (Ph) processes and Markov Arrival Processes (MAP). We pay particular attention to fitting these rpocesses given that they will be used in queueing models. We also describe use of these processes and their time-dependent generalizations in infinite-server queueing networks and discuss appromixations for finite-server queueing models.

3) Stochastic Simulation Input Modeling with Johnson Distributions, ***James R. Wilson***, NC State Univ., Dept. of IE, Riddick Labs., Yarbrough Dr., Raleigh, NC 27695-7906, jwilson@ncsu.edu

We survey recent experience in using the Johnson translation system of probability distributions for stochastic simulation input modeling. We also discuss recent work on using Johnson distributions to model multivariate simulation inputs.

4) Are Two-Parameter Distributions Sufficient for Input Modeling?, ***Donald Gross***, George Mason Univ., Dept. of OR & Eng., Fairfax, VA 22030, dgross1@gmu.edu, ***Nicole Bussolati***, ***Man Juttijudata***

From the theory of queues, there is some evidence that it is the first two moments of interarrival and service time distributions that have major impact on system performance measures (e.g., queue lengths and waiting times). We investigate this via a G/G/c simulation for various theoretical and real data sets.

MC27 Queueing Issues II

Contributed Session
Chair: Nadim Abboud, American Univ. of Beirut, Fac. of Eng. & Architecture, Box 11-0236, Beirut, Lebanon, neabboud@aub.edu.lb

1) withdrawn - author request of 4/4, ***Hongtao Zhang***, HKUST, Dept. of ISMT, Clear Water Bay, Kowloon, Hong Kong, imhzhang@ust.hk

2) withdrawn - author request of 2/27, ***Sun Hur***, Hanyang Univ., Dept. of IE, Ansan Kyunggi-do, 425-791, Korea, hursun@email.hanyang.ac.kr, ***Seung-Jin Paik***

3) A Regenerative-Based Algorithm for Closed Queueing Networks with Exponential Servers, ***Nadim Abboud***, American Univ. of Beirut, Fac. of Eng. & Architecture, Box 11-0236, Beirut, Lebanon, neabboud@aub.edu.lb, ***Amal S. Abou Nehme Sawaya***

Using potentials from Markov chain theory and elementary results from regenerative processes, a new algorithm is developed to compute the expected number of entities at each node of a closed queueing network with exponential servers and Markov routing. The performance of the algorithms is compared to Buzen's and mean value analysis algorithms.

4) Analysis of Erlang Transfer Lines, ***Nebahat Donmez***, Bilkent Univ., IE Dept., Ankara, 06533, Turkey, nebahat@bilkent.edu.tr bilkent.edu.tr/~nebahat, ***Cemal Dincer***

Transfer lines literature is mostly devoted to the analysis of lines with exponential processing times. We propose a solution for the performance measures of a reliable transfer line with n machines with k-Erlang processing times and finite buffers where arrivals are Poisson. A program in C is coded for the exact solution for utilization, mean throughput, expected WIP and variance of WIP.

MC28 Research Techniques & Project-Based Instruction

Sponsor: Forum on Education
Sponsored Session
Chair: Ellen S. Jordan, Tiffin Univ., 155 Miami Street, Tiffin, OH 44883, ejordan@tiffin.edu

Co-Chair: Ruth A. Maurer

1) Research Techniques & Project-Based Instruction, ***Ellen S. Jordan***, Tiffin Univ., 155 Miami St, Tiffin, OH 44883, ejordan@tiffin.edu, ***Ruth A. Maurer***

Project-based teaching is an excellent method for presenting the basis of good research technique. The discovery of the breadth, depth and application of subject area will be shown to result from project-based instruction, using examples. Ellen Jordan will present a health care project done in this Format, and Ruth Maurer will present the Walden University approach to the process of learning.

MC29 Topics in Airline Revenue Management

Sponsor: Aviation Applications Section
Sponsored Session
Chair: E. Andrew Boyd, PROS Strategic Solutions, 3223 Smith, Ste. 100, Houston, TX 77006, boyd@prosx.com

1) Overbooking with Substitutable Inventory Classes, ***Garrett van Ryzin***, Columbia Univ., 412 Uris Hall, NYC, NY 10027, givl@columbia.edu, ***Itir Karaesman***

In several yield management applications (e.g. hotel and car rentals), bookings are made for multiple inventory classes (e.g. compact/mid-size/full-size cars or economy/deluxe rooms), and there is a possibility to accommodate overbookings in one class with inventory from another class. We analyze a general model of overbooking that allows such substitution and propose efficient computational techniques.

2) Distressed Inventory: The Managing of Internet Offerings, ***Surain Adyanthaya***, PROS Strategic Solutions, 3223 Smith St., Ste. 100, Houston, TX 77006, adyanthaya@prosx.com

Last minute ticket offers via the Internet are becoming an important means for the sale of inventory that would otherwise go unused. The increasing popularity of the Internet broadens the revenue potential of these types of offerings; however, the theory used to manage them is still not well developed. Current approaches to control of distressed inventory will be reviewed...

3) Passenger Demand & Seasonality: A Revenue Management Perspective, ***Jacques Cherrier***, Air Canada, POB 14000 Postal Station, Saint-Laurent, Montreal, Quebec, H4Y 1H4, Canada

Effective revenue management must be built on accurate passenger demand forecasting. We will describe Air Canada's recent experiences with special emphasis on the handling of seasonality in the historical data. Practical recommendations will be suggested to enhance the ability of the yield management personnel to deal with market realities.

4) Air Cargo Revenue Management, ***E. Andrew Boyd***, PROS Strategic Solutions, 3223 Smith, Ste. 100, Houston, TX 77006, boyd@prosx.com, ***Shankar Sivaramakrishnan***

A model for the air traffic revenue management problem is presented, and model variations are discussed. Computational results are presented.

MC30 Session Withdrawn

Sponsor: Aviation Applications Section
Sponsored Session
Chair: William Colligan, CSSI Inc., 1250 Maryland Ave. SW, Ste. 520, Washington, DC 20024, wcolligan@cssiinc.com

1) withdrawn - chair request of 3/12, ***Stephane Mondoloni***, CSSI Inc., 1250 Maryland Ave. SW, Ste. 520, Washington, DC 20024,

smondolini@cssiic.com

2) withdrawn - chair request of 3/12, ***Willie Weiss***, CSSI Inc., Ste 520, 1250 Maryland Av., S.W., Washington, DC 20024, wweiss@cssiinc.com

3) withdrawn - author request of 3/12, ***William Colligan***, CSSI Inc., 1250 Maryland Ave. SW, Ste. 520, Washington, DC 20024, wcolligan@cssiinc.com

MC31 Plant Location

Cluster: Logistics
Invited Session
Chair: Pierre Dejax, Ecole Centrale Paris, Lab. Prod. Logistique, Lab. Prod. Logistique, Grande Voie des Vignes, Chatenay-Macabry, 92295, France, dejax@pl.ecp.fr

1) Two-Echelon Distribution Systems, ***Irina Ioachim***, TransQuest Inc., Hartsfield Intl. Airport, 1001 Intl. Blvd., Dept. 999, Atlanta, GA 30354, irina.ioachim@transquest.com, ***Alain J. S. P. Martel, Eric Galiboie***

We address the problem of finding a coordinated procurement policy for a 2-echelon distribution system. The nodes considered in the distribution system are either warehouses or sales points operating under deterministic time varying demand. We formulate the problem as an NLP and discuss 2 heuristic solution approaches.

2) A Methodology for Plant Location & Logistics System Restructuring: An Application to a Real Case, ***Pierre Dejax***, Ecole Centrale Paris, Lab. Prod. Logistique, Lab. Prod. Logistique, Grande Voie des Vignes, Chatenay-Macabry, 92295, France, dejax@pl.ecp.fr, ***Florence Lamer, Thierry Bonnet***

Model design and methodology of study have to be closely related for achieving successful results in restructuring an existing logistics system. We present a methodology based upon the development of a multi-level, multi-product plant location model and its application to a real industrial case.

MC32 Logistics-Supply Chains

Contributed Session
Chair: Bhaba R. Sarker, LA State Univ., Dept. of IE, Baton Rouge, LA 70803-6409, bsarker@unixl.sncc.lsu.edu

1) What is Supply Chain Management?, ***Yasemin Aksoy***, Tulane Univ., Freeman Sch. of Bus., New Orleans, LA 70118-5669, yaksoy@freeman.tulane.edu, ***Murat Bayiz***

For SCM researchers, the highlight of the INFORMS Dallas meeting was the question posed by many of their friends.

2) Component Commonality in Supply Chains: Optimizing Inventory Levels & Allocation, ***Ajay K. Mishra***, Univ. of Pittsburgh, Katz Grad. Sch. of Bus., Pittsburgh, PA 15260, mishra+@pitt.edu, ***Prakash Mirchandani***

We study two-stage assemble-to-order systems in which multiple products having stochastic demand share multiple common components. Our stochastic programming formulation computes component inventory levels and their allocation to products for satisfying product-specific service levels. We discuss the problem structure, solution properties, and report computational results for large problems.

3) Positioning Safety Stocks in a Convergent Supply Chain with Budgetary Constraint, ***Prakash Mirchandani***, Univ. of Pittsburgh, Katz Grad. Sch. of Bus., Pittsburgh, PA 15260, pmirchan+@pitt.edu, ***Ajay K. Mishra***

Downstream safety stock positioning improves product service level but increases the holding cost and decreases flexibility to respond to demand uncertainties. Analytical studies, with restrictive assumptions, and simulations studies made contradicting recommendations on optimal safety stock location. We study this problem, with a budget constraint, in a multi-level assembly system.

4) Modeling a Production-Delivery System in a Supply Chain System, ***Gyana R. Parija***, IBM, 522 South Rd., Poughkeepsie, NY 12601-5400, ***Bhaba R. Sarker***

The production and delivery of finished goods are influenced by demand pattern of the existing product with respect to other competing markets. This paper develops a model that incorporates the life cycle behavior of a product in a typical supply chain system. The model is interpreted in the context of electronics products.

MC33 Finance II

Contributed Session
Chair: Alan Brandyberry, Grand Canyon Univ., Coll. of Bus., 3300 W Camelback Rd., Phoenix, AZ 85017, abrandyb@grand-canyon.edu

1) On the Identification of Groups Among Firms in the Czech Voucher Privatization Auctions, ***Alan Brandyberry***, Grand Cyn Univ., Coll. of Bus., 3300 W Camelback Rd., Phoenix, AZ 85017, abrandyb@grand-canyon.edu, ***Joel T. Harper***

We explore commonalities among involved firms resulting in their value relative to initial pricing in the auction system utilized in the Czech privatization process. Discriminant and cluster analysis are employed to determine discriminating variables among hypothesized groups and to explore other possible group sets in the 988 privatized firms.

2) Risk Allocation for Government Privatization, ***Mark A. Robershotte***, Battelle Pacific Northwest Lab., 902 Battelle Blvd., PO Box 999 MSIN A0-21, Richland, WA 99352, mark.robershotte@pnl.gov

To reduce costs, government entities are considering various forms of privatization. The DOE's expensive nuclear tank waste clean-up is one. For contractors to obtain private financing, an equitable and appropriate risk allocation is required. This paper details the risk allocation modeling and analysis experience from the Hanford, WA project.

3) Optimization in Financial Engineering, ***Ilan Adler***, Univ. of CA, IE/OR Dept., Berkeley, CA 94720, adler@ieor.berkeley.edu

I will present optimization models to detect arbitrage opportunities using a variety of financial derivatives. Theoretical, practical and computational aspects of the models will be discussed.

MC34 Software Demonstrations

Chair: To be announced

1) Software Demonstration: Analytica & Crystal Ball, ***Ben Bouillion***, Decisioneering, 1515 Arapahoe St., Ste. 1311, Denver, CO 80231, customerservice@decisioneering.com

Decisioneering has 3 main product lines: Crystal Ball, Crystal Ball Pro and Analytica. Crystal Ball picks up where Microsoft Excel spreadsheets end by giving you the ability to perform Monte Carlo analysis on spreadsheet models. Crystal Ball Pro's Optquest technology provides an evolutionary step to this process by determining the optimal choice for a given business decision based on multiple Crystal Ball simulations...

2) Software Demonstration: Introducing DPL 4.0 - Decision Analysis Software, ***Dan Smith***, Applied Decision Analysis, 2710 Sand Hill Rd., Menlo Park, CA 94025-7020, philb@adainc.com

DPL is the professional DA software using influence diagrams, decision trees and spreadsheets. Graphical outputs include Rainbow Diagrams, Tornado Diagrams, Risk Profiles, Policy Trees and Policy Summaries. New in DPL 4.0: A new Win95 interface, strategy tables, graphical value of perfect information and control, and more!

MC35 Decision Support Systems I

Contributed Session
Chair: Q. B. Chung, La Salle Univ., Mgmt. Dept., 1900 W Olney Ave., Philadelphia, PA 19141-1199, chung@lasalle.edu

1) Influence of Software on Decision Strategies: A Case of an Intelligent Modeling Environment, ***Q. B. Chung***, La Salle Univ., Mgmt. Dept., 1900 W Olney Ave., Philadelphia, PA 19141-1199, chung@lasalle.edu, ***Robert M. O'Keefe, Thomas R. Willemain***

Knowledge-based model management systems can free decision makers from mathematical details of the problem so that they can focus on "strategizing" the solution process. In an experiment designed to capture and analyze the decision makers strategies, we found that the characteristics of software affect the user's decision making approach and performance.

2) The Effect of Advanced Information Technologies on Organizational Design, Intelligence & Decision Making, ***Reza Torkzadeh***, Univ. of TX, IDS Dept., Coll. of Bus., El Paso, TX 79968-0544, reza@utep.edu, ***Xenophon Koufteros***

Based on organizational communication and IS research, Huber (1990) set forth 14 propositions for the effects of computer-assisted communication, computer-assisted information storage and acquisition and decision-aiding technologies of organizational design, intelligence and decision making. We empirically examine these 14 propositions. IS executives and managers of 49 firms were surveyed.

3) The Impact of DSS Use on Decision Performance, ***Dominique Blain***, Univ. du Quebec a Montreal, 1619 St-Christophe, Montreal, Quebec, H2L 3W7, Canada, k25674@er.uqan.ca

Do decision-makers who use DSSs make better decisions than those who do not? How do individual characteristics and system characteristics affect the quality of decision making? We present an empirical study that addresses these questions.

4) withdrawn - author request of 3/3, ***Ying-Hueih Chen***, Carleton Univ., Sch. of Bus., 1125 Colonel By Dr., Ottawa, Ontario, K1S 5B6, Canada, yhchen@business.carleton.ca, ***Gregory E. Kersten***

MC37 Network Planning

Cluster: **Telecom Network Planning**
Invited Session

Chair: Rene Seguin, Univ. of Montreal, CRT, CP 6128, Succ. Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, rene@crt.umontreal.ca

1) Solving a Multi-Facility Expansion Problem, ***Patrick Soriano***, Ecole Polytech., Univ. of Montreal, CP 6128 Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, patrick@crt.umontreal.ca, ***Christine Dupuis***, ***Michel Gendreau***

2) Network Performance-Based Connection Admission Control in ATM Networks, ***M'hamed Nour***, Montreal Univ., DIRO, CP 6128 Succ. Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, nour@iro.unmontreal.ca, ***Michel Gendreau***, ***J. William Atwood***

3) Tabu Search for a Network Loading Problem with Multiple Facilities, ***Bernard Gendron***, Univ. de Montreal, DIRO, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, bernard@crt.umontreal.ca, ***Jean-Yves Potvin***, ***Patrick Soriano***, ***David Berger***, ***S. Raghavan***

We study a network design problem that arises in the telecommunications industry. Communication between a gateway vertex and a number of demand vertices is achieved through a network of fiber optic cables of different types, each with an associated capacity. A TS heuristic, based on a k-shortest path algorithm, is designed to a solution that minimizes the cost of installing capacity...

4) Designing Local Access Networks for Long Distance Communications, ***R. Berger***, US West Advanced Technologies, 4001 Discovery Dr., Ste. 220, Optimization Group, Boulder, CO 80303, ***S. Raghavan***

Long distance companies pay access fees to lease facilities to connect to customers within the local telephone company's network. We discuss an optimization problem that arises in the design of access networks and present an algorithm which includes optimization and queueing that provides potential savings of 40-50%.

MC38 Performance Evaluation & Design of Telecommunication Networks

Sponsor: **TST**
Sponsored Session

Chair: Indranil Bose, Univ. of TX, Arlington, TX 76019-0437, bose@uta.edu

1) A Lagrangian Dual-Based Algorithm for Capacitated Survivable Network Design Problems, ***Varadharajan Sridhar***, OH Univ., 197 RTVC, Sch. of CSM, 9 S College St., Athens, OH 45701-2979, sridhar@ouvaxa.cats.ohiou.edu, ***June S. Park***, ***Bezalel Gavish***

We study the capacitated survivable network design problems under a single node or link failure. The objective is to minimize the fixed cost of links to meet performance and connectivity requirements. The problem is modeled as 0/1 nonlinear integer program. Lagrangian dual-based solution procedure is used to solve the problem.

2) Use of GIS Tools in Telecommunication Network Design & Modification, ***Rakesh Gupta***, OK State Univ., Dept. of Mgmt., Stillwater, OK 74078, rgupta@okway.okstate.edu, ***Hasan Pirkul***

We present and evaluate a tool based on GIS concepts for the design and modification of centralized networks. We present a functional visual interactive tool for such tasks and demonstrate its usefulness in a design task. Designs obtained via this tool are seen to compare favorably with those obtained by a stand-alone heuristic.

3) Interval QoS Routing for Multipoint Internet Teleconferencing, ***Alexander B. Bordetsky***, CA State Univ., Telecomm. & Collab. Tech., Hayward, CA 94542, ***Boris Peltsverger***

Recent advances in MBone technology provide rich background for support of multiparty communications in virtual management and design teams. We propose the model of QoS routing that is based on the interval adaptation of multicast delivery trees according to the application and individual user communication profiles.

4) A Tabu Search Heuristic for the Steiner Tree Problem, ***Jean-Francois Larochelle***, Ecole Polytech. of Montreal, GERAD, Math. & IE Dept., 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, jeanfran@crt.umontreal.ca, ***Michel Gendreau***, ***Brunilde Sanso***

We present a TS algorithm for the Steiner tree problem in graphs with a continuous diversification and a path diversification. Computational results on the benchmark problems of the OR-Library, for which optimal solutions are known, are compared to the genetic algorithm of Esbensen and the chunking genetic algorithm of Voss and = Gutenschwager.

Monday 14:45-16:15

MD01 Congestion Pricing & Continuous Time Models

Sponsor: **TSS & IFORS**
Sponsored Session

Chair: Jia Hao Wu, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, wujiahao@crt.umontreal.ca

1) A Decomposition Method for Congestion Toll Pricing, ***Donald W. Hearn***, Univ. of FL, Ctr. for Applied Opt., ISE Dept., 303 Weil Hall, Gainesville, FL 32611, hearn@ise.ufl.edu, ***Motakuri V. Ramana***, ***Mehmet B. Yildirim***

The problem of identifying a congestion toll pricing vector which causes the user optimal solution of a traffic assignment problem to be system optimal has been identified as a large-scale optimization problem with linear constraints. In this talk we describe a Benders decomposition method for the problem of minimizing total toll costs to all users. Computational results will be presented.

2) Analytical & Applicative Framework for Spillback Congestion Modeling in the Continous Time-Link-Based Dynamic Network, ***V. Adamo***, Univ. of Calabria Cosenza, Dipt. di Ing. dei Tras., Fac. di Ing. Via Claudio 21, Napoli, Italy, torrieri@ds.unina.it, ***Vittorio Astarita***, ***Jia Hao Wu***, ***Michael Mahut***, ***Michael A. Florian***

An analytical framework for modelling spillback on the network in link based continuous time models is presented together with some simple solved examples and a simulation procedure for the full network representation. The spillback of congestion on a network is the propagation of congestion back from one link to another and occurs when the links have no space for incoming vehicles. The analytical framework presented provides a way to adjust existing models in order to take into account this complicated phenomena.

3) Continuous Time-Dependent Shortest Trail Problem with Turn Policies: Model, Algorithm & Parallel Implementation Under the PVM Environment, ***Yiwen Xu***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, yiwen@crt.umontreal.ca, ***Jia Hao Wu***, ***Michael A. Florian***

We define and formulate the time-dependent shortest trail problem with turn penalties in a road network. We develop an algorithm to solve the problem with the stability condition, that is, the FIFO condition. And we present an implementation of the algorithm in a distributed computer network with the PVM (Paralle Virtual Machine) environment where turn penalties are considered. Computational results for real large networks in the PVM environment are reported.

4) An Efficient Algorithm for the Continuous Network Loading Problem: A Dynaload Implementation, ***Yiwen Xu***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, yiwen@crt.umontreal.ca, ***Jia Hao Wu***, ***Michael A. Florian***

The continuous network loading problem consists in determining, on a congested network, time-dependent arc volumes, together with arc and path travel times, given the time varying path (departure) flow rates over a finite time horizon. This problem constitutes an intrinsic part of the dynamic traffic assignment problem. In this paper, we present a modified DYNALOAD algorithm for the problem. An efficient implementation is developed. Numerical examples are provided.

MD02 Computer Science & Transportation Science II

Sponsor: **TSS & IFORS**
Sponsored Session

Chair: Jaime Barcelo, Polytech. Univ. of Catalunya, Dept. of Stats & OR, Pau Gargallo 5, Barcelona, E-08028, Spain, barcelo@eio.upc.es

1) withdrawn - author request of 3/6, ***Der-Horng Lee***, Univ. of CA, Inst. of Trans. Studies, 523 Social Sci. Tower, Irvine, CA 92697-3600, dhlee@translab.its.uci.edu, ***Bin Ran, Seongil Shin***

2) Discretized Deterministic Dynamic User Equilibrium Models & Optimal Control Formulations, ***E. Codina***, Polytech. Univ. of Catalunya, Dept. of Stats. & OR, Pau Gargallo 5, Barcelona, E-08028, Spain, ***Jaime Barcelo***

In a previous paper the authors presented a discretized model for dynamic user equilibrium on traffic networks with a finite difference approximation to the simple continuum model. This paper analyzes the connection between this model and discretized optimal control problems on traffic networks also developed to model dynamic user and system equilibrium with special emphasis on the role of congestion as a factor on the consistency of the discrete approximations of the optimal control models.

3) A Flow-Based Approach to Dynamic Traffic Assignment, ***Ismail Chabini***, MIT, 77 Massachusetts Ave., Room 1-263, Cambridge, MA 02139, chabini@mit.edu, ***Yiyi He***

We present a flow based approach to dynamic traffic assignment. The approach contains four components; a user behaviour component, a link performance component, a dynamic network loading component and a dynamic shortest paths component. The approach is general. We illustrate it by showing a model that supports ITS applications. We present efficient solution algorithms. Results show that these algorithms can solve realistic network problems faster in real-time.

MD03 Air Traffic Management

Sponsor: TSS
Sponsored Session

Chair: Michael O. Ball, Univ. of MD, Coll. of Bus. & Mgmt., College Park, MD 20742-1815, mball@mbs.umd.edu

1) Collaborative Decision Making Models for Air Traffic Management, ***Mike Wambsganss***, Metron Inc., 11911 Freedom Dr., Ste. 800, Reston, VA 22090-5602, wambsganss@metsci.com, ***Michael O. Ball, Amedeo Odoni***

A new set of procedures for computing ground delay programs based on collaborative decision making is being implemented within the US jointly by the airlines and the Federal Aviation Administration. We discuss the models and tools underlying these procedures and describe several related research questions.

2) Collaborative Command & Control for Strategic Airlift, ***Thomas Mifflin***, Metron, 11911 Freedom Dr, Ste. 800, Reston, VA 20190-5602

In the future, US strategic airlifts will increasingly rely upon the commercial sector. The purpose of DARPA's Virtual Airline project is to develop technology so that the Air Mobility Command can exercise collaborative command and control with air carriers. We present an overview of the project along with results from a model that quantifies the benefits of the Virtual Airline approach.

3) Optimal Rerouting of Air Traffic Flow, ***Dimitris Bertsimas***, MIT, Sloan Sch. of Mgmt., OR Ctr., E53-359, Cambridge, MA 02139, dbertsim@aris.mit.edu, ***Sarah A. Stock***

We address the problem of optimally rerouting aircraft in the presence of severe weather. Using a combination of optimization metholologies (integer programming, dynamic multicommodity network flows and decomposition techniques), we solve large scale realistic size problems fast. We used real data that we obtained from the FAA and Euro-Control.

4) Efficient Solution of a Stochastic Ground Holding Model, ***Robert L. Hoffman***, Univ. of MD, Applied Math. Program, Inst. for Systems Research, College Park, MD 20742, ***Ryan Riffkin, Michael O. Ball, Amedeo Odoni***

The determination of the number of flights to allow entry into the airspace of a congested airport is of importance in the computation of ground delay programs. When a distribution of possible weather scenarios is considered, this becomes stochastic optimization problem. We present an integer programming formulation and show its constraint matrix is totally unimodular.

MD04 Inventory Management II

Contributed Session

Chair: Margaret K. Schaefer, Coll. of William & Mary, Dept. of Math., Williamsburg, VA 23187-8795, mkscha@math.wm.edu

1) A Multi-Period Profit Maximizing Model for Retail Supply Chain Management, ***Sudip Bhattacharjee***, SUNY, 310 C Jacobs Mgmt. Ctr., Buffalo, NY 14260, bhats@acsu.buffalo.edu, ***R. Ramesh***

We present 2 efficient solution methods for a multi-period inventory and pricing model for a single product with fixed life perishability. Wagner-Whitin DP recursions are developed and structural properties of the model investigated. Results are within 71-91% within optimum benchmark values, at fractional computational costs.

2) Capital Investment Decisions in the Management of Rental Equipment, ***Sergei V. Savin***, Univ. of PA, OPIM Dept., The Wharton Sch., 1300 SH-DH, 3620 Locust Walk, Philadelphia, PA 19104, savin@opim.wharton.upenn.edu, ***Morris A. Cohen, Ziv Katalan, Noah F. Gans***

Rental and leasing businesses must determine appropriate quantities of equipment to stock to serve demand that varies randomly over time. Often these companies are able to dynamically respond to demand fluctuations by buying and selling equipment. We propose a model for finding effective buying and selling policies.

3) The Videotape Rental Inventory Problem, ***Margaret K. Schaefer***, Coll. of William & Mary, Dept. of Math., Williamsburg, VA 23187-8795, mkscha@math.wm.edu

We consider the problem faced by a videotape rental outlet manager of deciding how many copies of first-run movies to order. We apply the theory of repairable spares inventories to this problem, trading off lost sales and holding costs, and use real data to predict demand and test the model.

MD05 Supply Chain Management in the Computer Industry

Sponsor: MSOM
Sponsored Session

Chair: Gerry Feigin, IBM, TJ Watson Research Ctr., PO Box 218, Yorktown Heights, NY 10598, feigin@us.ibm.com

1) Analytical Modeling: A Key Element of Demand & Supply Chain Management, ***Raja G. Petrakian***, Xilinx Inc., 1072 Church St., Mountain View, CA 94041, raja.petrakian@xilinx.com

Managing the demand and technology uncertainty that characterizes the semiconductor industry is made easier by the use of quantitative and statistical models. These models are embedded into systems that are deployed in key corporate business processes such as demand forecasting, technology prediction, production planning, inventory management and capacity planning.

2) Simulation of a DRAM Production Supply Chain, ***Kaan Katircioglu***, IBM, TJ Watson Research Ctr., PO Box 218, Yorktown Heights, NY 10598, kaan@watson.ibm.com, ***Gerry Feigin***

We describe a detailed simulation of a DRAM production supply chain from raw wafer through SIMM assembly. The simulation has been used to analyze the impact of production and inventory policies, cycle times, yields and demand variability on inventories and service levels.

3) Collaborative Supply Chain Synchronization, ***Kumar Bhaskaran***, IBM, TJ Watson Research Ctr., PO Box 218, Yorktown Heights, NY 10598, bha@us.ibm.com, ***Daniel Connors, Terry Heath, Nitin Nayak***

Supply chains transcend functional, organizational and enterprise boundaries. Synchronization of supply chains, in practice, is a collaborative exercise that engages material, capacity, production and demand planners across a multi-tiered manufacturing network to balance supply and demand. We introduce a supply chain planning system that facilitates such collaborative supply chain synchronization.

MD06 Panel: Teaching Service Operations

Sponsor: MSOM
Sponsored Session

Chair: Patrick T. Harker, Univ. of PA, OPIM Dept., Wharton Sch., 1300 SH-DH, 3620 Locust Walk, Philadelphia, PA 19104-6366, harker@wharton.upenn.edu

1) Panel: Teaching Service Operations, ***Patrick T. Harker***, Univ. of PA, OPIM Dept., Wharton Sch., 1300 SH-DH, 3620 Locust Walk, Philadelphia, PA 19104-6366, harker@wharton.upenn.edu

What is different between manufacturing and service OM? Why not teach these topics in the core OM course? What are the fundamental concepts that should be included in this course? Three well-known scholars will present their views, followed by a debate from the audience.

MD07 Capacity Reservation & Pricing Systems

Sponsor: MSOM
Sponsored Session
Chair: Michael L. Pinedo, NYU Stern Sch. of Bus., OR Dept., Tisch Hall, 40 W 4th St., Ste. 7-08, New York, NY 10012-1118, mpinedo@stern.nyu.edu

Co-Chair: Sridhar Seshadri

1) Capacity Reservation & Allocation Strategies for Customers with Time Preferences, *Vipul Agrawal*, NYU, OP, Stats. & OR Dept., 40 W 4th St., Ste. 701B, New York, NY 10012, vagrawal@stern.nyu.edu, ***Michael L. Pinedo, Sridhar Seshadri***

We study pricing and allocation mechanisms for allocating capacity slots to customers over a fixed time horizon. The customers may assess different values for different time slots. We analyze the effect of customers' demand uncertainty and value distribution, and existence of an after-market on the expected profit maximization (of the seller) and system welfare.

2) Role of Pricing & Yield Management in Fabless-Foundry Partnerships, ***Arun Chatterjee***, KLA-Tencor Corp., San Jose, CA 95161, arun.chatterjee@kla-tencor.com, ***Raman Nurani, Sridhar Seshadri, J. George Shanthikumar***

In the semiconductor industry, the fabless-foundry partnership business is expected to reach $68 billion by the end of this century. We present game theoretic models to emphasize the importance of pricing and yield management in establishing successful partnership between fabless firms and wafer foundries and some field observations.

3) Inspection Strategies for Multistage Production Systems with Time-Varying Quality, ***Michael H. Veatch***, Gordon Coll., Dept. of Math., Wenham, MA 01984, veatch@gordonc.edu

The decision of whether to do sampling inspection of incoming material, or other inspections, is addressed in a multistage cost-of-quality model. Sampling is relevant because the defect rate varies randomly. The model is applied to a Kodak printer for digital photographs.

4) Interval Scheduling with Jobs Requiring Multiple Machines, ***Andrew Feldman***, Columbia Univ., Dept. of IE/OR, New York, NY 10027, andrew@ieor.columbia.edu, ***Michael L. Pinedo***

Consider m machines in paralledl. Job j has a processing time, a release date, and a due date: there is no slack. Job j needs m_j machines for its processing. We present algorithms for this problem setting that minimizes various objective functions.

MD08 Some Product Development Issues

Sponsor: Technology Management Section
Sponsored Session
Chair: Dundar F. Kocaoglu, Portland State Univ., Eng. Mgmt. Program, 1900 SW 4th Ave., Portland, OR 97201, kocaoglu@emp.pdx.edu

1) Building Environmental Issues into a Firm's Product Life Cycles, ***Louis Lefebvre***, Ecole Polytech. of Montreal, Dept. of IE, PO Box 6079, Sta. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, lefebvrl@cirano.umontral.ca, ***Elisabeth Lefebvre***

This presentation looks into the conceptual dimensions related to the integration of environmental issues into firm's product life cycles. A critical examination of some of the associated benefits is also presented along with the motivations that incite firms to adopt an environmentally friendly behavior.

MD09 Information Processing & Knowledge Flows in New Product Development

Sponsor: Technology Management Section
Sponsored Session
Chair: Anil Khurana, Boston Univ., Sch. of Mgmt., 595 Commonwealth Ave., Boston, MA 02215, akhurana@bu.edu

1) Information Flow Modeling & Time-to-Market Analysis in a Product Development Process, ***Maria Carrascosa***, MIT, 77 Massachusetts Ave., Rm. 3-436, Cambridge, MA 02139, carras@mit.edu, ***Steven D. Eppinger, David E. Whitney***

Concurrent execution in product development can save development time, but the information exchanged is preliminary and may change, causing rework to spread throught the organization. We develop a model that characterizes the information flows and estimates the completion time of a project. This model can be used to identify the most critical information exchanges to reduce time to market and to determine the most appropriate start time for each task.

MD10 Scheduling Models for Modern Manufacturing

Cluster: Scheduling
Invited Session
Chair: Nicholas G. Hall, OH State Univ., 301 Hagerty Hall, 1775 S College Rd., Columbus, OH 43210-1399, hall.33@osu.edu

1) Scheduling Large Robotic Cells, ***Chelliah Sriskandarajah***, Univ. of Toronto, Dept. of MIE, 5 King's College Rd., Toronto, Ontario, M5S 3G8, Canada, chellia@mie.utoronto.ca, ***Nicholas G. Hall, Hichem Kamoun***

We consider a general robotic cell with m machines. It is known that in such a cell there are exactly m! potentially optimal one-unit cycles. We classify these cycles into four groups, according to the computational complexity of the part sequencing problem associated with each of them.

2) Using the Alternative Process Plans in a Job Shop, ***Stephan Kreipl***, Univ. of Passau, Dr. Hans Kapfinger Str. 30, Passau, 94032, Germany, stephan.kreipl@uni-passau.de

Most of the work in job shop scheduling is based on a fixed machine sequence for each job, even if alternative process plans for processing the job are possible. By taking into consideration alternative process plans in scheduling, the flexibility of the system is increased and better results for given cost functions are achieved.

3) Minimizing Makespan in Multi-Resource Shop Scheduling, ***Stephane Dauzere-Peres***, Ecole Des Mines de Nantes-Dept Automatiq, et Productique - 4 Rue Alfred, La Chantrerie - BP 20722, Nantes Cedex 3, F44307, France, dauze@auto.emn.fr, ***William Roux, Jean-Bernard Lasserre***

We consider a rather general scheduling problem, where jobs can have nonlinear routings, and operations may need several resources to be performed. Moreover, each of the resources could be chosen from a given set. A neighborhood structure is presented, in which resequencing and reassigning an operation are similar moves, and is used to derive an efficient tabu search algorithm.

4) Lower Bounds for Makespan Minimizing in a Flowshop with Setups, ***Roger Z. Rios-Mercado***, TX A&M Univ., 1000 Country Place Dr., Apt. 69, Houston, TX 77079-4712, roger@hpc.uh.edu www.hpc.ub.edu/~roger/, ***Jonathan F. Bard***

Two lower bounding schemes for makespan minimization in a flowshop with sequence-dependent setup times are presented and evaluated within a B&B enumeration algorithm.

MD11 Issues in Flexible Assembly Systems

Cluster: Flexible Manufacturing Systems
Invited Session
Chair: Kathryn E. Stecke, University of Michigan, Sch. of Business, 701 Tappan Rm 5206, Ann Arbor, MI 48109-1234, kstecke@umich.edu

1) withdrawn - author request of 3/26, ***M.H. Herman Shen***, Dept. of Aerospace Eng., Applied Mech., and Aviation, Ohio St. Univ., 2036 Neil Ave., rm. 328 Bolz hall, Columbus, OH 43210, shen@osushen.eng.ohio-state.edu

2) Automotive Body Assembly System Configurations, ***Shixin J. Hu***, Univ. of MI, Coll. of Eng., 3424 G G Brown, Ann Arbor, MI 48109-2125, ***Kathryn E. Stecke, Ya-Chih Lin***

A wide variety of existing configurations for automotive body assembly systems are reviewed. Their performances (in terms of reliability and dimensional variations) are analyzed and compared. Additional productivity, change-over efficiency, and life-cycle cost, will be defined and compared w.r.t. the different configurations.

3) Analytical Performance Models for Open Fabrication/ Assembly Systems, ***Rajan Suri***, Univ. of WI, Ctr. for Quick Response Mfg., 1513 University Ave., Madison, WI 53706-1572, suri@engs.wisc.edu, ***Bash'Shar El-Jawhari***

We present tractable analytical models for such systems with multiple input stations, batch sizing, and re-order policies.

MD12 Constraint Programming: Frameworks for Optimization

Cluster: Constraint Programming
Invited Session

Chair: Gilles Pesant, Univ. of Montreal, CRT, CP 6128, succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, pesant@crt.umontreal.ca

1) Constraint-Based System Architecting for Xerographic Modules, ***Naveen Sharma***, Xerox Corp., Wilson Center for Research, M/S 128-51E, Webster, NY 14580, naveen@wrc.xerox.com

Many system level design decisions that affect the ability of an architecture to be flexible and be able to support multiple products are locked-in at an early design stage. We describe a constraint-based modeling effort that provides decision support to system engineers at this crucial product development stage. Specifically, the effort is focused upon: simulating coupled functional-geometric aspects of architectures, comprehending design option space that a selected set of components offer...

2) Randomized Algorithms in Probabilistic Concurrent Constraint Programming, ***Alessandra DiPierro***, City Univ. London, North Hampton Square, London, EC1V OHB, UK, adp@cs.city.ac.uk, ***Herbert Wiklicky***, ***Nicos Angelopulos***

We present a probabilistic extention of CCP, which we call probabilistic CCP or PCCP. The main aim is to allow the formulation of randomised algorithms within the declarative CCP framework. We present operational semantics as well as an implementation (by means of an interpreter) of PCCP. As an example, we implement in PCCP some well-known randomised algorithms like simulated annealing and report concrete results on benchmarks like the TSP.

3) Visual Solver: A Modeling Language for Combinatorial Optimization, ***Pascal Van Hentenryck***, Brown Univ., Box 1910, Prov., RI 02912, pvh@cs.brown.edu

We present the design and application of Visual Solver, a modeling language for combinatorial optimization. Visual Solver makes it possible to state combinatorial search problems in a very concise manner, supports both traditional constraint programming and OR technologies and generates algorithm animations automatically. Applications of Visual Solver in scheduling and resource applications are discussed.

4) A Constraint Programming Framework for Local Search Methods, ***Gilles Pesant***, Univ. of Montreal, CRT, CP 6128, succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, pesant@crt.umontreal.ca, ***Michel Gendreau***

We present a novel integration of local search algorithms within a constraint programming framework for combinatorial optimization, in an attempt to gain both the efficiency of local search methods and the flexibility of constraint programming while maintaining a clear separation between the problem constraints and the actual search procedure.

MD14 Tutorial: Modeling Stochastic Programs

Cluster: Stochastic Programming
Invited Session

Chair: Julia L. Higle, Univ. of AZ, Dept. of SIE, Tucson, AZ 85721, julie@sie.arizona.edu

1) Tutorial: Modeling Stochastic Programs, ***Julia L. Higle***, Univ. of AZ, Dept. of SIE, Tucson, AZ 85721, julie@sie.arizona.edu

SPs may be thought of as LPs in which various data elements are represented as random variables. SP models tend to be extremely large-scale so that model development typically requires a careful balance between the opposing desires for "model validity" and "ease of computation." A number of SP model classes will be presented and discussed.

MD15 Computation & Complementarity

Cluster: Nonlinear Programming
Invited Session

Chair: Michael C. Ferris, Univ. of WI, Comp. Sci. Dept., 1210 W Dayton St., Madison, WI 53706-1685, ferris@cs.wisc.edu

1) On the Implementation of a Semismooth Solver for Nonlinear Complimentarity Problems, ***Christian Kanzow***, Univ. of Hamburg, Inst. of Appl. Math., Bundesstrasse 55, Hamburg, D-20146, Germany, kanzow@cs.wisc.edu, ***Francisco Facchinei***

We give a short review of a semismooth equation-based method for the solution of nonlinear complementarity problems and discuss its theoretical properties. We then turn to some implementation details of this algorithm and present some numerical results.

2) Optimization Over the Internet: NEOS/NEXUS, ***Todd Munson***, Univ. of WI, Comp. Sci. Dept., 1210 W Dayton St., Madison, WI 53706, tmunson@cs.wisc.edu, ***Jorge J. More***

The NEOS/NEXUS extensions enable users to solve optimization problems within larger applications over the Internet through a set of library calls. A heterogeneous metacomputing environment consisting of workstations, supercomputers, and Condor clusters is used to solve the problems. We describe the mechanisms provided by NEOS/NEXUS and demonstrate their usefulness with an application utilizing many of the available resources.

3) Interfaces to PATH, ***Michael C. Ferris***, Univ. of WI, Comp. Sci. Dept., 1210 W Dayton St., Madison, WI 53706-1685, ferris@cs.wisc.edu, ***Todd Munson***

The PATH implementation has recently undergone significant revision to improve robustness and efficiency. In this talk, we discuss the algorithmic enhancements made and design features incorporated. Special attention is given to the available interfaces to PATH.

MD16 Interior-Point Algorithms for Linear Programming & Its Extensions

Cluster: Linear Programming
Invited Session

Chair: Michael J. Todd, Cornell Univ., Sch. of OR/IE, Rhodes Hall, Ithaca, NY 14853-3801, miketodd@cs.cornell.edu

1) Optimization with Linear, Quadratic & Semidefinite Constraints, ***Farid Alizadeh***, Rutgers Univ., RUTCOR, PO Box 5062, New Brunswick, NJ 08903, alizadeh@rutcor.rutgers.edu

We consider optimization problems where variables have either linear, or convex quadratic or semidefinite constraints; we focus particularly on the quadratic constraints. We will define primal and dual nondegeneracy and strict complementarity conditions, and develop primal-dual interior point methods for such problems and show that in the absence of degeneracy these algorithms are numerically stable.

2) Lowering the Complexity of Linear Programming with Standard Linear Algebra, ***Kurt M. Anstreicher***, Univ. of IA, Dept. of MS, Iowa City, IA 52242-1000, kurt-anstreicher@uiowa.edu

We consider interior point methods for linear programming that use a pre-conditioned conjugate gradient method to approximately solve the Newton equations on each step, combined with a partial updating strategy to maintain the pre-conditioner. This approach was first suggested by Nesterov and Nemirovskii, for use with "fast matrix multiplication," to obtain a low-complexity algorithm for LP. We show that the same approach, with standard linear algebra, obtains an overall complexity below O(n*3L) operations.

3) High-Order Infeasible-Interior-Point Methods for Solving Sufficient Linear Complementarity Problems, ***Shinji Mizuno***, Inst. of Statistical Math., 4-6-7- Minami-Azabu, Minato-Ku, Tokyo, 106, Japan, mizuno@ism.ac.jp, ***Josef Stoer***, ***Martin Wechs***

We develop infeasible-interior-point methods of arbitrarily high order for solving linear complementarity problems. The results apply to degenerate problems having no strictly complementary solution. Variants of these methods are described that eventually avoid recentering steps, and for which all components of the approximate solutions converge superlinearly at a high order.

MD17 Recent Advances in Plant Layout & Material Handling

Cluster: Optimization Days
Invited Session

Chair: Saifallah Benjaafar, Univ. of MN, Dept. of Mech. Eng., Minneapolis, MN 55455, saif@maroon.tc.umn.edu

1) Centralized WIP Storage & the Stochastic Analysis of Automated Storage/Retrieval Systems, ***Yavuz A. Bozer***, Univ. of MI, Depto of IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, yavuz.bozer@umich.edu, ***Myeonsig Cho***

AS/R systems are used for centralized WIP storage in many manufacturing plants. We present closed-form analytical results to evaluate the performance of such AS/R systems assuming that storage and retrieval requests occur randomly and independently; dual command cycles are performed when possible.

2) Multi-Stage Approach to Solving the Facility Layout & Material Handling System Design Problem, ***Srinivasan Rajagopalan***, RPI, Dept. of SDES, CII 5015, 110 8th St., Troy, NY 12180, rajags@rpi.edu, ***Sunderesh S. Heragu***

e present a multi-stage approach to solve concurrently the facility layout and the material handling system design problem. The output from the layout module is used as an input to the material handling system module and the location of the p/d points and flowpath is determined. An intelligent agent based approach is used to check for "goodness of the solution".

3) The Quadratic Assignment Problem with Changing Unit Distance Material Handling Cost Between Facilities, ***Sonia Bartolmei-Suarez***, Univ. of Puerto Rico, Dept. of Indust. Eng., Univ. of Puerto Rico, Mayaguez, Puerto Rico, sonia@exodo.upr.clu.edu, ***Pius J. Egbelu***

The traditional QAP assumes handling cost between two facilities is directly proportional to the distance between them. This is generally not true in practice due to changing equipment requirements as the distance between facilities changes. In this paper, a QAP in which handling cost is not directly proportional to distance between facilities is presented.

4) Design of Plant Layouts with Queueing Effects, ***Saifallah Benjaafar***, Univ. of MN, Dept. of Mech. Eng., Minneapolis, MN 55455, saif@maroon.tc.umn.edu

We present a formulation of the plant layout problem where the objective is to minimize average work-in process (WIP). We show that the choice of layout has a direct impact on WIP accumulation, lead time, throughput rates, and required material handling capacity. More importantly, we show that layouts generated using a queueing-based model can be very different from those obtained using conventional layout procedures.

MD19 Tutorial: Parallel Computing

Invited Session

Chair: Teodor Gabriel Crainic, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, theo@crt.unmontreal.ca

1) Tutorial: Parallel Computing, ***Stavros A. Zenios***, Univ. of Cyprus, Sch. of Econ. & Mgmt., 75, Kallipoleos St. PO Box 537, Nicosia, CY 1678, Cyprus, zenioss@atlas.pba.ucy.ac.cy ucy.ac.cy/ucy/pba/zenios/

This tutorial will review parallel computing as it applies to problems in OR/MS. We will discuss parallel computing technology, algorithms and applications. Attendees will get a view of what combinations of algorithms and technology have been found to work best on general problem classes.

MD20 Tutorial: Operations Research & AIDS Policy Modeling

Invited Session

Chair: Sophie D. Lapierre, Ecole Polytech., CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, sophiel@crt.umontreal.ca

1) Tutorial: Operations Research & AIDS Policy Modeling, ***Margaret L. Brandeau***, Stanford Univ., IE-EM Dept., Terman Bldg., Stanford, CA 94305-4024, brandeau@stanford.edu soe.stanford.edu/ieem/faculty/brandeau.html

This tutorial describes how OR techniques can lead to improved decision making for HIV prevention and improved treatment of those who are infected. We present a number of models, covering a range of application areas and methodologies, to illustrate the use and potential of OR in this area.

MD21 Issues in Logistics

Sponsor: College on Simulation
Sponsored Session

Chair: To be announced

1) A Truck Repositioning Problem, ***Hossam Zaki***, The SABRE Group, 4255 Amon Carter Blvd., MD 4311, Ft. Worth, TX 76155

We describe the basic components of a truck repositioning problem for the one-way consumer rental business. Challenges encountered in demand forecasting and optimization model formulation will also be discussed.

2) Simulation Methods for Route Reliability Analysis, ***Michael A. Zeimer***, Schneider Logistics, Inc., 3101 S Packerland Dr., PO Box 2666, Green Bay, WI 54306-2666, zeimerm@schneider.com

Often route designers build routes without regard to variation in travel times, stop times, and pick-up/delivery quantities or use intuition to design reliable routes by being unnecessarily conservative with vehicle capacities and road speeds. The results are routes that do not adequately balance cost and reliability. We describe simulation methods that can be used to design routes that are reliable and efficient.

3) Estimating Delivery & Pickup Activity Times, ***Xinglong Zhang***, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, xzhang@isye.gatech.edu, ***H. Donald Ratliff***

For delivery and pickup operations, the fundamental activities are driving between customer locations and stopping at customer sites to make deliveries or pickups. In order to guarantee reasonable workloads for drivers and to meet promised delivery windows, it is necessary to have good estimations of the times associated with these activities...

4) Inbound Supply Chain Management for JIT Manufacturing, ***Kirk Baumgartner***, SABRE Tech. Solutions, 4255 Amon Blvd., MD 4376, Ft. Worth, TX 76155, kirk_baumgartner@sabre.com, ***Rajesh Dontula***, ***Todd Tillinghast***

We describe an integrated suite of planning and operations systems that support inbound supply chain management for JIT manufacturing. Systems included are route planning, dock schedule planning, fleet size planning, real-time trailer tracking, yard and dock operations management, internal plant conveyance control, and parts visibility through pipeline management.

5) Supply Chain Design: Customer Allocation, ***Jarrod D. Goentzel***, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, goentzel@isye.gatech.edu, ***Paul M. Griffin***, ***H. Donald Ratliff***

A common aspect of supply chain design is the allocation of customers to distribution centers. Often direct distance is used as a basis for this decision. We incorporate road networks and route clustering options into a new measure to use in allocation.

MD22 Equilibria of Noncooperative Games

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Robert F. Nau, Duke Univ., Fuqua Sch. of Bus., Durham, NC 27708-0120, rnau@mail.duke.edu

1) Nash Equilibria Are Superficial Correlated Equilibria, ***Robert F. Nau***, Duke Univ., Fuqua Sch. of Bus., Durham, NC 27708-0120, rnau@mail.duke.edu, ***Sabrina Gomez***, ***Pierre Hansen***

It is well known that the set of correlated equilibrium distributions of a noncooperative game is a convex polyhedron that includes the Nash equilibria. We prove a remarkably simple yet surprising result: that the Nash equilibria must all lie on the surface of the correlated equilibrium polyhedron.

2) Nash & Correlated Equilibria of 2- & 3-Persons Games: An Empirical Study, ***Sabrina Gomez***, GERAD, ***Pierre Hansen***, ***Robert F. Nau***

The sets of all Nash, correlated, Pareto optimal correlated and coalition proof correlated equilibria of bimatrix and of 3-persons games are studied. It is known that solutions in the last set can give substantially larger payoffs than Nash equilibria.

3) An Algorithm for All Extreme Nash Equilibria of Bimatrix Games, ***Charles Audet***, GERAD & HEC, Polytech. of Montreal, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, charlesa@crt.umontreal.ca, ***Pierre Hansen***, ***Brigitte Jaumard***, ***Gilles Savard***

The extreme equilibria of bimatrix games are enumerated in finite time by a branching scheme that exploits the KKT conditions of 2 pairs of parameterized LP s.

4) Correlated Equilibrium & Unilaterally Competitive Games, ***Olivier De Wolf***, Univ. Catholique de Louvain, 25 Cours du Bia Bouquet, Louvain-la Neuve, 1348, Belgium, dewolf@core.ucl.ac.be

We propose to investigate some properties of correlated equilibria in some class of games commonly qualified as competitive. In particular, we show that in these kinds of games (including the n person case), there generally is no incentive for the players to correlate their strategies.

5) Extreme Nash Equilibria of Bimatrix Games Are Extreme Correlated Equilibria, ***Pierre Hansen***, HEC, 3000 Ch Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, pierreh@crt.umontreal.ca, ***Sabrina Gomez***

Polyhydral combinatorics are used to prove that in bimatrix games all extreme Nash equilibria are extreme correlated equilibria.

MD23 Probability Modeling

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Prakash P Shenoy, University of Kansas, School of Business, Summerfield Hall, Lawrence, KS 66045-2003, pshenoy@ukans.edu

1) A Simple Approximation for Probabilistic Dependence Among Binary Events, ***Donald L. Keefer***, AZ State Univ., Dept. of Mgmt., Box 4006, Tempe, AZ 85287-4006, don.keefer@asu.edu

We propose a simple model for approximating probabilistic dependence among binary success/failure events. This model requires assessment of just one

conditional probability in addition to the n marginals. Extensive numerical tests indicate this model produces much more accurate joint probabilities, expected values and certainty equivalents than widely used approximations.

2) Market-Based Belief Aggregation, ***David M. Pennock***, Univ. of MI, AI Lab., 1101 Beal Ave., Ann Arbor, MI 48109-2110, dpennock@umich.edu, ***Michael P. Wellman***

We show how belief aggregation (combining the probabilistic beliefs of the members of a group) can be facilitated through a securities market. Each participant's investment decisions are individually rational; the market's resulting equilibrium represents the group's consensus belief. Similar market infrastructures may aid group decision making and coordination under uncertainty.

3) Bayesian Network Models of Portfolio Risk, ***Catherine Shenoy***, School of Bus., Summerfield Hall, Lawrence, KS 66045-2003, cshenoy@ukans.edu, ***Prakash P Shenoy***

We investigate the use of Bayesian networks for modeling portfolio risk, especially financial portfolios that are not well diversified. From the Bayesian network model we obtain a probability distribution of the portfolio return. We compare the variance of this distribution with the variance calculated from a traditional multi-factor model.

MD24 Imprecise Preference Modeling

Cluster: Multicriteria Decision Analysis
Invited Session

Chair: Freerk A. Lootsma, Delft Univ. of Tech., Fac. TWI Dept. OR, Mekelweg 4, Delft, 2628 CD, The Netherlands, f.a.lootsma@twi.tudelft.nl

1) Deriving Weights from Pairwise interval Comparisons, ***Jonathan Barzilai***, Technical Univ. of Nova Scotia, PO Box 1000, Halifax, Nova Scotia, B3J 2X4, Canada, barzilai@tuns.ca

In previous work we constructed a mathematical framework for deriving weights from pairwise comparison matrices in the additive and multiplicative cases. We extend this framework to the case of imprecise measurement by generalizing the theory from point estimates to interval ones.

2) The Centroid Method as a Means of Analysis of the Sensitivity of Weight Elicitation, ***David Olson***, TX A&M Univ., Dept. of Bus. Analysis, College Station, Colloge Station, TX 77843-4217, dolson@acs.tamu.edu

The use of the centroid method (SMARTER) as a means of sensitivity analysis for weights elicited through multi-attribute utility analysis is demonstrated. The problem context involved consideration of three overall objectives in an analysis of alternatives for the disposal of weapons grade plutonium. Results of the centroid method are compared with Monte Carlo simulation results. Relative advantages of each approach are considered.

3) Fuzzy SMART & a Fuzzy Extention of the AHP, ***Freerk A. Lootsma***, Delft Univ. of Tech., Fac. TWI Dept. OR, Mekelweg 4, Delft, 2628 CD, The Netherlands, f.a.lootsma@twi.tudelft.nl

We model the decision maker's judgment (grades in SMART and pair wide comparisons in the AHP) via fuzzy numbers with triangular membership functions. The final grades (SMART) and the final scores (AHP) can accordingly be written as fuzzy numbers of the same type. We demonstrate how these data can be used for a sensitivity analysis.

4) Fuzzy Preference Relations for Treating Imprecise Assessments in Decision Models, ***Rosalind Elster***, Univ. Autonoma de Barcelona, Dept. of Econ & Econ. Hist, Bellaterra barcelona, 08193, Spain

We use fuzzy relations of max-min transitive type to model different preference/indifference situations. The resulting multicriteria evaluation procedure is based on an aggregation rule in which the diversity among the assessments of single fuzzy relations is taken into consideration.

5) The Impact of Multicriterion Choice on the Value of Additional Information, ***Kazimierz Zaras***, Univ. of Quebec, 42 rue Mgr. Rheaume, CP 700, Poste 286, Rouyn Noranda, PQ, J9X 5E4, Canada, ***Jean-Marc Martel***

The value of additional information is a well known term in courses on single-attribute DA. The objective of this presentation is to extend Bayesian approach to a multicriterion analysis where at most one source of information in relation to each attribute is admitted. The multicriterion analysis is supposed to be based...

MD25 Using Probability to Model Risks

Sponsor: Applied Probability Section
Sponsored Session

Chair: Robin Dillon, Stanford Univ., Dept. of IE, Terman Eng. Center, Stanford, CA 94305, dillon@leland.stanford.edu

1) On The Meaning & Application of Probability in Risk Assessment, ***Ali Mosleh***, Univ. of MD., Reliability Eng. Prog., Cntr. for Risk Studies, College Park, MD 20742, mosleh@eng.umd.edu

Depending on the application, type of events involved, availability of relevant information and the risk analyst's preferences and biases, uncertainty about events is expressed in qualitative or quantitative terms. The most popular quantitative measure is probability, although in some cases other measures such as fuzzy metrics have also been used...

2) Faster-Better-Cheaper Management of Space Projects: How Successful is It & Likely to Remain?, ***Elisabeth Pate Cornell***, Stanford Univ., Dept. of IE/EM, Terman Eng. Center, Stanford, CA 94305, mep@leland.stanford.edu

NASA's management of space missions has shifted from larger spacecrafts to smaller missions, to be completed within a tighter schedule and smaller budget. We use probabilistic risk analysis methods and case studies to examine how the projects constraints affect the reliability of the missions and the long-term success of the new m anagement formula.

3) Quantifiying the Risk of Uncertain Decision Models, ***Neil Stiber***, Carnegie Mellon Univ., Engineering and Public Policy, Pittsburgh, PA 15213-3890, ***Paul S. Fischbeck***

Using a dataset of industrial site clean-up histories, a logistics regression model is developed that predicts the probability of site contamination. However, these predicted probabilities are themselves uncertain due to model uncertainty. EVPI is computed for both the site characteristics and the model parameters that predict the probabilities of contamination.

4) A Probabilistic Analysis of the Implications of a Worker Exposure Standard, ***Robin Dillon***, Stanford Univ., Dept. of IE, Terman Eng. Center, Stanford, CA 94305, dillon@leland.stanford.edu, ***Detlof von Winterfeldt***

A recent standard limits utility worker exposures to electromagnetic fields to 10 Gauss. A probabilistic time-and-motion model predicts rare, but consistent exceedances of this standard with current utility worker practices. Mitigation strategies are available, but they have large costs and create additional worker accident risks.

MD26 Input Modeling for Stochastic Analysis II

Cluster: Queueing
Invited Session

Chair: Sudha Jain, Univ. of Toronto, Dept. of Stats., 100 St. George St., Toronto, Ontario, M5S 1A1, Canada, jainsu@utstat.utoronto.ca

Co-Chair: Donald Gross

1) Normal-to-Anything & Autoregressive-to-Anything Input Processes, ***Barry L. Nelson***, Northwestern Univ., Dept. IE & Mgmt., 2225 N Campus Dr., Evanston, IL 60208, nelsonb@iems.nwu.edu

We review theoretical results and available software for transforming multivariate normal random vectors into random vectors with arbitary marginal distributions and correlation matrix, and form transforming Gaussian AR(p) processes into stationary time seriew with arbitary marginal distribution and autocorrelations specified through lag p.

2) Simulation Input Modeling with Bezier Distributions, ***Mary Ann J. Flanigan***, Wagner, Boeing Information Serv., Inc., 7990 Boeing Ct, MS CV-82, Vienna, VA 22182-3999, maflanig@gmu.edu, ***James R. Wilson***

A graphical, interactive technique for modeling univariate simulation input processes based on Bezier distributions is described. Several examples illustrate the advantages of this technique versus conventional methods for simulation input modeling.

3) Panel: What Do We Do in Real Life When Choosing Input Distributions?, ***Donald Gross***, George Mason Univ., Dept. of OR & Eng., Fairfax, VA 22030, dgross1@gmu.edu, ***William G. Marchal, Michael R. Taaffe***

A panel of distinguished speakers -- will discuss "what we do in real life when choosing input distributions?"

MD27 Queueing Issues III

Contributed Session

Chair: Donald C. McNickle, Brown Univ., Applied Math. Div., Box F, Providence, RI 02912, donald@cfm.brown.edu

1) Properties of Departure Processes from Simple Queues,

Donald C. McNickle, Brown Univ., Applied Math. Div., Box F, Providence, RI 02912, donald@cfm.brown.edu

Typically output and overflow processes are not independent. We investigate conditions under which the degree of dependence is limited.

2) Fluid Versions of Little's Formula & Extensions, ***Muhammad A. El-Taha***, Univ. of Southern ME, Dept. of Math. & Stats., 96 Falmouth St., Portland, ME 04104-9300, eltaha@usm.maine.edu

We provide a sample-path fluid version of Little's formula under weak pathwise conditions. Easy-to-verify sufficient conditions for the FIFO discipline will be given. We also provide a pathwise rate-stable version under conditions that can be verified from input information. Extensions of fluid Little's formula will also be presented.

3) Unstable Region for a FIFO Bramson-Type Queueing Network, ***Tao Huang***, Columbia Univ., Dept. of IE/OR, New York, NY 10027, huang@ieor.columbia.edu ieor.columbia.edu/~huang, ***Karl Sigman***

We find the sufficient unstable parameter region for a Bramson-type queueing network under the FIFO discipline. It improves the region in Bramson (1994) when there are numerous quick steps in the second server. The region is not empty even where there are only 2 quick steps in the second server. The stable region we have is close to the global region in Dai (1995).

4) Production Strategies for Random Yield Processes, ***Scott E. Grasman***, Univ. of MI, 1807 Willowtree Ln., #4-B8, Ann Arbor, MI 48105, grasman@umich.edu personal.engin.umich.edu/~grasman, ***John R. Birge, Tava Lennon Olsen***

Moments of queue length, waiting time and delay are derived from a queueing analysis of a single server, multiple item production system with random yield and setups. Production strategies are developed utilizing these moments. Analytical results are compared with simulation.

MD28 Undergraduate Project Showcase: Military Service Academies

Sponsor: Forum on Education
Sponsored Session

Chair: Harry Newton, USAF Academy, 2354 Fairchild Drive, Suite 6D2F Academy, CO 80840, newtonhn.dfms@usafa.af.mil

1) Undergraduate Project Showcase: Military Service Academies

The USAF, CG, Naval, Military Academies, AND the RMC of Canada are invited to select their top Operations Research Projects of the year. Students will present their projects during this showcase event. This event highlights and congratulates the excellent work of undergraduates while motivating them to continue their INFORMS involvement.

MD29 Revenue Management O&D Issues

Sponsor: Aviation Applications Section
Sponsored Session

Chair: Larry R. Weatherford, Univ. of WY, PO Box 3275, Laramie, WY 82071, 1rw@uwyo.edu

1) Nested Probabilistic Network Approach to Origin-Destination Control, ***Stephane Bratu***, MIT, Flight Transport. Lab., 77 Massachusetts Ave., Cambridge, MA 02139

Most mathematical programming solutions to airline O-D control do not account for the nesting of itineraries and fare classes on each flight leg. We propose a probabilistic network approach that explicity considers the nested nature of the problem, illustrate how it can be used to generate bid prices and compare its revenue performance to other known O-D control methods.

2) Update on Passenger Origin-Destination Simulator Simulation Results, ***Peter P. Belobaba***, M.I.T Flight Trans. Lab, 77 Mass. Ave., Room 33-215, Cambridge, MA 02139

Recent results from the Boeing/MIT joint study of the interaction of revenue management methods and passenger choice are presented. The PODS is used to illustrate the revenue and competitive impacts of different RM methods, including the interaction between network O-D control and alternative forecasting models and aggregation schemes.

3) Forecasting Issues in Revenue Management, ***Larry R. Weatherford***, Univ. of WY, PO Box 3275, Laramie, WY 82071, 1rw@uwyo.edu

Recent results from the Boeing/MIT joint study of the interaction of revenue management methods and passenger choice are presented. The PODS is used to illustrate the revenue and competitive impacts of different RM methods, including the interaction between netowrk origin-destination control and alternative forecasting models and aggregation schemes.

MD30 Evaluating Benefits of Government Aviation Technology Programs I

Sponsor: Aviation Applications Section
Sponsored Session

Chair: Jesse P. Johnson, Logistics Mgmt. Inst., 2000 Corporate Ridge, McLean, VA 22102, jjohson@lmi.org www.asac.1mi.org

1) withdrawn 3/11, ***Earl R. Wingrove***, Wyle Labs., ewingrov@1mi.org

2) Object-Oriented Analysis & Design of the ASAC Executive Assistant, ***James A. Villani***, Logistics Mgmt. Inst., 2000 Corporate Ridge, McLean, VA 22102, jvillani@1mi.org, ***Eileen R. Roberts***

The ASAC Executive Assistant is an automated on-line capability to perform selected analyses of aircraft technology/air traffic management improvements using an integrated suite of economic models. We will discuss the object-oriented analysis and design techniques used and how they led to a uniquely flexible and powerful design and implementation.

3) Air Cargo Operations Database, ***Eric Gaier, Jesse P. Johnson***

The air cargo operations database was developed for use in modeling and predicting the costs associated with air cargo operations, including target operating costs for future cargo aircraft designs. We analyze the operating costs faced by various cargo shippers as a function of aircraft type and size of operations.

4) The Future Market for Cargo Aircraft, ***Jesse P. Johnson***, Logistics Mgmt. Inst., 2000 Corporate Ridge, McLean, VA 22102, jjohson@lmi.org www.asac.1mi.org, ***Eric Gaier***

We examine the future market size for cargo aircraft by examining the baseline supply and demand requirements for cargo aircraft, then adding the projected growth in demand for cargo aircraft due to industry growth. In addition, we look at new vs. used split as well as domestic vs. international patterns.

MD31 Crew Scheduling Problems

Cluster: Logistics
Invited Session

Chair: Pierre Dejax, Ecole Centrale Paris, Lab. Prod. Logistique, Lab. Prod. Logistique, Grande Voie des Vignes, Chatenay-Macabry, 92295, France, dejax@pl.ecp.fr

1) A New Column Generation Methodology for Solving the Commercial Crew-Scheduling Problems: Application to the French Railroads, ***Maher Koubaa***, Ecole Centrale Paris, Lab. Prod. Lostique, Grands Voie des, Malabry Cedex, 92295, France, koubaa@pl.ecp.fr, ***Diane Bellant, Pierre Dejax, Bernard Rannou***

This paper deals with the modelling and solving of large scale commercial crew scheduling problems encountered in railroad companies. We present a new formulation of the problem based on a real application with the french High Speed Railroads. Application on real data shows drastic improvement from a previous method.

2) On Valid Inequalities & Facets for a Formulation of the Crew Scheduling Problem, ***Odile Marcotte***, Univ. of Quebec, GERAD & DIRO, 3000 ch Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, odile@crt.umontreal.ca, ***Benoit Rochefort, Francois Soumis***

The crew scheduling problem can be modeled as a variant of the multicommodity flow problem. We describe some fractional solutions that arise when one solves the linear relaxation of this problem, and show that they are often related to odd cycles. We also give a large class of valid inequalities and prove that some of them are facets of the convex hull of integral solutions.

MD32 Logistics

Contributed Session

Chair: Susan M. Hesse, Northwestern Univ., Dept. of IE/MS, 2225 N Campus Dr., Evanston, IL 60208-3119, hesse@iems.nwu.edu

1) Strategic Planning for Facility Location, ***Susan M. Hesse***, Northwestern Univ., Dept. of IE/MS, 2225 N Campus Dr., Evanston, IL 60208-3119, hesse@iems.nwu.edu, ***Mark S. Daskin, Charles ReVelle***

We consider new models for strategic facility location which incorporate

uncertainty in various problem parameters through scenario planning techniques. A generalization of the "minimax regret" objective is formulated, capturing user risk aversion, thereby deriving less conservative location solutions.

2) Locating Containers in a Mega Terminal, ***Ebru K. Demir***, Northwestern Univ., Dept. of IEMS, 2225 N Campus Dr., Rm. 3024, Evanston, IL 60208, demir@iems.nwu.edu, ***Chung-Lun Li***, ***David Simchi-Levi***, ***Yin Thin Leong***

We consider the problem of assigning locations to jobs and scheduling AGVs to maximize throughput at a container terminal. We present an assignment problem-based heuristic and analyze its worst case performance.

3) Dispatching Automated Guided Vehicles in a Mega-Container Terminal, ***Youhua Chen***, Ntl. Univ. of Singapore, Singapore, Singapore, ***Ebru K. Demir***, ***Barry L. Nelson***, ***David Simchi-Levi***, ***Yin Thin Leong***, ***Kevin Y. K. Ng***

We consider the problem of dispatching AGVs to tasks in a mega-container terminal. Optimal and approximate algorithms are presented.

4) Routing Orderpickers in a Warehouse with Multiple Cross Aisles, ***Kees Jan Roodbergen***, Erasmus Univ., Rotterdam Sch. of Mgmt., PO Box 1738, Rotterdam, 3000DR, The Netherlands, kroodbergen@fac.fbk.eur.nl

In many warehouses order pickers can change aisles not only at the front and rear of the warehouse, but also at one or more positions in between. We develop new routing heuristics for this situation and analyze consequences of various layouts on order picking efficiency.

MD33 Finance III

Contributed Session

Chair: Sila Cetinkaya, TX A&M Univ., IE Dept., College Station, TX 77843-3131, sila@ie.tamu.edu http://ie.tamu.edu/faculty/cetinkaya.cetinkaya.html

1) Mathematical Programming for Fund Mangement, ***Guang Yang***, Imperial Coll., Ctr. for Quant. Finance, Exhibition Rd., London, SW7 2BX, UK, gyang@ic.ac.uk, ***Nicos Christofides***, ***Simon Christofides***

We investigate a multi-period portfolio management problem arising in fund management, involving bond, equity, foreign currency and options trading. A new mathematical programming formulation is developed by using a stochastic network approach. The model is tested with real data, and computational results are presented.

2) Putting the CAPM Out to Pasture, ***Susan Lash***, 308 Harper Ct., Normal, IL 61761, slash@growmark.com

Portfolio theory was originally developed for use in the selection of securities. Single period decisions in agriculture are well suited to a portfolio optimization approach. This paper examines examples ranging from cropping decisions to genetics selection.

3) Optimal Nonmyopic Gambling Strategy for the Generalized Kelly Criterion, ***Sila Cetinkaya***, TX A&M Univ., IE Dept., College Station, TX 77843-3131, sila@ie.tamu.edu http://ie.tamu.edu/faculty/cetinkaya.cetinkaya.html, ***Mahmut Parlar***

We compute the optimal strategy for a gambler who has a general logarithmic utility function for his/her terminal wealth. In contrast to the well-known Kelly criterion, maximizing the utility of final wealth leads to a nonmyopic policy for this case. We provide a closed form formula for the nonmyopic solution.

MD34 Software Demonstrations

Chair: To be announced

1) Software Demonstration: INSIGHT.xla Business Analysis Software for Microsoft Excel, ***Sam L. Savage***, Stanford University, EES & OR, 417 Terman Engineering Center, Stanford, CA 94305-4023, savage@stanford.edu

Includes Monte Carlo, discrete-event simulation, time-series, Markov chains and decision trees, optimization models, including stochastic LP formatted to run with both Excel solver and What's Best! (a small version is included). See www.zdnet.com/pcweek/opinion/0302/02mach.html for PC Week review.

2) Software Demonstration: The Best of Two Worlds with MLX/MLX:Mathematica Link for Excel, ***Anton Rowe***, EPISOFT, Inc., 555 Bryant St., #191, Palo Alto, CA 94301, anton@episoft.com

Link the world's most popular spreadsheet to the world's leading computational engine. Excel provides the ease-of-use and interface ubiquity; Mathematica provides the computational power, high-quality graphics and extensability. You will be amazed at what you can develop inside a spreadsheet using MLX!

MD35 Decision Support Systems II

Contributed Session

Chair: James E. Armstrong, Jr., US Military Academy, Dept. of Systems Eng., Mahan Hall, Rm. 419, West Point, NY 10996-1779, fj8305@trotter.usma.edu www.se.usma.edu

1) A Decision Support System for Shop Scheduling, ***N. Ravichandran***, Indian Inst. of Mgmt., Wing 3, Ahmedabad, 380015, India, nravi@iimahd.ernet.in

We argue the strategic importance of a lean manufacturig environment in the context of an Indian auto component manufacturer and present the features of a DSS to facilitate shop planning with the documentation of implementation experience.

2) Cool MS/OR: Planning Logistics DSS in an Ice Cream Company, ***Hugo T. Yoshizaki***, Univ. of Sao Paulo, CP 61548, Sao Paulo SP, 05508-900, Brazil, hugo@usp.br

A director plan for implementing MS/OR models to aid logistics decisions at a $332 million ice cream company is presented. Typical decisions are production scheduling, vehicle routing, inventory control, location analysis etc. The planning process employed a specific methodology, SYLPHID, which identifies modeling opportunities, develops specific trajectories and integrates them into a consistent decision network.

3) PRISM Project, ***James E. Armstrong, Jr.***, US Military Academy, Dept. of Systems Eng., Mahan Hall, Rm. 419, West Point, NY 10996-1779, fj8305@trotter.usma.edu www.se.usma.edu, ***Charles S. Mitchell***

The PRISM project involves improving the design of a prototype military land capabilities DSSs. PRISM gives decision makers a quick overview of military capability around the world in 108 countries. It allows "what-if" assessments by using complexity theory and nonlinear dynamics to understand and evaluate new intelligence information that may alter military capabilities...

4) A Proposed DSS for Multiobjective Scheduling Project, ***Michel Gagnon***, Universite Laval, Fac. des sciences de l'admin., Ste. -Foy, Quebec, G1K 7P4, Canada, gagnonmi@microtec.net, ***Gilles R. D'Avignon***

We focus on the properties of a DSS to consider several objectives at the same time in a visual interactive environment in order to help the project director to identify changes to constraints and to obtain a final schedule which will satisfy his multiple objectives.

MD36 Network Flow Algorithms

Cluster: Networks

Invited Session

Chair: Thomas S. McCormick, Univ. of British Columbia, Fac. of Commerce, 2053 Main Hall, Vancouver, BC, V6T 1Z2, Canada, stmv@adk.commerce.ubc.ca

1) A Strongly Convergent Dual Simplex Method for the Generalized Minimum Cost Flow Problem, ***Ronald Armstrong***, RUTCOR, Fac. of Mgmt., 640 Bartholomew Rd., Piscataway, NJ 08854-8003, rarmstro@rutcor.rutgers.edu, ***Yang Xu***

A dual simplex method for the generalized minimum cost flow problem is presented. Using a strongly dual feasible quasi-tree structure, node excess, and node labeling, it is shown that the algorithm is finitely convergent without the use of special techniques to handle degeneracy.

2) Simple Combinatorial Algorithms for the Generalized Circulation Problem, ***Kevin Wayne***, Cornell Univ., Dept. of OR & IE, 290 Rhodes Hall, Ithaca, NY 14853, wayne@orie.cornell.edu, ***Eva Tardos***

We present two simple and intuitive combinatorial algorithms for the generalized circulation problem (flows with gains and losses). The first adds a new rounding scheme to the Fat-Path algorithm. The second generalizes the preflow-push algorithm. We match the best known complexity bound for the approximate generalized circulation problem and presents computational experience.

3) An O(nm)-time Network Simplex Algorithm for the Shortest Path Problem, ***Donald Goldfarb***, Columbia Univ., IE/OR Dept., New York, NY 10027-6699, ***Zhiying Jin***

We present an O (nm)-time network simplex algorithm for finding a tree of shortest paths from a given node to all other nodes in a network of n nodes and m directed arcs or finding a directed cycle of negative length. The worst-case running time of this algorithm is as fast as that proved for any strongly polynominal algorithm and faster than that proved for any previously proposed simplex algorithm for this problem. We also show that this algorithm can be implemented in O (n log n) time using O ((m/log n) + n) exclusive write

processors of a parallel random access machine.

MD37 Frequency Assignment

Cluster: Telecom Network Planning
Invited Session

Chair: Patrick Soriano, Ecole Polytech., Univ. of Montreal, CP 6128 Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, patrick@crt.umontreal.ca

1) Distributed Online Frequency Assignment in Cellular Networks, ***Jeannette Janssen***, Acadia Univ., Dept. of Math., Wolfville, NS, B0P 1X0, Canada, jeannette.janssen@acadiau.ca, ***Danny Krizanc***, ***Lata Narayanan***, ***Sunil Shende***

2) Facility Redundancy & Partial Survivability in Cellular Networks, ***Peter Kubat***, GTE Labs. Inc., Telecomm. Research Lab., 40 Sylvan Rd., Waltham, MA 02254, pkubat@gte.com, ***James MacGregor Smith***, ***Calvin Yum***

3) Algorithms for Set T-Coloring & Frequency Assignment, ***Jin-Kao Hao***, EMA-EERIE, LGI2P, Parc Sci. Georges Besse, Mines, F-3000, France, kin-kao.hao@eerie.fr, ***Raphael Dorne***

4) An Adaptive Memory Approach for Frequency Assignment, ***Andre Bertrand***, Univ. of Montreal, Ecole HEC & CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, andreb@crt.umontreal.ca, ***Michel Gendreau***, ***Patrick Soriano***

MD38 Design & Restoration Problems in Optical

Sponsor: TST
Sponsored Session

Chair: Subrahmanyam Dravida, Bell Labs., Lucent Tech., 101 Crawfords Corner Rd., Rm. 3M-337, PO Box 3030, Holmdel, NJ 07733, dravida@hoserve.ho.lucent.com

1) A Polynomial Time Approximation Scheme for the SONET Ring Loading Problem, ***Sanjeev Khanna***, Bell Labs., Murray Hill, NJ 07733

A rapidly emerging design paradigm for large-scale optical-fiber networks involves connecting clusters of nodes through a SONET ring and building a network over these rings. We tackle an important optimization problem that consists of determining a routing scheme which minimizes the bandwidth required to satisfy all the pairwise traffic demands. = 20

2) Performance of WDM Transport Networks, ***Ender Ayanoglu***, Bell Labs., Holmdel, NJ

Wavelength division multiplexed point-to-point transport is becoming commonplace in wide area networks. With the expectation that the next step is end-to-end networking of wavelengths (in the optical domain, without conversion to electronics), there is a need for new design techniques, a new understanding of the performance issues, and a new performance evaluation methodology in such networks. We describe approaches to that end, summarizes research results, and points to open problems.

3) Distribution Restoration in Optical Networks, ***B. Doshi***, Bell Labs., Holmdel, NJ 07733, ***Subrahmanyam Dravida***, ***P. Harshavardhana***, ***Yufei Wang***

We describe a distributed restoration scheme for optical networks. We propose a novel algorithm which takes advantage of parallel computations in a distributed network. The computation time and restoration performance time will be shown for example networks. In addition, capacity comparisons with centralized optimization approaches will also be discussed.

4) SONET Intra Ring Design Problems, ***Youngho Lee***, Korea Univ., Dept. of IE, Sungbuk-Ku Anam Dong 5 Ka 1, Seoul, S. Korea, yhlee@kuccnx.korea.ac.kr, ***Junghee Han***, ***Seongin Kim***

We present a new optimization modeling for solving telecommunication network design problems. This problem arises in the design of synchronous optical netweorks (SONET). In this modeling, we seek to find an optimal clustering of demand links. This problem can also be conceptualized as an edge covering problem with capacity constraints.

Monday 16:30-18:00

ME01 Network Models

Sponsor: TSS & IFORS
Sponsored Session

Chair: David H. Bernstein, Princeton Univ., Dept. of Civil Eng. & OR, Princeton, NJ 08544, dhb@princeton.edu

1) Braess' Paradox Under Large Travel Demands, ***Jane N. Hagstrom***, Univ. of IL, Dept. of Info. & Dec. Sci., 601 S. Morgan, MC 294, Chicago, IL 60607, hagstrom@uic.edu, ***Robert A. Abrams***

We show that for "large enough" demands, Braess's paradox for traffic equilibrium cannot occur in the case of affine travel-time costs. We characterize Braess's paradox as occurring when the equilibrium distribution of flows does not solve a certain optimization problem.

2) Multicriteria Thoughts for the Traffic Assignment Problem, ***Tzu-li Wu***, RPI, Dept. of DS/ES, Troy, NY 12180, wut@rpi.edu, ***George F. List***

We present new perspectives on the multicriteria traffic assignment problem. A network manager's perspective is introduced. Comparisons are presented between the new perspective and classic user-equilibrium and system-optimal. The trade offs among these criteria are discussed and suggestions for future work are described.

3) Parallel Implementations of Time-Dependent Shortest Path Algorithms, ***Ismail Chabini***, MIT, 77 Massachusetts Ave., Room 1-263, Cambridge, MA 02139, chabini@mit.edu, ***Michael A. Florian***, ***Nicolas Tremblay***

We present results obtained with several parallelization strategies for computing time-depend shortest paths for ITS applications. The algorithms tested are the label setting algorithms of Chabini and Pallotino. The computing platforms used are a network of SUN SPARC Ultra workstations and a SUN SPARC Server 1000 shared memory machine.

4) Solving Path Flow Formulations of the Network Equilibrium Problem, ***David H. Bernstein***, Princeton Univ., Dept. of Civil Eng. & OR, Princeton, NJ 08544, dhb@princeton.edu

Historically, people have tended to avoid so-called "path flow formulations" of the network equilibrium problem in favor of so-called "arc formulations". This presentation considers both why path flow formulations are important and how they can be solved efficiently.

ME02 Applications of Travel Forecasting Models

Sponsor: TSS & IFORS
Sponsored Session

Chair: Bruce N. Janson, Univ. of CO, Dept. of Civil Eng., PO Box 173364, CB 113, Denver, CO 80217-3364, bjanson@carbon.cudenver.edu

1) Applications of the AIMSUN2/RB Microsimulator in Montréal, ***Michael A. Florian***, Univ. of Montreal, CRT & Dept. DIRO, CP 6128, CP 6128, Succ. Centerville, Montreal, Quebec, H3C 3J7, Canada, mike@crt.umontreal.ca, ***Michael Mahut***, ***Nicolas Tremblay***, ***Jaime Barcelo***, ***Jose Ferrer***

We present several applications of the AIMSUN2/RB microsimulator to several congested corridor of the urban highway network of Montreal. Those applications have been carried out with the collaboration of the Ministry of Transportation of Quebec and complement the transportation planning studies for the Montreal Region with detailed simulations of congested corridors.

2) The Effect of Earthquakes on Urban Highway Infrastructure Productivity, ***Peter Gordon***, Univ. of Southern CA, Econ. & Urban Planning, VKC-351 MC0042, Los Angeles, CA 90089-0042, pgordong@usc.edu, ***James E. Moore***, ***M. Shinozuka***

We summarize an integrated model of losses due to earthquake impacts on transportation and industrial capacity, and how these losses affect the urban economy. The procedure advances transportation and activity system analysis techniques in ways that help capture the most important economic effects. Network costs and origin-destination requirements are endogenous and consistent.

3) Real-Time Forecasting Using Unequally Spaced Observations, ***Piyushimita Thakuriah***, Univ. of IL, Urban Trans. Ctr., 1033 W Van Buren, Ste. 700 S, Chicago, IL 60607, thakuria@voyager.utc.uic.edu

Real-time forcasting of travel times is critical for intelligent transportation systems. Input travel time data streams, however, are unequally spaced in time. We propose a travel time forecasting procedure for an arterial corridor using a traffic model and a modified Kalman filter. An application of this forecasting model is made using data from an arterial network.

4) Modeling Route Diversion Impacts of Freeway Ramp Metering, ***Bruce N. Janson***, Univ. of CO, Dept. of Civil Eng., PO Box 173364, CB 113, Denver, CO 80217-3364, bjanson@carbon.cudenver.edu

Freeway ramp metering can only reduce total travel time in a network of alternative routes if Braess' paradox occurs, assuming fixed demand. Static and dynamic assignment examples are presented in which ramp metering reduces

total travel time because of restrictive freeway link capacities versus ample link capacities on alternative routes.

ME03 Optimization for Air Transportation

Sponsor: TSS
Sponsored Session

Chair: Jacques Desrosiers, Ecole des HEC & GERAD, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, jacques@crt.umontreal.ca

Co-Chair: Francois Soumis

1) Dynamic Constraint Relaxation for Large Column Generation Problems, ***Daniel Villeneuve***, Ecole Polytech. de Montreal, GERAD, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, danielv@crt.umontreal.ca, ***Francois Soumis***

Highly degenerate problems, such as set partitioning ones, contain many inactive constraints which may be identified from the solution. We propose an algorithm which relaxes a set of potentially inactive constraints before solving, tracking the minimal set at each iteration. We present numerical results on crew pairing problems using the GENCOL optimizer.

2) Weekly Aircraft Routing & Scheduling Problem, ***Nicolas Belanger***, Ecole Polytech. of Montreal, GERAD, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3C 2A7, Canada, nicolasb@crt.umontreal.ca, ***Francois Soumis***

The islands method permitting to considerably reduce the time resolution of the WARSP has been introduced under the hypothesis that any optimal solution used the minimal fleet. However, this hypothesis is not always satisfied in practice. We shall present an extension of this method not requiring this hypothesis and rapidly solving the problem optimally.

3) An Optimization Model for the Simultaneous Flight & Pilot Operational Scheduling Problems, ***Mirela Stojkovic***, Ecole Polytech. of Montreal, GERAD, 3000 ch. Cote-ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, mirela@crt.umontreal.ca, ***Francois Soumis***

The problem consists in simultaneously modifying, as necessary, the existing flight departure times and planned crew assignments, while keeping unchanged predefined aircraft itineraries. The problem is mathematically formulated as an integer nonlinear multi-commodity network flow model with time windows and solved by using a Dantzig-Wolfe decomposition combined with a B&B method.

4) Day of Operation Scheduling (DAYOPS), ***Goran Stojkovic***, Ecole Polytech. of Montreal, GERAD, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, goran@crt.umontreal.ca, ***Francois Soumis***

Traditionally, aircraft assignment and crew scheduling problems are solved sequentially. In DAYOPS problem, it is very important to find out a flight schedule that satisfies both of them in same time. We used Benders decomposition to iterate between two modules: aircraft assignment and crew scheduling. Both modules are separately solved by GENCOL optimizer. Proposed model, for the first time, solve simultaneously these 2 modules using feedback from crew schedule to improve aircraft assignment.

ME04 Operations Management I

Contributed Session

Chair: Charles H. Smith, VA Commonwealth Univ., PO Box 844000, Richmond, VA 23284-4000, chsmith@vcu.edu

1) Modeling a Process Improvement Decision, ***Charles H. Smith***, VA Commonwealth Univ., PO Box 844000, Richmond, VA 23284-4000, chsmith@vcu.edu, ***Kim I. Melton***

Under the continual improvement philosophy a decision maker can allocate resources towards targeting the process mean, reducing the inherent process variation, or reducing the frequency of occurrences of special causes of process disruption. The preferred actions depend on objectives, costs, and time horizon.

2) Commonality in Multiple-Period Systems, ***Mark S. Hillier***, Univ. of WA, MS Dept., Box 353200, Seattle, WA 98195, mhillier@u.washington.edu

By comparing the costs of a commonality and no commonality scenario using a very general, multiple-period model, we determine when using a more expensive common component is beneficial. We also investigate using both unique and common components, with common component serving as a backup.

3) Focus vs. Adaptability: An Empirical Analysis of the Trade-Off, ***Ashok Mukherjee***, Case Western Reserve Univ., WSOM, 10900 Euclid Ave., Cleveland, OH 44106, axm89@po.cwru.edu, ***Will Mitchell, Brian Talbot***

We examine how changes in manufacturing requirements affect the performance of a focused factory. Absorptive capacity of a production line for a given change is hypothesiazed as the key predictor of performance. The hypotheses are tested at a well-known focused factory of the Copeland Corporation.

4) Business Cycles & Downsizing of Knowledge Workers: The Stochastic Staffing Problem with Learning Effects & Non-Stationary Demand, ***Edward G. Anderson***, Univ. of TX, CBA 4. 202, Austin, TX 78712, edanderson@mail.utexas.edu

How best to manage a firm's knowledge resources under business cycles is vital but not well understood. Using the example of managing automotive engineers, who typically require years of mentoring under business cycles, we develop an optimal dynamic programming policy for managing resources with long lead-times under uncertain, non-stationary requirements.

ME05 Panel: New Books in Supply Chain Management

Sponsor: MSOM
Sponsored Session

Chair: Michael J. Magazine, Univ. of Cincinnati, Dept. of QAOM, Cincinnati, OH 45221-0130, mike.magazine@uc.edu

1) Panel: New Books in Supply Chain Management, ***Hau L. Lee***, Stanford Univ., Dept. of IE/EM, Terman 351, Stanford, CA 94305-4024, haulee@leland.stanford.edu, ***Corey Billington***, ***Chris Tang***, ***Teck Ho***, ***David Simchi-Levi***, ***Philip Kaminsky***, ***Edith Simchi-Levi***, ***David F. Pyke***, ***Edward A. Silver***

ME06 Advances in Flexible Manufacturing Systems Design

Sponsor: MSOM
Sponsored Session

Chair: Diwakar Gupta, McMaster Univ., DeGroote Sch. of Bus., 1280 Main St. W, Hamilton, Ontario, L8S 4M4, Canada, guptad@mcmaster.ca

1) Technical Progress & Technology Acquisition: A Stochastic Programming Approach, ***Atiqur Rahman***, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal Quebec, H3A 1G5, Canada, rahman@management.mcgill.ca, ***Shanling Li***

Many high-tech manufacturing firms find that the market for their current products is eroded by the emergence of new technologies. We formulate this problem as a stochastic programming model to help firms make optimal technology acquisition decisions. An algorithm is proposed and numerical results are presented.

2) Investment Decisions for Reconfigurable Machining Systems, ***Wichai Narogwanich***, Univ. of MI, IOE Dept., 1205 Beal Ave., Ann Arbor, MI 48109-2117, wichai@engin.umich.edu, ***John R. Birge***, ***Izak Duenyas***

We consider models for investing in reconfigurable machinery. It is uncertain when the machine will fail as well as when reconfiguration will be required. We present structural and numerical results.

3) Design of Flexible Plant Layouts, ***Saifallah Benjaafar***, Univ. of MN, Dept. of Mech. Eng., Minneapolis, MN 55455, saif@maroon.tc.umn.edu, ***Mehdi Sheikhzadeh***

We address the problem of designing flexible plant layouts for manufacturing facilities where product demand and product mix are subject to variability. We present an alternative to both product and process layouts which we show to be more robust in dynamic environments.

4) Multistage Capacity Planning, ***Brian Denton***, McMaster Univ., DeGroote Sch. of Bus., 1280 Main St. W, Hamilton, Ontario, L8S 4M4, Canada, dentonbt@mcmaster.ca, ***Diwakar Gupta***

We present a model for examining the tradeoff between lower operating/acquisition costs of dedicated capacity and the ability to hedge against demand uncertainty by using fully flexible and/or convertible capacity. Convertible capacity processes only one product type but may be reconfigured periodically to suit changing demand pattern.

ME07 Economic Models of Operations Strategy

Sponsor: MSOM
Sponsored Session

Chair: Phillip J. Lederer, Univ. of Rochester, Simon Sch. of Bus. Admin., Rochester, NY 14627, lederer@mail.ssb.rochester.edu

1) Generalized Manufacturing-Retailer Contracting Authors, ***Gerard P. Cachon***, Duke Univ., Fuqua Sch. of Bus., Box 90120,

Durham, NC 27708, ***Martin Lariviere***

Several researchers have examined contracting between a manufacturer and a retailer facing a newsvendor problem. We consider the relationship between alternative contracting schemes as well as their efficiency in different contract settings. In particular, we consider price dependent demand distributions.

2) Firm Pricing Policy & Location Strategy: The Case of Uniform Pricing, *Phillip J. Lederer*, Univ. of Rochester, Simon Sch. of Bus. Admin., Rochester, NY 14627, lederer@mail.ssb.rochester.edu, ***Dananjay Nanda***

In the operations literature there is an unrecognized strategic interaction between location and pricing. Location affects the demand pattern thus the << optimal >> prices. Pricing affects the demand pattern and << optimal >> locations. We explore this interaction for uniform pricing. We explain the use of uniform prices, and model pricing interactions with location.

3) Real Options & R&D Project Evaluation, *Arnd H. Huchzermeier*, WHU, Otto-Beisheim GSM, Burgplatz 2, Vallendar, 56179, Germany, ah@shu-koblenz.de, ***Christoph H. Loch***

Standard evaluation methods understate the value of R&D projects when corrective actions can be taken by management. Variability in technical outcomes and in market payoffs increases the value of the real option. Contrary to conventional options theory wisdom, an increase in market demand variability may reduce rather than enhance the option value.

4) Risk & Capacity Decisions, *Phillip J. Lederer*, Univ. of Rochester, Simon Sch. of Bus. Admin., Rochester, NY 14627, lederer@mail.ssb.rochester.edu, ***Tushar Mehta***

Typically, firms use a management-mandated hurdle rate in evaluating new technologies, effectively masking risk differences. We assess a hurdle rate based on the technology's cost structure, and subsequently, optimize the firm's capacity choice. Also, we estimate the "error" resulting from a pre-established hurdle rate over a range of model parameters.

ME08 Models & Methodologies in Technology Management

Sponsor: **Technology Management Section**
Sponsored Session

Chair: Dundar F. Kocaoglu, Portland State Univ., Eng. Mgmt. Program, 1900 SW 4th Ave., Portland, OR 97201, kocaoglu@emp.pdx.edu

1) Growing as an INC-500 Company, *Moren Levesque*, Carnegie Mellon Univ., GSIA, Pittsburgh, PA 15213-3890, moren@andrew.cmu.edu, ***Kenneth R. MacCrimmon***

Growth is a key objective of entrepreneurial companies. To explore the determinants of growth, we studied the fastest growing companies listed in INC 500 Magazine from 1991 to 1997. The relationships and implications among variables such as profitability, productivity, size, age and industry are presented in this paper.

2) TQM Implementation in an Engineering Faculty, *Nuket Yetis*, Marmara Univ., Fac. of Eng., Kuyubasi Kadikoy, Istanbul, 81040, Turkey, yetis@marun.edu.tr

TQM in higher education covers organizational productivity for statisfying customer needs and quality requirements, and provides a structure for educational processes with performance measurements. To have a successful implementation of TQM for continuous quality improvements in higher education, specific characteristics of the university environment should be taken into consideration.

3) A Reexamination of DEA Cross-Evaluation in Cellular Manufacturing Layout Analysis, *Timothy R. Anderson*, Portland State Univ., Eng. Mgmt. Program, PO Box 751, Portland, OR 97207-0751, tima@emp.odx.edu, ***Akin Uslu***, ***Keith Hollingsworth***

This work examines the advantages and disadvantages of DEA cross-evaluation in analyzing cellular manufacturing layout simulation results. It is found that while cross-efficiency may be an interesting variant of Data Envelopment Analysis, it is not well suited to simulation output analysis.

4) Informal Structure for Technology Development Organizations, *Jang W. Ra*, Univ. of AK, Sch. of Eng., Anchorage, AK 99508, afjwr@uaa.alaska.edu

We present a matrix format approach for mapping employees informal networks and show how to properly select a team leader and key members whose technical leadership and people skills are actually supported by employees, not falsely assumed by a top manager.

ME09 Knowing & Knowledge in Product & Service Innovation

Sponsor: **Technology Management Section**
Sponsored Session

Chair: Deborah J. Dougherty, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, doughert@management.mcgill.ca

1) Organizational Knowledge Architectures For & Against Sustained Innovation, *Deborah J. Dougherty*, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, doughert@management.mcgill.ca

The market, technology, and core operating knowledge architecture in organizations capable of sustained product innovation differs fundamentally from that found in non-innovative organizations, promoting both extensive=differentation and integration at multiple levels of action. Central charactgeristics of the differences are described and suggestions for transformation are offered.

2) Product Concept Development in Multinationals, *Alan O'Sullivan*, McGill Univ., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, osulliva@management.mcgill.ca

The paper discusses how organization competencies are matched to customer needs during product concept development in a multinational corporation. Social identities influence concept development by constraining cognition and cueing behaviour. Dealing explicitly with social identities is argued to be a key task in the generation of an effective product concept.

3) Emotion, Identity & Skills: A Discursive Model of Social Innovation, *Thomas Lawrence*, Univ. of Victoria, Fac. of Bus., PO Box 1700, Victoria, BC, V8W 2Y2, Canada, tlawrence@business.uvic.ca, ***Nelson Phillips***

We develop a discursive model of how independent actors collaborate to produce social innovation, highlighting the complex relationships among talk and action through wich people co-construct emotions, skills, and identities. A case study of a collaborative initiative in employment services illustrates the importance of this model to managing innovation.

4) No Title Supplied, *Pablo Martin*, McGill Univ., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, martin@management.mcgill.ca

ME10 Scheduling: Computational Developments & New Directions

Cluster: **Scheduling**
Invited Session

Chair: Reha Uzsoy, Purdue Univ., Sch. of IE, 1287 Grissom Hall, W Lafayette, IN 47907-1287, uzsoy@ecn.purdue.edu

1) Procedures & Logic for Scheduling at a Job Shop, *Scott Webster*, Syracuse Univ., Sch. of Mgmt., Syracuse, NY 13244-2130, stwebster@som.syr.edu

Results from a detailed case study of scheduling practice at one company will be presented. The scheduling function is a largely manual process performed by 2 individuals. The logic is complex approximately 30 statistics are monitored and over 100 rules are used. Implications for future research will also discussed.

2) A Column Generation Method for a Multi-Stage Roll Cutting & Scheduling Problem, *Manish Bhatia*, Univ. of Illinois, Dept. of Mech. & IE, Urbana, IL 61801, palkar@uiucvm.bitnet, ***Udatta S. Palekar***

We consider the problem of optimal cutting pattern generation at a manufacturing plant and a finishing plant for the production of rolls of a synthetic film. The solution approach uses a column generation approach to develop cutting paters. The model considers capacity loss, trim loss, inventory carrying costs and transportaion costs to arrive at the optimal solution. We will provide computational results with masked real-world data.

3) Scheduling a Parallel Processing Facility in an Aluminum Smelter, *Marc Gravel*, Quebec Univ., Dept. of Math. & Info., 555 Bl de l'Universite, Chicoutimi, Quebec, G7H 2B1, Canada, ***Wilson Price***, ***Caroline Gagn***

We treat a bi-criterion scheduling problem for parallel processors in an aluminum smelter. The processors are melting furnaces used in making ingots having particullar alloy specifications. The criteria are to minimize delivery delays and reduce set-ups. Set-up durations are sequences dependent. A GA is used to obtain feasible schedules.

4) Decomposition Methods for Scheduling in Complex Job

Shops, ***Ebru Demirkol***, Purdue Univ., Sch. of IE, 1287 Grissom Hall, W Lafayette, IN 47907-1287, demirkol@ecn.purdue.edu, ***Reha Uzsoy***, ***Cheng-Shuo Wang***

We examine the performance of different heuristic decomposition procedures derived from the shifting bottleneck procedure in shops involving reentrant product flows, batch processing machines and sequence-sependent setup times. Extensive computational results on a variety of problem classes will be presented.

ME11 FMS Planning

Cluster: **Flexible Manufacturing Systems**
Invited Session

Chair: Kathryn E. Stecke, University of Michigan, Sch. of Business, 701 Tappan Rm 5206, Ann Arbor, MI 48109-1234, kstecke@umich.edu

1) Aggregate Capacity Planning of Flexible Manufacturing Systems Using a Concept of "Operation Types", ***Tama Koltai***, Tech. Univ. of Budapest, Dept. of IM, Huegyetem rkp. 9, Budapest, 1111, Hungary, koltai@wg.bhe.hu, ***Andras Farkas***, ***Kathryn E. Stecke***

One of the reason for the complexity of capacity planning of FMSs is the possibility of alternative use of the machines. A rough cut capacity planning model is provided to check with operation allocation to machines can be better for certain operations mangement objectives, such as tooling cost minimization...

2) Optimal Feeder Positioning Using Stochastic Programming, ***Wei-Liang Lin***, Univ. of TX, Grad. Program in OR/IE, Austin, TX 78712-1063, wll@csr.utexas.edu, ***Valerie Tardif***

Positioning feeders among pick-n-place machines on a paced serial PCBA line directly impacts setup and cycle times. Traditional methods focus on unique board types, ignoring the constantly varying demand mix. We present a stochastic programming approach which yields a solution with low setup and overall cycle time over all boards.

3) Minimizing System Setups in a Flexible Manufacturing System, ***Gunter J Schmidt***, Univ. of Saarbruecken, JTM, Bau 15, Gebaeude 15, PO Box 15 11 50, Saarbruecken, D-66041, GERMANY, gs@itm.uni-sb.de

A number of different parts has to be produced by a flexible manufacturing system. The set of part types can be partitioned into a number of part groups. All members of the same group are manufactured simultaneously with fixed relative ratios. The periodic demand of all part types belonging to the same group...

ME12 Data Envelopment Analysis: Health Care Applications I

Cluster: **Health Applications**
Invited Session

Chair: Yasar A. Ozcan, VA Commonwealth Univ., Dept. of Health Admin., PO Box 980203, Richmond, VA 23298-0203, ozcan@gems.vcu.edu

1) Choice of Input Prices in DEA Cost Efficiency Measurement: The Case of Dutch Nursing Homes, ***Evelien Eggink***, Social & Cultural Planning Office, PO Box 37, Rijswijk, 2280 AA, The Netherlands, ee@scp.nl, ***Jos L. T. Blank***

This paper evaluates the impact of input price differences on DEA-cost efficiency. Three measures of input prices are used reflecting intertemporal, regional, and quality related variation respectively. Empirical analysis is performed on a panel data set of Dutch nursing homes. The relationship between efficiency scores and both characteristics of the nursing homes, and different input price measures, is studied.

2) Has the DRG System Really Influenced Hospital Productivity Growth in Portugal? An Empirical Analysis Using Non-Parametric Methods, ***Vania Sena***, Univ. of York, Dept. of Econ. & Related Study, York, Y01 5DD, UK, destefa@ponza.dia.unisa.it, ***Clara Elizabeth Dismuke***

This paper assesses the impact of the DRG system in Portugal on the evolution of capital productivity in hospitals, measured as the sum of the variation of capital efficiency and the technical progress. Non-parametric methods are used to examine a unique data-set of discharge abstgracts for the five most frequent DRGs. Results show the DRG system has played a role in improving hospital capital productivity.

3) The Efficiency of the Quebec Hospitals: Test of a Two Step Model, ***Ann-Lise Guisset***, Ctr. des Sci. Hospitalieres, Clos Chapell-aux-Champs, 30 UCL 30.37, Bruxelles, B-1200, Belgium, guisset@hosp.ucl.ac.be, ***Philippe Michelon***, ***Claude Sicotte***, ***W. D'hoore***, ***Frederick Semet***

We model hospital production as a two step process: resources services and health. Management controls the first step while physicians control the second step. DEA is used at each step of the production process to evaluate the efficiency of 76 Quebec hospitals. Quality measures are tested for correlation with efficiency scores.

ME14 Panel: Modeling Risk in Stochastic Programs

Cluster: **Stochastic Programming**
Invited Session

Chair: Julia L. Higle, Univ. of AZ, Dept. of SIE, Tucson, AZ 85721, julie@sie.arizona.edu

1) Panel: Modeling Risk in Stochastic Programs, ***John R. Birge***, Univ. of MI, 1205 Beal Ave., 1877 IOE Dept., Ann Arbor, MI 48109, jbirge@umich.edu personal.engin.umich.edu/~jbirge, ***Suvrajeet Sen***, ***Alan J. King***

Many alternatives have been considered for modeling risk in stochastic programs, including varieties of utility functions, downside risk limits, and financial option pricing. This panel will discuss the relative advantages of the methods and their applicability in different situations.

ME15 Applications of Optimization

Cluster: **Nonlinear Programming**
Invited Session

Chair: Steven A. Gabriel, ICF Kaiser Intl., 9300 Highway, Fairfax, VA 22031-1207, sgabriel@icfkaiser.com

1) Computational Aspects of Regulation & Competition Models, ***Olivier Daxhelet***, Univ. Catholique de Louvain, 34 Voie du Roman Pays, Louvain-La-Neuve, 1348, Belgium, dax@core.ucl.ac.be, ***Yves Smeers***

Special purpose regulation is a key step for the transition to a competitive market in several network industries. Assessing the outcome of different mixes of regulation and competition is thus an important practical question. It also raises interesting and difficult computational problems. We consider a typical situation taken from the telecommunication industry; there is competition on part of the market, the other part remaining captive.

2) No Title Supplied, ***Antonio Estache***, The World Bank, Economic Development Inst., Washington, DC, ***Kangbin Zheng***

This paper sets up a one-principal-multi-agent game framework for optimal regulation of public utilities with both demand and cost uncertainties, and applies this analytical framework empirically to policy tudies in the water supply sector of Brazil. In addition to addressing information asymmetry and incentive compatibility among consumer groups,...

3) Solving the Nonaddictive Shortest Path Problem, ***Steven A. Gabriel***, ICF Kaiser Intl., 9300 Hwy, Fairfax, VA 22031-1207, sgabriel@icfkaiser.com, ***David H. Bernstein***

Recently, there has been research aimed at solving the nonadditive form of the Wardrop User Equilibrium Problem in Traffic Modeling. The nonadditivity refers to the costs of the paths which are not simply the sum of the costs of the links comprising the path as it typically assumed. Various algorithms have been proposed for this nonadditive version of the problem...

4) Transportation Design Problems: An MPEC Approach, ***Alvin Lim***, JHU, Dept. of Math. Sci., Baltimore, MD 21218, ***Jong-Shi Pang***

We discuss several transportation design problems and their numerical solution via the methodology of Mathematical Programming with Equilibrium Constraints. These include the origin destination estimation and adjustment problem, the continuous network design problem, and the toll setting problem. Computational results are presented.

5) Distributed Power Resource Optimization: Integrating Local Planning Costing & Central Resource Evaluation, ***Susan A. McCusker***, JHU, Dept. of Geo. & Environ. Eng., Baltimore, MD 21218, mccusker@hjuvms.hcf.jhu.edu, ***Benjamin F. Hobbs***

Distributed resources are small power supply, storage, or DSM options that can avoid distribution investments. A method for Screening DRs is proposed that involves coordination of a central system investment model, a stochastic power flow model, and DR MIP models. Solutions are obtained by Benders decomposition.

ME16 Interior Point Methods for Mathematical Programming

Cluster: Linear Programming
Invited Session
Chair: Renato D. C. Monteiro, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332, monteiro@isye.gatech.edu

1) Search Directions & Potential Reduction Algorithms for Semidefinite Programming, ***Levent Tuncel***, Univ. of Waterloo, Dept. of Cominatorics & Opt., Waterloo, Ontario, N2L 3G1, Canada, ltuncel@math.uwaterloo.ca

I will present a simple and general framework for potential-reduction and path-following algorithms in the context of semidefinite programming and related problems. I will show how this framework is used to unify many families of search directions for interior-point algorithms to solve semidefinite programming problems.

2) Implementation of Primal-Dual Methods for Semidefinite Programming Based on MT Directions, ***Paulo R. Zanjacomo***, GA Inst. of Tech., Sch. of ISYE, Atlanta, GA 30332, paulo@isye.gatech.edu, ***Renato D. C. Monteiro***

We report some computational results on the performance of interior-point predictor-corrector methods based on the MT directions and a variant of these directions, called the S-Ch-MT direction. We also compare our implementation with others based on the NT, HRVW/KSH/M and AHO directions.

3) Large-Scale Semidefinite Programming, ***Romesh Saigal***, Univ. of MI, Dept. of IOE, Ann Arbor, MI 48109, rsaigal@engin.umich.edu

Large scale semidefinite programs are similar to large scale linear programs in several respects, and also pose several interesting problems that are different. This talk will explore this relationship.

4) Computational Issues in Solving Large-Scale Sparse Semi-Definite Programs for Combinatorial Optimization, ***Steven J. Benson***, Univ. of IA, Dept. of Math. Sci., AMCS, Iowa City, IA 52246-3402, benson@math.uiowa.edu, ***Yinyu Ye***, ***Xiong Zhang***

We discuss computational issues in the dual potential reduction algorithm for semidefinite programming and show how to exploit the sparse structure of some combinatorial optimization data. We report computational results for solving the Max-Cut semidefinite program whose dimension is up-to 5000. To the best of our knowledge, all existing methods to this date solve problems with dimension at no more than few hundreds.

ME17 Information Technologies in Networked Manufacturing

Cluster: Optimization Days
Invited Session
Chair: Sophie D'Amours, Univ. of Laval, Pavillon Pouliot, Ctr. de Research SORCIIER, Ste-Foy, Quebec, G1K 7P4, Canada, sophie.damours@osd.ulaval.ca

1) The Netman Software Architecture, ***Louis Cloutier***, Cetr. de recherche SORCIIER, Univ. Laval, Pavillon JA de Seve, Ste-Foy, Quebec, G1K 7P4, Canada, LouisCloutier@apg.com, ***Pierre Lefrancois***, ***Bernard Espinasse***

Within the NETMAN project, one of the objectives is to develop a computer-based infrastructure, building onto the most recent information technologies to support the operations of a network of business units. A large number of the software components are developed to support the interactions between the nodes of a supply network.

2) Data Modeling Strategies & Techniques for Data Mining, ***Daniel Pascot***, Univ. Laval, Dept. Syst. d Info. Org., Pavillon Palasis-Prince, Ste-Foy, Quebec, G1K 7P4, Canada, Daniel.Pascot@sio.ulaval.ca

Most of the methods for data mining implementation proposed in the literature and by consultants starts with the definition of management information needs and ends with data gathering. Unfortunately either it is not possible in practice to collect data only for these needs, either extracting required data from the operational data bases is a tedious and difficult process.

3) Information Technology & Production Planning & Control, ***Amar S Ramudhin***, Centre de recherche SORCIIER, Pavillon JA de Seve, Laval University, Quebec, G1K 7P4, CANADA, amar.Ramudhin@osd.ulaval.ca

We present an information driven hierarchical framework for implemation of production planning and control. Such a framework must support formal aggregation and disaggregation concept with strong inter-level linkage. The framework will be presented through an example.

4) Information Sharing in Networked Manufacturing, ***Sophie D'Amours***, Univ. of Laval, Pavillon Pouliot, Ctr. de Research SORCIIER, Ste-Foy, Quebec, G1K 7P4, Canada, sophie.damours@osd.ulaval.ca, ***Pierre Lefrancois***, ***Benoit Montreuil***

We address the impact of information sharing on a manufacturing network and its value creation process. We explore networking strategies where business relationships are characterized by the information exchanged between firms on demand, price and capacity. The results of our research suggest that higher networking flexibility is achieved when firms favor tight webbed relationships.

ME19 Tutorial: Lift & Project Methods for Mixed-Integer Programs

Invited Session
Chair: Jean-Marie Bourjolly, Concordia Univ., 1455 de Maisonneuve Blvd. W, Montreal, Quebec, H3G 1M8, Canada, jean-m@crt.unmontreal.ca

1) Tutorial: Lift & Project Methods for Mixed Integer Programs, ***Sebastian Ceria***, Columbia Univ., Grad. Sch. of Bus., 417 Uris Hall, New York, NY 10027, sebas@cumparsita.gsb.columbia.edu

We present an algorithm that can be used for any integer program to generate "lift-and-project" cuts. These cuts rely solely on the fact that some variables in the model are integer constrained. We show through extensive computational experiments that they are quite effective when used within a B&C algorithm to solve general MIPs arising from a wide variety of applications.

ME20 Panel: Managing Transitions - Grad School to First Job, Academia to Industry, Industry to Academia

Sponsor: Forum on Women in OR/MS
Sponsored Session
Chair: Candace A. Yano, Univ. of CA, 4135 Etcheverry Hall, Berkeley, CA 94720-1777, yano@ieor.berkeley.edu www.ieor.berkeley.edu/~yano

1) Panel: Managing Transitions - Grad School to First Job, Academia to Industry, Industry to Academia, ***Eric Wolman***, George Mason Univ., 7806 Hidden Meadow Terr., Potomac, MD 20854-1792, ***David Kim***, ***Margaret Belknap***

Panelists will discuss their experiences in making successful transitions within the OR/MS profession.

ME21 Simulation Methodology

Sponsor: College on Simulation
Sponsored Session
Chair: Perwez Shahabuddin, Columbia Univ., Dept. of IE/OR, 500 W 120th St., New York, NY 10027-6699, perwez@ieor.columbia.edu

1) Permutated Importance-Sampling Estimators for Regenerative Simulations, ***James Calvin***, NJIT, Simulation & Modeling Lab., Dept. of CIS, Newark, NJ 07102-1982, calvin@cis.njit.edu, ***Marvin Nakayama***

We reduce the variance of importance-sampling estimators by applying permutations. The basic idea is to run a simulation using one sequence of regeneration points, permute the cycles based on another sequence of regeneration points, compute an estimator based on the new path, and average over all possible permutations.

2) Application of Gradient Estimation Techniques to the Design & Analysis of Control Charts, ***Xi-Ren Cao***, HKUST, Clear Water Bay, Dept. of EEE, Kowloon, Hong Kong, ***Michael C. Fu***, ***Jian-Qiang Hu***

The evaluation of complicated control charts in statistical process control requires the use of Monte Carlo simulation due to the intractability of the underlying model. We apply gradient estimation techniques to derive sensitivity estimators of average run lengths of control charts with respect to various system parameters...

3) On the Choice of Sample Space for Importance Sampling & Likelihood Ratio Derivative Estimation, ***Perwez Shahabuddin***, Columbia Univ., Dept. of IE/OR, 500 W 120th St., New York, NY 10027-6699, perwez@ieor.columbia.edu

Importance sampling involves choosing a new probability measure to achieve reduction in variance. Likelihood ratio derivative estimation is also based on a change of measure concept. We show that in many cases, the choice of the

granularity of the sample space, on which to implement the change of measure, may affect the variance. In some cases, it may mean the difference between finite and infinite variance.

4) Efficient Rare Event Simulation of Polling Systems, ***Sandeep Juneja***, Indian Inst. of Tech., Dept. of Mech. Eng., Hauz Khas, New Delhi, 110016, India, sandeepj@mech.iitd.ernet.in, ***Prashant Singhal***

ATM networks are often modeled using polling queueing systems. For such networks, the buffer overflow probability, although very small, is an important performance measure that needs to be accurately estimated. We describe importance sampling techniques to efficiently estimate these small buffer overflow probabilities for a wide class of polling systems, using what we refer to as the cyclic approach.

ME22 The Value of Information

Sponsor: Decision Analysis Society
Sponsored Session
Chair: Charles D. Linville, 2917 Keswick Rd., Baltimore, MD 21211, clinville@worldnet.att.net

1) Expected-Utility Preference Reversals in Information Acquisition, ***Gordon B. Hazen***, Northwestern Univ., IE/MS Dept., MEAS, Evanston, IL 60208-3119, ***Jay Sounderpandian***

Suppose you must choose between 2 pieces of information A and B. In the absence of cost, you would prefer to obtain A rather than B, and in fact would be willing to take more risk to obtain A than B. Nevertheless, you would pay more money for B than for A. Are your preferences consistent with expected utility? The answer is yes, they may very well be.

2) Decision Making & Participation Style, ***Mehdi Mostaghimi***, Pfizer Central Research, Portfolio Analysis Group, Groton, CT 06340, mehdi_mostaghimi@groton.pfizer.com, ***David K. Kreutter***

The decision reached by a decision maker after consulting experts is influenced by his/her participatory style in the decision process. We use a Bayesian estimation method to show that the decision maker's optimal decision varies with his/her participatory style. Numerical examples are presented.

3) The Sensitivity of Value of Information to Analysis Assumptions, ***Maxine E. Dakins***, Univ. of ID, 1776 Science Cntr. Dr., Idaho Falls, ID 83405, medakins@if.uidaho.edu

We examine the sensitivity of the expected value of sample information in an environmental remediation decision problem to changes in important assumptions of the analysis including the structure of the model, the form and parameters of the loss function and the form and symmetry of the likelihood function.

4) Biases in the Estimation of the Expected Value of Information, ***Charles D. Linville***, 2917 Keswick Rd., Baltimore, MD 21211, clinville@worldnet.att.net

We examine 2 mechanisms by which estimates of the expected value of information (VOI) can be biased. Expert overconfidence can lead both to underestimates and overestimates of VOI. Also, simulation variance can lead to positive and negative biases in estimates of VOI based on Monte Carlo simulation.

ME23 Creating Value Using Decision Analysis

Sponsor: Decision Analysis Society
Sponsored Session
Chair: Ralph L. Keeney, Univ. of Southern CA, 101 Lombard St., Ste 704W, San Francisco, CA 94111

1) Discovering Options, ***James E. Smith***, Duke Univ., Box 90120, Durham, NC 27708-0120, jes9@mail.duke.edu, ***Gardner Walkup***

While the DA process frequently generates creative alternatives, the process often misses potentially valuable options associated with a project. We describe methods that we have found useful for thinking about project dynamics and discovering embedded options. We illustrate the ideas with examples drawn from the oil and gas industry.

2) Creating Alternatives When Tradeoffs Are Taboo, ***Robin Gregory***, Decision & Value Scope Res., 1124 West 19th St., N Vancouver, BC, V7P 1Z9, Canada

We describe recent work with private sector and government clients who are reluctant to acknowledge value tradeoffs made as part of both routine and strategic business decisions. We discuss approaches used to help identify these multiple objectives and assist in defining acceptable project or program alternatives.

3) Creating Customer Value by Creating Alternatives, ***Ralph L. Keeney***, Univ. of Southern CA, 101 Lombard St., Ste 704W, San Francisco, CA 94111

A general model of individual customer values is presented. Assessments from representative customers indicate the distribution of specific customer values. Proposed new products are evaluated against the set of existing products to indicate the increase in value for different customers and the market share for the new product.

ME24 Dynamic Multicriteria

Cluster: Multicriteria Decision Analysis
Invited Session
Chair: Gilles R. D'Avignon, Universite Laval, Fac. des sciences de l'admin., Ste.-Foy, Quebec, G1K 7P4, Canada, gilles.davignon@fsa.ulaval.ca

1) A Dynamic Multicriteria Model: Some Properties, ***Gilles R. D'Avignon***, Universite Laval, Fac. des sciences de l'admin., Ste.-Foy, Quebec, G1K 7P4, Canada, gilles.davignon@fsa.ulaval.ca

Multicriteria methods are used to rank actions/options with respect to a decision-maker's preferences, usually at a given point in time. But, in some situations there is a need to take decisions taking into account performance of previous years. Based on several contexts, a dynamic multicriteria model was developed. this presentation will discuss some properties of such a model.

2) A Dynamic Multicriteria Evaluation of Belgian Insurance Companies, ***Bertrand Mareschal***, Brussels Free Univ., Stats & OR, Bvd. du Triomphe CP 210/01, Brussels, B-1050, Belgium, bmaresc@ulb.ac.be, ***Annie Laforet***

Using a dynamic multicriteria approach together with appropriate data banks, Belgian insurance companies are investigated. The presentation will focus on the particular methodology used as wsell as the major findings.

3) A Dynamic Multicriteria Model to Health Care Resources Allocation, ***Martin Soucy***, Univ. Laval, Facul. des sciences de l'admin, Sainte-Foy, G1K 7P4, Canada, ***Gilles R. D'Avignon***

Using a dynamic multicriteria approach, two data banks (MED-ECHO) and SIFO) are investigated to measure the importance of several factors in the design of a system to allocate global financial resources to regions. The presentation will focus on a simulation of regional budgets over a period of three years.

ME25 Applied Probability in Finance

Sponsor: Applied Probability Section
Sponsored Session
Chair: Sid Browne, Columbia Univ., 402 Uris Hall, Grad. Sch. of Bus., New York, NY 10027, sb30@columbia.edu

1) Insights to Reality Gained from Some New Models in Finance, ***Larry Shepp***, Rutgers Univ.

A simple model for staff size management of a large company reveals that massive downsizing is part of the optimal strategy for maximizing total expected profit. The optimal strategy surprisingly makes use of a strategy which has often been considered paradoxical when companies use it, namely a company tends to downsize on an upturn in the company's fortune, e.g...

2) Some Numerical Issues in Pricing of Path-Dependent Financial Derivatives, ***Steve Kou***, Columbia Univ.

Recently, numerical analysis has just begun to be used in pricing financial derivatives, especially when analytical solutions are not available. An example is pricing of discrete path-dependent options, particularly, discrete lookback and barrier options. Although these are among the most popular options traded in markets, there are essentially no analytical formulas for these options, and even Monte Carlo simulation is very difficult.

3) withdrawn - chair request of 3/27, ***Michael Taksar***, SUNY, Dept. of Applied Math. & Stats, Stony Brook, NY 11794-3600

4) Probability Maximization & Active Portfolio Management, ***Sid Browne***, Columbia Univ., 402 Uris Hall, Grad. Sch. of Bus., New York, NY 10027, sb30@columbia.edu

The objective of "active" portfolio management is to beat a given index. Since an index is just some specific portfolio strategy, the "active" portfolio manager is concerned with beating another (given) portfolio strategy. In this paper we consider the objective of maximizing the probability of beating another strategy.

ME26 Stochastic Models in Manufacturing Systems

Cluster: Queueing
Invited Session

Chair: Elizabeth M. Jewkes, Univ. of Waterloo, Dept. of MS, 200 University Ave. W, Waterloo, Ontario, N2L 3G1, Canada, emjewkes@mansci.watstar.uwaterloo.ca

1) A Discrete MAP/PH/1 Vacation Queue with Threshold, ***Xiaoyi Xu***, Univ. of Manitoba, Dept. of MIE, Winnipeg, Manitoba, R3T 5V6, Canada, ***Attahiru S. Alfa***

We consider a single-server queue where vacations start when the queue becomes empty. The server only returns when the number of customers reaches a threshold N. Matrix-geometric methods are used to obtain the performance measures. This vacation control policy is more realistic than the standard N-policy or T-policy types...

2) Makespan in a Tandem Queueing System, ***Oi-Ming He***, Dalhousie Univ., Dept. of IE Daltech, PO Box 1000, Halifax, Nova Scotia, B3J 2X4, Canada, qmhe@newton.ccs.tuns.ca, ***Eldon Archibald Gunn***

This research studies the makespan of a batch of jobs in a production system which is modeled as a tandem queueing system. Approximations of the first and second moments of the makespan (departure time) of n jobs (customers) in a tandem queuing system with k servers in series are proposed for the light traffic case and the heavy traffic case, respectively. Numerical examples are discussed to learn insights into the makespan problem.

3) Optimal Investments in Setup Reduction with a Model Incorporating WIP Inventories, ***Tim Nye***, Univ. of Waterloo, MS Dept., 200 University Ave. W, Waterloo, Ontario, N2L 3G1, Canada, tyne@mansci.watstar.uwaterloo.ca

A substantial literature has developed over the last decade on EOQ/EPQ-based models of setup reduction. Since WIP is empirically known to be a major operating cost, and is not captured in EOQ/EPQ models, this work develops a queuing-based model for setup reduction. Analytic results are obtained, and comparisons are made to previous models.

4) A 2-Priority Queue with Crossover Feedback, ***David A. Stanford***, Univ. of Western Ontario, Dept. of Stats., Western Sci. Ctr., Rm. 262, London, Ontario, N6A 5B7, Canada, stanford@fisher.stats.uwo.ca, ***Elizabeth M. Jewkes***

In certain production environments, the priority of doing one task over another is fixed. We consider a model in which four product types require one or both of these tasks in a specified order. Results are given for all average delays and several delay distributions as seen by these product types.

ME27 Inventory Management I

Contributed Session

Chair: Ben A. Chaouch, Univ. of Windsor, Fac. of Bus. Admin., Windsor, Ontario, N9B 3P4, Canada, chaouch@uwindsor.ca

1) Inventory Placement in a Supply Chain for a Single Period Problem, ***Piotr Z. Stalinski***, Cleveland State Univ., Dept. of OM & Bus. Stats., E 24 St. & Euclid Ave., Cleveland, OH 44115, p.stalinski@csuohio.edu, ***Chia-Shin Chung***

This paper investigates the single-period placement problem for a serial supply chain. In our model, upper stages in the series resupply the lowest stage in case of a shortage. We assume a partial backorder/lost sales policy. We provide an iterative procedure for solving the problem.

2) Order Quantity in a Dual Supply Mode with Updating Forecasts, ***Houmin Yan***, Chinese Univ. of Hong Kong, Dept. of SE/EM, Shatin, NT, Hong Kong, China, yan@se.cuhk.edu.hk www.se.cuhk.edu.hk/~webadmin/Faculty/yan.html, ***Ke Liu***, ***Arthur Hsu***

In this paper, we study how an updated forecast affects manufacturer's choice in ordering raw materials, model the problem of optimal order quantity from two modes of suppliers' problems. We demonstrate that cost function is convex, and twice differentiable with respect to order quantity. With this model we are able to obtain...

3) Stock Levels & Delivery Rates in Quick-Response Replenishment Systems, ***Ben A. Chaouch***, Univ. of Windsor, Fac. of Bus. Admin., Windsor, Ontario, N9B 3P4, Canada, chaouch@uwindsor.ca

ME28 Innovative Software for OR/MS

Sponsor: **Forum on Education**

Sponsored Session

Chair: Rick Olson, Univ. of San Diego, Ind. & Systems Engineering, San Diego, CA 92110-2492, r_olson@acusd.edu

1) Simulating Queues in Spreadsheets: It Can (& Should) Be Done, ***Thomas A. Grossman***, Univ. of Calgary, Fac. of Mgmt., 2500 University Dr. NW, Calgary, Alberta, T2N 1N4, Canada, grossman@mgmt.ucalgary.ca;informs.org/informed/

Spreadsheet Add-In simulation is cheaper and more accessible (especially to low-tech users) than simulation packages. Simulating queues in spreadsheets has been perceived as being prohibitively difficult. We have developed families of spreadsheet queueing engines (available on the web) that allow queuing simulations to be quickly developed, even by unsophisticatged users.

2) What Do You Get When You Mate Excel with Mathematica?, ***Sam L. Savage***, Stanford University, EES & OR, 417 Terman Engineering Center, Stanford, CA 94305-4023, savage@stanford.edu

Mathematica is powerful but takes effort to learn. Now Mathematica's functions are available through a wizard in Excel. Imagine writing an Excel formula in one cell, and having its derivative and integral appear in two other cells. How about complex variables and Mathematica Graphics? It's all there.

3) Spreadsheet Add-Ins for OR/MS Instruction, ***Paul A. Jensen***, Univ. of TX, MC C2200, Dept. of Mech. Eng., Austin, TX 78712-1080, pjensen@mail.utexas.edu

I review several spreadsheet add-ins for Microsoft Excel. We restrict attention to add-ins that can be used for instruction in Operations Research and Management Science and that are provided by their authors for little or no charge.

4) Non-Commercial Courseware for OR/MS, ***Rick Olson***, Univ. of San Diego, Ind. & Systems Engineering, San Diego, CA 92110-2492, r_olson@acusd.edu

We will summarize courseware available through the internet and other non-commercial sources. Software applicable to statistics, math programming and decision analysis will be discussed. Typical programs discussed will include java-based WWW sites and interactive tutorials suitable primarily for undergraduate business or engineering courses.

ME29 New Aspects of Revenue Management

Sponsor: **Aviation Applications Section**

Sponsored Session

Chair: Garrett J. van Ryzin, Columbia Univ., 412 Uris Hall, New York, NY 10027, gjv1@columbia.edu

1) Revenue Management as a Queueing Control Problem: New Results, ***Conrad Lautenbacher***, Univ. of NC, Dept. of OR, CB #3180, Smith Bldg., Chapel Hill, NC 27599-3180, conrad@or.unc.edu, ***Janakiram Subramanian***, ***Shaler Stidham Jr.***

We consider revenue management with cancellations and overbooking. Exploiting the equivalence to a queueing control problem, we develop efficient dynamic-programming-based algorithms for calculating optimal booking limits for different fare classes. Our numerical results indicate possibly substantial increases in revenue using our model, when compared with previous approaches.

2) Abstracting the Revenue Management Problem for Practical Use, ***E. Andrew Boyd***, PROS Strategic Solutions, 3223 Smith, Ste. 100, Houston, TX 77006, boyd@prosx.com

A general formulation of the revenue mangement problem is presented and provable results are outlined. The practical importance of the formulation is stressed by describing how it can be used as the framework for defining revenue managment systems in new application areas.

3) Adaptive Methods for Seat Protection Optimization, ***Jeffrey I. McGill***, Queen's Univ., Sch. of Bus., Kingston, Ontario, K7M 6A1, Canada, ***Garrett van Ryzin***

We discuss recent progress on the application of a stochastic approximation scheme to adaptive updating of seat protection levels.

ME30 Evaluating Benefits of Government Aviation Technology Programs II

Sponsor: **Aviation Applications Section**

Sponsored Session

Chair: Jesse P. Johnson, Logistics Mgmt. Inst., 2000 Corporate Ridge, McLean, VA 22102, jjohson@lmi.org www.asac.1mi.org

1) Evaluation of Decision Support Tools for Air Traffic Management, ***David B. Lee***, 6486 Eastwood Glen Dr., Montgomery, AL 36117, dlee@1mi.org,703-917-7557, ***Dou Long***, ***Joana Plugge***, ***Mel R. Etheridge***, ***Jesse P. Johnson***, ***Peter Kostiuk***

We present a general method for making cross-comparable estimates of the benefits of decision support technologies for air traffic management and apply it

to 3 NASA-developed tools: Active Final-Approach Spacing Tool, AFAST, Expedite Departure Path, EDP, and Conflict Probe and Trial Planning, CPTP.

2) Safety Analysis, *Gerald W. Shapiro*, 5923 Kingsford Rd., Springfield, VA 22152, ***Peter Kostiuk***

A methodology for quantitative assessment of the safety impacts of changes in air traffic procedures and/or technologies is presented with case studies. The methodology combines reliability analysis with an "impact-response" model, which guides the analyst in selecting simulation scenarios.

3) Upgraded ASAC Air Carrier Investment Model, *Earl R. Wingrove*, Wyle Labs., ewingrov@1mi.org, ***Eric Gaier***

To assist US industry with future technological challenges, NASA must identify research with the greatest potential for improving the air transportation system. ASAC utilizes a parametric model to link airline operations with aircraft characteristics. We added the following modules: US functional cost, Asian and European econometric, market share and input-output.

4) withdrawn 3/11, *Caroline Nelson, Majorie Curia*

ME31 Arc Routing

Cluster: Logistics
Invited Session

Chair: Michel Gendreau, Univ. de Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, michelg@crt.umontreal.ca

1) Capacitated Arc Routing Problems on Directed Graphs, *Pierre Dejax*, Ecole Centrale Paris, Lab. Prod. Logistique, Lab. Prod. Logistique, Grande Voie des Vignes, Chatenay-Macabry, 92295, France, dejax@pl.ecp.fr, ***Michel Gendreau, Cyrille Gueguen***

We present a new model for capacitated are routing problem on undirected graphs. Using this formulation, we detail some reconstruction heuristics basecd on a relaxation of th is model. Some preliminary results would conclude the presentation.

2) Heuristics for the Mixed Chinese Postman Problem, *Brigitte Martineau*, Univ. of Montreal, CRT, CP 6128, succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, ***Gilbert Laporte, Patrick Soriano***

We compare several heuristic strategies for the Chinese Postman Problem on a mixed graph. The first two, MIXED1 and MIXED2 proposed by Frederickson at al have worst-case bounds. The new heuristics transform the problem into a TSP.

3) The Chinese Postman Problem with Turn Penalties, *Jacinthe Clossey*, Univ. of Montreal, CRT, CP 6128 Succ. Centerville, Montreal, Quebec, H3C 3J7, Canada, ***Gilbert Laporte, Patrick Soriano***

We propose heuristics for the Chinese Postman Problem on a rectilinear undirected graphs, with penalties for U-turns, left-turns and right-turns. Instead of transforming this problem into an equivalent TSP, we use a direct approach to handle turn penalties while constructing the Eulerian cycle.

4) The Stochastic Eulerian Tour Problem, *Srimathy Gopalakrishnan*, Univ. of Montreal, DIRO & CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, ***Michel Gendreau, Jean-Marc Rousseau***

We define the SETP as follows: Consider an Eulerian graph in which n edges require service. On any given instance of the problem, only a subset of the n edges have to be visited to provide service, and the number of edges present is determined using a specified probability distribution.

ME32 Managing Schools

Sponsor: Public Programs & Processes Section
Sponsored Session

Chair: Robert Shumsky, Univ.of Rochester, Simon Grad. Sch. of Bus., Rochester, NY 14627, shumsky@ssb.rochester.edu

1) School Performance Evaluation with Data Envelopment Analysis, *Douglas Lamdin*, UMBC, Policy Sciences Grad. Program, 1000 Hilltop Circle, Baltimore, MD 21250, lamdin@umbc2.umbc.edu

Across the US, an increasing focus is on measurable outcomes and performance evaluation in primary and secondary education. DEA is a logical and potentially valuable evaluation tool. We describe and illustrate its potential use.

2) Making Continuous Improvement Work in Schools, *Gordon S. Black*, Gordon S. Black Corp., 135 Corporate Woods, Rochester, NY 10175, gordonb@gsbc.com

3) Private Management of Public Schools: Lessons from the Edison Project, *John Chubb*, The Edison Project, 521 5th Ave., 16th Floor, New York, NY 10175, john_chubb@edisonproject.com

The private management of public schools is emerging as a potentially major new strategy in education reform in the US. The Edison Project is the largest private manager of public schools in the US. The presentation will apply Edison's practical lessons to the policy issues of private management.

4) A Framework & National Benchmarks for Assessing Academic Productivity, *Lawrence C. Walters*, Brigham Young Univ., Inst. of Public Mgmt., 760 TNRB, Provo, UT 84602, larry_walters@byu.edu, ***Gary C. Cornia, Douglas Chabries***

We make use of a national sample of post-secondary faculty to test and develop a framework for assessing the productivity of academic departments and faculty. The framework provides useful insights for academic administrators who must allocate scarce resources. The framework and benchmarks are applied to a large private university and the resulting policy implications are explored.

ME33 Resource Allocation

Contributed Session

Chair: Graeme M. Warren, Univ. of Pretoria, Dept. of ISE, Pretoria, 0002, South Africa, graeme@iiwi.ee.up.ac.za maui.ee.up.ac.za/~graeme/graeme.htm

1) Demand/Routing Control & Capacity Planning of Network Systems, *Yasushi Masuda*, Keio Univ., Fac. of Science & Tech., 3-14-1 Hiyoshi Kohoku, Yokohama, 223, Japan, masuda@ae.keio.ac.jp

When the traffic volume and routing ar not static, a naive application of bottleneck analysis may hurt the system. We investigate the pricing for traffic control and the problem of capacity expansion of systems with optimal or suboptimal equilibrium traffic.

2) Scheduling of Multi-Plant Systems for Rapid Replenishment to Retailers, *Gregory W. Diehl*, Harvard Univ., 29 Oxford St., Cambridge, MA 02138, diehl@paone.harvard.edu, ***Edward Lau, Frederick H. Abernathy***

We examine resource allocation and production scheduling problems in the rapid replenishment business. We design scheduling policies for a multi-plant system (with quick and slow response times) so as to maximize profit while fulfilling seasonally varying demand.

3) The Product Mix Problem: Heuristics, *Graeme M. Warren*, Univ. of Pretoria, Dept. of ISE, Pretoria, 0002, South Africa, graeme@iiwi.ee.up.ac.za maui.ee.up.ac.za/~graeme/graeme.htm

We will formulate the product mix problem and consider the performance of several heuristics for this problem. We will describe a related rate mix problem and establish a connection to recent work on the stability of queueing networks.

ME34 Software Demonstrations

Chair: To be announced

1) Software Demonstration: New Developments in MIMI, *Tom Baker*, Chesapeake Decision Sciences Inc., 200 South St, New Providence, NJ 07974, teb@chesapeake.com

MIMI is an application environment for planning, scheduling and supply chain applications that combines OR, expert systems, graphics and database technologies. We trace the evolution of MIMI over a period of 10 years and demonstrate some of the most recent developments in the areas of distributed computing, modeling wizards and internet/intranet capabilities.

2) Software Demonstration: ALPHA/Sim Software Simulation Tutorial, *Kendra E. Moore*, Alphatech Inc., 50 Mall Rd., Burlington, MA 01803-4537

ALPHA/Sim is a general-purpose, discrete-event simulation tool. ALPHA/Sim allows a user to graphically build a simulation model, enter input data via integrated forms, execute the simulation model and view the simulation results, within a single graphical environment. We describe how to use ALPHA/Sim to build, simulate and analyze a simple manufacturing system and describe some advanced features and list some sample applications.

ME35 Decision Support Systems III

Contributed Session

Chair: Cathleen M. Brown, US Military Academy, Dept. of Systems Eng., Mahan Hall, West Point, NY 10996, fc6756@trotter.usma.edu www.se.usma.edu

1) Innovative Battle Command & Control System Architecture

for Force XXI, ***Cathleen M. Brown***, US Military Academy, Dept. of Systems Eng., Mahan Hall, West Point, NY 10996, fc6756@trotter.usma.edu www.se.usma.edu, ***James E. Armstrong, Jr.***, ***William B. Carlton***

The Task Force XXI Advanced Warfighting Experiment during the National Training Center Rotation at Ft. Irwin, California 15-29 March 1997 raised many intriguing issues about the impact of digitization on the design and operation of battle command and control systems. Some issues are system architecture concerns about the mix of voice and data on the same net and the static nature of the addressing scheme...

2) Possibilistic Analysis of Government Projects, ***Bel G. Raggad***, Pace Univ., 861 Bedford Rd., Pleasentville, NY 10570, raggad@pacevm.dac.pace.edu, ***Moncef Belhadjali***

A private project involves a quantitative comparison of the streams of costs and benefits over its expected economic life. A government project contains ligitimate ambiguity due to the fuzziness of its revenues received through various forms of taxation and spent supposedly in the public interest. The paper proposes a possibilistic framework...

3) Planning Information Systems: New Architectures & Old Problems, ***Pedro R. Kanof***, George Washington Univ., Dept. of MS, 1669 32nd St., Washington, DC 20007, pkanof@aol.com

In recent years, new architectures have been proposed to answer the needs of corporations that use information systems. The new architectures include open systems, distributed databases, and intensive use of computer networks (LAN and WAN). In this paper, I disucss three important consequences of the new architectures and propose some solutions.

4) Factors Influence Usage Patterns of Analytical Techniques Within Project Management Software, ***Matthew J. Liberatore***, Villanova Univ., Coll. of Commerce & Finance, 800 Lancaster Ave., Villanova, PA 19085, liberator@ucis.vill.edu, ***Bruce Pollack-Johnson***

We discuss the analysis of an extensive random survey of Project Management professionals concerning usage of PM software and analytical techniques as well as opinions about future research directions. Implications for researchers in Project Scheduling will be discussed.

ME36 Minimum Cut Algorithms

Cluster: Networks
Invited Session
Chair: Thomas S. McCormick, Univ. of British Columbia, Fac. of Commerce, 2053 Main Hall, Vancouver, BC, V6T 1Z2, Canada, stmv@adk.commerce.ubc.ca

1) Building Chain & Cactus Representations of All Minimum Cuts From Hao-Orlin in the Same Asymptotic Run Time, ***Lisa Fleischer***, Columbia Univ., 330 SW Mudd Hall, New York, NY 10027, lisa@ieor.columbia.edu

A cactus tree is a simple data structure that represents all minimum cuts of a weighted graph in linear space. We describe the first algorithm that can build a cactus tree from the asymptotically fastest deterministic algorithm that finds all minimum cuts in a weighted graph--the Hao-Orlin minimum cut algorithm. This results id a faster deterministic algorithm to construct a cactus tree of a graph.

2) Crossing Properties of Multiterminal Cuts, ***David B. Hartvigsen***, Univ. of Notre Dame, Coll. of Bus. Admin., PO Box 399, Notre Dame, IN 46556-0399, hartvigsen.i@nd.edu, ***Robert F. Easley***

Gomory and Hu proved the following: For any graph with nonnegative edge weights there exists a collection of noncrossing cuts that contains a min cut for every pair of nodes. We show how this result generalizes for a natural multiterminal cut problem.

3) withdrawn - chair request of 2/10, ***Dorit S. Hochbaum***, Univ. of CA, 4135 Etcheverry Hall, Dept. of IE/OR, Berkeley, CA 94720, dorit@hochbaum.berkeley.edu

4) Approximate Binary Search Algorithms for Mean Cuts & Cycles, ***Thomas S. McCormick***, Univ. of British Columbia, Fac. of Commerce, 2053 Main Hall, Vancouver, BC, V6T 1Z2, Canada, stmv@adk.commerce.ubc.ca

Iwano, et al. gave an approximate binary search algorithm for computing max mean cuts. We give a short proof of the correctness of their algorithm. We also show how their algorithm can be dualized to an approximate binary search algorithm for computing min mean cycles that is as fast as but simpler than Orlin & Ahuja's algorithm.

ME37 Constraint-Based Programming: Algorithmic Analytics

Sponsor: CSTS
Sponsored Session
Chair: Carol Tretkoff, ILOG Inc. & CUNY, 1901 Landings Dr., Mountain View, CA 94040, tretkoff@ilog.com

1) Cooperative Solvers: ILOG Solver & CPLEX, ***Michel Leconte***, ILOG, 1 rue de Verdun, Gentilly, 94253, France, leconte@ilog.fr, ***Philippe Refalo***, ***Jean-Francois Puget***

We present a tight coupling between a constraint programming system and an LP system. We have integrated 2 state-of-the-art systems, ILOG Solver, a C++constraint-programming library and the CPLEX Callable Library into a new C++ optimization library. We show how they work together and discuss implementation issues such as communication between finite domain propagation and B&B search...

2) Practical Aspects of Randomized Algorithms, ***Carla P. Gomes***, Rome Laboratory, 525 Brooks Rd., Rome, NY 13441-4505, gomes@ai.rl.af.mil

Recently, stochastic algorithms have become very successful. We consider complete randomized backtrack-style algorithms, within a constraint based paradigm. These algorithms are a particular case of Las Vegas algorithms, i.e stochastic algorithms that always return the correct solution if it exists or prove inconsistency. We describe interesting properties of their computational cost distributions and the implications of this kind of analysis for algorithm design.

3) Modeling & Solving Sports League Scheduling with Constraint Programming, ***Jean-Charles Regin***, ILOG, 9 rue de Verdun, Gentilly, 94253, France, regin@ilog.fr

We aims to show how a classic practical benchmark problem for scheduling sports leagues can be solved easily and efficiently using constraint programming. A solution to this problem is given this result outperforms all previous work (as of this writing). The proposed model highlights the advantages of using efficient filtering algorithms for several kinds of global constraints...

4) Disjunctive Constraints & Financial Optimization, ***Ken McAloon***, ILOG & CUNY, 1901 Landings Dr., Mountain View, CA 94040, mcaloon@ilog.com

Portfolio optimization models include the LP based mean absolute deviation models (Sharpe) and the QP models (Markowitz). When disjunctive constraints such as mutual exclusions, minimal trading amounts, integrality requirements etc. are added, interesting computational issues arise as well as problems of model formulation. Available approaches and performance trade-offs will be discussed.

ME38 Financing Major Telecommunications Projects in Canada

Sponsor: TST
Sponsored Session
Chair: Francis Paquet, Microcell Connexions, 1250 Boul. Rene-Levesque ouest, Montréal, Québec, H3B 4W8, Canada

1) Creating a Telecommunications Business Case In Canada, ***Jacques Leduc***, Microcell Telecom., ***Rene Bousquet***

With the emergence of the convergence of the information technologies and a favorable regulatory framework, telecommunications offer new business opportunities as well as real challenges for existing companies. Growth on the Internet, explosion of the wireless business, competition in telephone service local access, emergency of satellite service providers will bring Canada toward the 21st century. These elements are all presented here from a financial standpoint.

2) Launching Personal Communication Service in Canada: Microcell's Case, ***Luc Vincent***, MODELCOM, ***David Hannan***

Microcell is an example of a new company that has taken the risk of exploiting the PCSs new business here in Canada. We present the company positioning and tools developed to assess the viability and assure a sustainable plan.

3) The Convergence Challenge, ***Remy Brodeur***, Bell Canada, Canada

Digitization - a true technological revolution - has brought about convergence, then competition, in what has come to be known as the telecommunications and new media industry. What are the main issues facing a telecommunications company such as Bell Canada in this new information society, where the consumer is king?

Tuesday 08:00-09:30

TA01 Traffic Network Origin-Destination Demand Estimation

Sponsor: TSS & IFORS
Sponsored Session
Chair: R. Jayakrishnan, Univ. of CA, Dept. of Civil & Env. Eng., Irvine, CA 92697, rjayakri@uci.edu

1) A Real-Time Framework for the Dynamic Origin-Destination Flow Estimation & Prediction Problem in Congested Vehicular Networks, ***Ying Kang***, Univ. of TX, Dept. of Civil Eng., ECJ 6.2, Austin, TX 78712, yingkang@mail.utexas.edu, ***Hani S. Mahmassani***

A polynomial expression of rapidly time-varying origin-destination flows is used in a sequential Kalman Filter model in conjunction with a dynamic traffic assignment simulator. Numerical experiments are presented.

2) Derivation of Section Measures & Incomplete Origin-Destination Data & Its Use in Dynamic Origin-Destination Estimation, ***Carlos Sun***, Univ. of CA, Civil & Env. Eng., Irvine, CA 92697, c2sun@uci.edu, ***R. Jayakrishnan***

A "readily implementable" approach is presented for the collection and derivation of section measures and incomplete OD data. Signal processing and system identification techniques are used to reidentify vehicles and extract traffic measurements. A dynamic OD framework which uses these new types of data is described in detail.

3) An Adaptive & Dynamic Framework for Freeway Origin-Destination Demand Predictions, ***Debashish Bhattacharjee***, Purdue Univ., Civil Eng., W. Lafayette, IN 47907, dbhattac@ecn.purdue.edu, ***James V. Krogmeier, Kumares C. Sinha***

An improved adaptive and dynamic framework is proposed for predicting freeway OD demands. Such framework is ideal for real-time application both under normal and incident induced congestion situation. The effect of probe vehicles on the performance of filtering technique is studied in depth. Our proposed framework showed promising results with simulation experiments conducted on a freeway network in Indiana.

TA02 TSP

Sponsor: TSS
Sponsored Session
Chair: Jacques Renaud, Univ. du Quebec, Tele-univ., 2600 Blvd. Laurier, Tour de la Cite, CP 10700, Quebec, Quebec, G1V 4V9, Canada, jrenaud@teluq.uquebec.ca

1) Applying the Neural Networks Approach to Solve the Traveling Salesman Problem, ***Dahbia Kadi***, Groupe Ecole Superieure de Commerce de Rennes, 2 rue Robert d, Arbrissel, France, dahbia.kadi@esc-rennes.fr, ***Laoucine Kerbache***

Our research considers the mathematical methods to solve the TSP and VRP. We investigate the use of a novel heuristics class method: the NN to solve these problems. Among the several types of NN, we consider the unsupervised learning algorithms and more precisely the Kohonen self-organising networks. We will first apply this new approach to the TSP and then investigate its generalisation to the VRP.

2) Approximation Algorithms for the Capacitated Traveling Salesman Problem with Pick-Ups & Deliveries, ***Julien D. Bramel***, Columbia Univ., 406 Uris Hall, Columbia Bus. Sch., New York, NY 10027, jdb8@columbia.edu, ***Shoshana Anily***

We consider the CTSSPD. This problem has pick-up points and delivery points where a single point is, respectively, available and desired. A vehicle of limited capacity must pick-up and delivery all product. We present 2 polynomial-time approximation algorithms and analyse their worst-case performance.

3) A Tabu Search Algorithm for the Generalized Traveling Salesman Problem, ***Frederick Semet***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal Quebec, H3C 3J7, Canada, frederic@crt.umontreal.ca, ***Jacques Renaud***

The generalized TSP consists of determining the shortest tour which passes through m sets of nodes visiting exactly one node in each set. We describe a TS heuristic based on a partition of the m sets into subsets according to a classification procedure. This algorithm produces near optimal results on the 36 TSPLIBS problems for which the optimal solutions are known.

4) Perturbation Algorithms for the Pickup & Delivery Traveling Salesman Problem, ***Jacques Renaud***, Univ. du Quebec, Tele-univ., 2600 Blvd. Laurier, Tour de la Cite, CP 10700, Quebec, Quebec, G1V 4V9, Canada, jrenaud@teluq.uquebec.ca, ***Fayez F. Boctor***

In the pickup and delivery TSP, each pickup customer should be visited before its associated delivery customer. We propose different perturbation algorithms which can be used as improvement procedures. Results are presented for a large set of benchmark test problems.

TA03 Hazardous Materials Transportation Planning

Sponsor: TSS
Sponsored Session
Chair: Erhan Erkut, Univ. of Alberta, Fac. of Bus., Edmonton, Alberta, T6G 2R6, Canada, erhan.erkut@ualberta.ca

1) Routing & Scheduling of Radioactive Shipments in Networks with Time-Varying Costs & Curfews, ***L. A. Bowler***, Northwestern Univ., Dept. of Civil Eng., Evanston, IL 60208, ***Hani S. Mahmassani***

A time-dependent least-cost path algorithm using a label-correcting approach is adapted to capture time-varying risk and curfews through certain cities. The impact of curfews and travel time uncertainty on departure time flexibility in networks is examined, and trade-offs among risk and travel time are investigated in an actual test network.

2) Incorporating Plume Model in Hazmat Risk Analysis, ***Jianjun Zhang***, Univ. of Alberta, Dept. Earth & Atmospheric Sci., Edmonton, Alberta, T6G 2H4, Canada, jianjun@pop.srv.ualberta.ca

Plume models evaluate the distribution of gaseous pollutants in the area impacted by a pollution source. Incorporating plume models in transportation risk analysis is computationally intensive. We show how plume models can be incorporated in hazmat risk analysis and routing with the help of a GIS.

3) Do Temporal Effects Make a Difference in Hazmat Routing?, ***William Frank***, SUNY, Dept. of IE, Buffalo, NY 14260, ***Rajan Batta, J. C. Thill***

We investigate hazardous material routing with some link attributes as a function of time. To answer the question of whether temporal effects matter, a realistic case study if required. Our case study will use a GIS and model the continental US. Algorithmic solution methods are also discussed.

4) Selecting Dissimilar Paths, ***Vedat Akgun***, SUNY, Dept. of IE, Buffalo, NY 14260, ***Erhan Erkut***

It may be desirable to generate a number of alternate paths between an origin and a destination for certain transport planning instances. The use of the most obvious method for this, a k-shortest path algorithm, may result in k paths that are very similar to one another. We study alternate methods for generating paths that are spatially dissimilar, and report our computational results.

TA04 Operations Management II

Contributed Session
Chair: Srinagesh Gavirneni, Schlumberger, 8311 North FM 620, Austin, TX 78726, gavirneni@slb.com

1) Benefits of Cooperation in a Production Distribution Environment, ***Srinagesh Gavirneni***, Schlumberger, 8311 North FM 620, Austin, TX 78726, gavirneni@slb.com

We model cooperation in a production distribution setting that contains one capacitated supplier and many identical retailers. We consider 3 inventory allocation mechanisms, representing varying degrees of information sharing, at the supplier and estimate the benefits due to cooperation in this supply chain. We observed that the benefits of cooperation decrease when supplier capacity increases...

2) Supply Contracts in a Capacity-Constrained Supplier Oligopoly, ***Elizabeth C. Junqueira***, Univ. of CA, 2525 1/2 Hillegass Ave., Berkeley, CA 94704, junqueir@ieor.berkeley.edu www.ieor.berkeley.edu/~junqueir, ***Candace A. Yano, J. George Shanthikumar***

We consider supply contracts from the supplier's perspective. We model the problem of supplier-capacity allocation among multiple buyers, when each contract specifies bounds on per-period purchase quantities. We discuss properties of the optimal policy and related managerial insights.

3) Supplier Base Management: Screening, Incentives & Idiosyncratic Investments, ***Mordechai Levi***, Univ. of PA, The Wharton Sch., 1341 SH-DH, Philadelphia, PA 19104-6366, moti@opim.wharton.upenn.edu, ***Paul R. Kleindorfer***

This paper builds on Seshadri (1995) in solving simultaneously the joint problem of screening an appropriate number of suppliers and investing in the quality of the resulting longer-term relationships with these suppliers. The results of this theoretical investigation are contrasted with empirical trends on supplier base size and structure.

TA05 Cooperation, Pricing, Flexibility & Transportation Problems in Supply Chains

Sponsor: MSOM
Sponsored Session
Chair: Shanling Li, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, li@management.mcgill.ca

1) Cooperation Issues in a Manufacturer-Retailer System, ***Zhimin Huang***, Adelphi Univ., Sch. of Bus., Box 701, Garden City, NY 11530, huang@sable.adelphi.edu, ***Susan Li***

We examine the issues of cooperation in a manufacturer-retailer inventory system. Game theory concepts form the foundation for the analysis of these issues. Initially, the relationship between the buyer and seller is modeled as a 2-stage game, then interactive game theory is utilized to address the problem of system cooperation.

2) Heuristic Approaches to a Mail Transportation Network, ***Wen-Chyuan Chiang***, Univ. of Tulsa, Coll. of Bus., 600 S College Ave., Tulsa, OK 74104-3189, qm_wc@centum.utulsa.edu, ***Panos Kouvelis***

We consider a mail transportation network in which distance is to be minimized subject to time constraint. We propose an optimization framework and discuss efficient heuristics to solve the problem. Computational results are presented and compared.

3) Modeling & Evaluation of Multiple International Sourcing Agreements Using Option Pricing Techniques, ***Constantin A. Vaitsos***, Univ. of Southern CA, Marshall Sch. of Bus., Los Angeles, CA 90089-1421, vaitsos@alnitak.usc.edu, ***Genaro J. Gutierrez***

We study the trade-offs involved in devising multi-supplier sourcing agreements to hedge against exchange rate fluctations that may give cost advantage to sourcing in certain regions of the world. We evaluate the benefits of adding/dropping suppliers from the existing sourcing network using option pricing techniques.

4) Flexibility & Supply Chain Relations, ***Sudheer Gupta***, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, gupta@management.mcgill.ca

We study investments in flexible technologies by manufacturers producing differentiated products and their impact on supply chain relations when competitive reactions are explicitly accounted for. Various supply contracts under different technology states are analyzed.

TA06 Modeling & Analysis of Agile Workforces

Sponsor: MSOM
Sponsored Session
Chair: Wallace J. Hopp, Northwestern Univ., Dept. of IE/MS, 2225 North Campus Dr., Evanston, IL 60208-3119, hopp@iems.nwu.edu

1) Modeling the Flexible Labor Supply Chain, ***Joseph Milner***, Washington Univ., Olin Sch. of Bus., One Brookings Dr., CB 1133, St. Louis, MO 63130, milner@wuolin.wustl.edu, ***Edieal J. Pinker***

We analyze the interaction of a firm and a contingent labor supplier through a stochastic model including both supply and demand processes. We consider both short term labor availability and long term contracts. We determine optimal policies and discuss their implications for management.

2) On Pooling in Queueing Networks, ***Martin I., Reiman***, Bell Labs., Lucent Tech., 600 Mountain Ave., Rm. 2C-117, Murray Hill, NJ 07974-2070, marty@lucent.com, ***Avishai Mandelbaum***

We compare 2 systems: an unpooled system consisting of specialized servers, which is modeled as a Jackson network and a pooled system consisting of flexible servers which is modeled as an M/PH/1 queue. We examine steady-state mean sojourn times in these 2 systems and show that sometimes pooling helps and sometimes it hurts.

3) Flexible Workforce Scheduling in a Job Shop, ***Hong Chen***, HKUST & Univ. of British Columbia, Fac. of Comm., BRAMSS, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, honchen@uxmail.ust.hk, ***Brian Kapalka***, ***Martin L. Puterman***

We describe our approach to modeling and improving workforce allocation for a British Columbia aviation parts manufacturer. We present a stochastic simulation model of the job shop and investigate the performance of a several dynamic employee scheduling rules. We discuss some challenging stochastic optimization problems that arise in this setting.

4) Organization of Flexible Labor in Stochastic Production Systems, ***Mark P. Van Oyen***, Northwestern Univ., IE/MS Dept., 2225 N Campus Dr., Evanston, IL 60208-3119, vanoyen@nwu.edu, ***Wallace J. Hopp***, ***Esma Senturk-Gel***

We analyze serial production systems with agile workers as queueing control and performance analysis problems. We investigate the optimal dynamic assignment of workers to jobs/stations over time under various constraints on worker agility to identify conditions yielding significant performance improvement "opportunity".

TA08 Panel: Issues in Technology Management Education

Sponsor: Technology Management Section
Sponsored Session
Chair: Michael K. Badawy, VA Tech., Pamplin Coll. of Bus., 7054 Haycock Rd., Falls Church, VA 22043, badawy@vt.edu

1) Panel: Issues in Technology Management Education, ***Robert M. Mason***, Case Western Reserve Univ., Weatherhead Sch. of Mgmt., 10900 Euclid Ave., Cleveland, OH 44106-7235, ***Michael K. Badawy***, ***Louis Lefebvre***

Academic program in technology and innovation management will be described, analyzed, and evaluated. Different paradigms will be explored along with their implications for the design and implementation of graduate degree program in MOT.

TA09 Managing the Interactions Between New Peoduct Development, Operations & Marketing

Sponsor: Technology Management Section
Sponsored Session
Chair: Kamalini Ramdas, Univ. of VA, Darden Grad. Sch. Bus. Admin., PO Box 6550, Charlottesville, VA 22906, ramdask@darden.gbus.virginia.edu

1) Responding to Changing Customer Needs: The Design of a Flexible Development Process, ***Marco Iansiti***, Harvard Bus. School, Morgan Hall T69, Boston, MA 021633, miansiti@bhs.edu, ***Alan D. MacCormack***

How do firms manage product development when customer needs change dramatically during the development cycle? We describe exploratory research in the internet software industry which illustrates an approach to development based upon continuous interactions with customers. The design "evolves" during a cycle in response to changing information on customer requirements.

2) A Cross-Functional Approach to Evaluating Line Extensions for Assembled Products, ***Mohanbir S Sawhney***, Northwestern Univ., Kellogg Grad. Sch. of Mgmt., Leverone Hall,2001 Sheridan Rd, Evanston, IL 60208-2013, mohans@nwu.edu, ***Kamalini Ramdas***

We present a cross-functional approach to evaluating a set of line extensions for assembled products. We simultaneously model demand side and cost side interactions among products in the product line. This allows to integrate marketing, operations, and accounting perspectives on variety management, and to optimize incremental contribution from line extensions.

3) Internalization & Integration of Design & Production, ***Karl Ulrich***, Univ. of PA, Wharton Sch. Dept. of OPIM, 1317 SHDH, Philadelphia, PA 19104, ulrich@wharton.upenn.edu, ***David Ellison***

A trend in industry seems to be increasing outsourcing of component production, and in some cases component design. We examine the question of how to organize the design and production of products and their components. We review the literature, propose a new framework, and present evidence from industrial practice.

4) Modeling the Performance of Innovations as Interactions Between R&D, Production & Marketing, ***Soumyo D. Moitra***, Indian Inst. of Mgmt., Dept. of Op. Mgmt., Diamond Harbour Rd., Joka, Calcutta, 700027, India, sdmoitra@hotmail.com

The performance of innovations depends on the decisions a firm makes with respect to research and development, production, and marketing. This paper explores models that link the development decisions with the performance of the innovation. The approach integrates the development process of an innovation with its subsequent lifecycle.

TA10 Scheduling with Uncertainty

Cluster: Scheduling
Invited Session
Chair: Xiaoqiang Cai, Chinese Univ. of Hong Kong, Dept. of Systems Eng., Shatin NT, Hong Kong, xqcai@se.cuhk.hk

1) Due-Date Determination & Resequencing, ***Chung-Lun Li***, Washington Univ., Olin Sch. of Bus., CB 1133, St. Louis, MO

63130, lichung@wubmail.wustl.edu, ***T. C. Edwin Cheng***

Traditional scheduling due-date determination models assume that the production system is operating in a static and deterministic environment and the system carries no workload at each sheduling epoch. We consider a new due-date determination model which applies to the situation where the scheduler wishes to update the existing schedule when some new jobs have arrived into the system.

2) A Modified Genetic Algorithm for Power System Scheduling, ***Xiaohong Guan***, Xian Jiaotong Univ., Inst. of Systems Eng., Shanxi, China, ***Xiaoqiang Cai***, ***Houmin Yan***

A modified GA is applied to improve the schedules generated by a Lagrangian relaxation method for power systems scheduling. Instead of using penalty factors to handle constraints, the basic GA operators are modified to deal with large numbers of the system-wide and individual constraints.

3) A Mathematical Programming Approach for Quality Improvement of Ready-to-Assemble Products, ***Manu S. Madan***, Univ. of WI, Mgmt. Dept., Whitewater, WI 53190, madanm@uwwvax.uww.edu, ***R. P. Sundarraj***, ***Tom Bramorski***

Customers of RTA products often experience difficulty in the assembly process. This is primarily due to the confusing grouping and scheduling of parts that result in a significant amount of search time for the parts. In this research, we provide a methodology for determining grouping of parts with the objective of easing the assembly process.

4) Scheduling Assembly Process with Uncertain Material Arrivals, ***Gavin Cheung***, ***Houmin Yan***

The uncertain material supplies affect the on time delivery of the end-products. Considering this uncertain factor in designing the sequence of assembly processes would improve the system performance. We consider the problem of a single product with multiple operations. Conditions are developed in scheduling assembly processes with consideration of random material arrivals and process time.

TA11 Other FMS Issues

Cluster: **Flexible Manufacturing Systems**
Invited Session

Chair: Kathryn E. Stecke, University of Michigan, Sch. of Business, 701 Tappan Rm 5206, Ann Arbor, MI 48109-1234, kstecke@umich.edu

1) An Empirical Study of Correlation Analysis Between Flexible Automation & Manufacturing Flexibility, ***Marcio Zukin***, PUC/Rio, Dept. of IE, Rua Marques de Sao Vicente 225, Rio de Janeiro, 22453-900, Brazil, marzukin@rdc.puc-rio.br, ***Paolo R. T. Dalcol***

This paper discusses issues derived from a deep insight into the results of a recent study involving 16 leading firms of the consumer electronics industry in Brazil. It analyses the relationship between flexible automation and variables such as managerial perception of flexibility, machine changeover and increase in variety of products.

2) A Genetic Algorithm & Dynamic Programming Approach for the Dynamic Layout Problem, ***C.H. Cheng***, The Chinese Univ. of Hong Kong, ***J. Balakrishnan***, ***Chung-Ming Lau***

The dynamic facility layout problem designs facility layouts over a multiple period planning horizon. Since the problem is very complicated, optimal algorithms such as dynamic programming are not effective in solving large problem instances. In this research, we explore the use of genetic algorithm.

3) withdrawn - author request of 3/3, ***Byoung Kyn Choi***, Dept. of Ind. Eng. KAIST, 373-1, Kusong-dong Yusong-gu, Taejon, 305-701, Korea, bkchoi@bezier.kaist.ac.kr, ***Byoung Hee Kim***

4) A 2-Level Approach for Balancing a Flexible Assembly Line, ***Tadeusz Sawik***, Dept of CIM Fac of Management, University of Mining & Metall, Ul Gramatyka 10, Krakow, 30-059, POLAND, tsawik@novell.zarz.agh.edu.pl

A two-level approach is presented to determine duplicate assignment of assembly tasks to stations with limited working space and to simultaneously select assembly plans and assembly routes for a mix of products so as to balance the station workloads and to minimize total transportation time in a unidirectional flow line.

TA12 Data Envelopment Analysis: Health Care Applications II

Cluster: **Health Applications**
Invited Session

Chair: Yasar A. Ozcan, VA Commonwealth Univ., Dept. of Health Admin., PO Box 980203, Richmond, VA 23298-0203, ozcan@gems.vcu.edu

1) Physician Benchmarking for Asthma Cases with DEA, ***Yasar A. Ozcan***, VA Commonwealth Univ., Dept. of Health Admin., PO Box 980203, Richmond, VA 23298-0203, ozcan@gems.vcu.edu, ***Shyuemeng Luu***, ***Kevin W. Glass***, ***Charles Shasky***, ***Louis F. Rossiter***

DEA was used to evaluate physician practice behavior for asthma. DMUs consists of 274 physicians who treated 50 or more cases of asthma in Virginia during 1995. Production of the services by frontier physicians occur with less resource consumption and if emulated by non-efficient physicians, $8.2 million can be saved.

2) Measuring Efficiency in OECD Health Sectors: A DEA Approach, ***Fabienne Fecher***, Univ. of Liege, Fac. d'Econ. de Gestion, Blvd. du Rectorat7 Bt B31, Liege, 4000, Belgium, ffecher@ulg.ac.be

The purpose of this paper is to measure and to compare technical efficiency both from a static and a dynamic points of view in 20 OECD health sectors over the period 1970-1993. DEA (VRS) method is used to construct the production frontier. Outputs are measured by two main health indicators: life expectancies...

3) No Title Supplied, ***Tsevi Vovor***, Ecole Polytech. de Montreal, Dept. of Math. & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, ***Daniel Bilodeau***, ***Pierre-Yves Cremieux***, ***Brigitte Jaumard***, ***Pierre Ouellette***

The performance of the production of Quebec hospitals is studied using DEA. The results are compared with those of a parametric quantitative analysis. Tested indicators include scale economies, implicit prices of capital, economies of scale, elasticities of substitution and technological changes across time.

4) A Dynamic Programming Approach to Efficient Clinical Trial Design, ***Karl Claxton***, Harvard Sch. of Public Health, Harvard Ctr. for Risk Analysis, 718 Huntington Ave., Boston, MA 02125, kclaxton@hsph.harvard.edu, ***Kimberly Thompson***

A DP approach to optimal patient allocation is proposed. Numerical examples of sequential clinical decision problems demonstrate that the optimal allocation, even in a fixed sample design, increases the expected net benefits of sample information and can identify strategies which should not be included in an efficient trial design.

TA13 Discrete Multiple Objective Programming & Decision Making

Cluster: **Discrete Optimization**
Invited Session

Chair: Margaret M. Wiecek, Clemson Univ., Dept. of Math. Sci., Clemson, SC 29634-1907, wmalgor@clemson.edu

1) Algorithms for Discrete Multiple Objective Optimization Problem, ***Thomas L. Morin***, Purdue Univ., Sch. of IE, 1287 Grissom Hall, W Lafayette, IN 47907-1287, morin@ecn.purdue.edu, ***Vidyanand Choudhary***, ***Joseph Walter***

We develop a linear expected time algorithm to find the set of efficient points for multi-criterion optimization problems. We provide computational results and a comparison with other fast algorithms. Our algorithm works better (faster) in almost all situations. We also improve on the M1 heuristic presented by Bentley et al in 1993.

2) Some Recent Applications of Discrete Multiple Objective Programming, ***Michael M. Kostreva***, Clemson Univ., Dept. of Math. Sci., Martin Hall, Clemson, SC 29634-1907, flstgla@clemson.edu

We summarize some novel applications of multiple objective programming with discrete variables. Areas of interest are wildlife management, solution of the game Tetris, and engineering design. The different applications require distinct solution methodologies, which will be summarized.

3) Routing with Fractional Bicriteria Cost Functions, ***Hossein Soroush***, Kuwait Univ., Dept. of Stats. & OR, PO Box 5969, Safat, 13060, Kuwait, hsoroush@kuc01.kuniv.edu.kw

We study the problem of finding an optimal path in a deterministic bicriteria network where the cost function is fractional in the 2 criteria. The most general version of the problem is explored and an exact solution approach is developed.

TA14 Multistage Stochastic Programming

Cluster: **Stochastic Programming**
Invited Session

Chair: To be announced

1) Stochastic Scenario Decomposition: An Algorithm for Multistage Stochastic Linear Programs, ***Julia L. Higle***, Univ. of AZ, Dept. of SIE, Tucson, AZ 85721, julie@sie.arizona.edu, ***Suvrajeet Sen***, ***Brenda Rayco***

SSD is a cutting plane algorithm based on a dual formulation of multistage stohstic linear programs. We will present the SSD algorithm, as well as comp;utational expedients designed to limit the size of the master program. Preliminary computational results will be discussed.

2) A Convergent Algorithm for Multistage Stochastic Linear Programs with Recourse, ***Zhi-Long Chen***, Princeton Univ., Dept. of Civil Engr. & OR, 272 Towne Bldg, 220 S 33rd St., Philadelphia, PA 191046315, zlchen@seas.upenn.edu, ***Warren B. Powell***

We propose a convergent algorithm for multistage stochastic linear programs with recourse where random quantities in different stages are independent. The algorithm solves one LP for each stage in each iteration and builds up valid cutting planes for each expected recourse function based on dual solutions of these LPs.

3) A Computational Scheme for Multiperiod Stochastic Programming Based on Nonanticipavity Aggregation, ***Chanaka Edirisinghe***, Univ. of TN, MS Program, 610 Stokely Mgmt. Ctr., Knoxville, TN 37996, ***Guey-Mei You***

We propose a new computational algorithm based on approximation methodology. At each iteration, lower and upper bounds are computed based on a certain relaxation of nonanticipativity requirements, as determined by the utilized moment conditions of the underlying distribution. Preliminary computational results will be reported.

4) The Abridged Nested Decomposition Method for Multistage Programs, ***John R. Birge***, Univ. of MI, 1205 Beal Ave., 1877 IOE Dept., Ann Arbor, MI 48109, jbirge@umich.edu personal.engin. umich.edu/~jbirge, ***Chris Donohue***

Multistage stochastic programs with many scenarios become extremely large as the number of scenarios in each period increases. We will describe an algorithm that abridges the tree and enables solution of very large problems.

5) Implementation of the Flexible Partition L-Shaped Method in OSL, ***Alan J. King***, IBM, TJ Watson Research Ctr., PO Box 218, Yorktown Heights, NY 10598, ***Stephen E. Wright***

Effective decomposition of multistage stochastic programs requires careful attention to the grain size of the subproblems. A flexib le partition L-shaped method gives the user control over this grain size, leading to excellent speedup statistics. The authors report on their implementation of this method in OSL.

TA15 Interior Point Methods & Variational Inequalities

Cluster: **Nonlinear Programming**
Invited Session

Chair: Jean-Louis Goffin, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, jlg@crt.umontreal.ca

1) Accessing Interior Point-Based Decomposition Methods via Algebraic Modeling Languages, ***Emmanuel Fragniere***, Univ. of Lausanne, HEC, Dorigny Lausanne, CH-1015, Switzerland, ***Jacek Gondzio***, ***Robert Sarkissian***, ***Jean-Philippe Vial***

We will show that IPM can benefit from the possibility of exploiting particular structures of models. By employing the concept SET (Structure Exploiting Tool) we have developed, we will examine several models generated by GAMS and solved by an IPM based decomposition method on a parallel machine.

2) Quasi-Newton Approach to the Solution of VIPs Without Jacobian Evaluations, ***Michel Denault***, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke W, Montreal, Quebec, H3A 1G5, Canada, ***Jean-Louis Goffin***

Monotone variational inequality problems whose jacobian is impossible or expensive to evaluate, can be solved safely using linear cutting planes. On the other hand, jacobian-based quadratic cuts can drastically improve the rate of convergence. We reconcile the two conecpts and present theoretical and numerical Results on the use quadratic cuts based on {approximations} of the (unavailable) jacobian.

3) On the Convergence of the Frank-Wolfe Method for Solving Asymmetric Variational Inequalities, ***Thomas L. Magnanti***, MIT, E40-147, 77 Massachusetts Ave., Cambridge, MA 02139-4307, magnanti@mit.edu, ***Georgia Perakis***

We study the convergence of the Frank-Wolfe method for solving affine, asymmetric variational inequalities. Our convergence results impose a condition of positive definiteness on the Jacobian and the squared Jacobian matrix of the problem, restricting its degree of symmetry. Further, we improve our convergence results by introducing averaging.

4) The Homogeneous Analytic Center Cutting Plane Methods with Approximate Centers, ***Yurii E. Nesterov***, Univ. of Geneva, HEC. Section of Mgmt. Studies, 102 Bd Carl-Vogt, Geneva, 1211, Switzerland, ***Jean-Philippe Vial***

In a recent paper, Nesterov and Vial proposed a new analytic center cutting plane method in a projective space. The method is based on exact analytic centers. We relax this assumption and analyze the complexity of the new scheme.

TA16 Convex Optimization: Cutting Plane Algorithms & Applications

Cluster: **Linear Programming**
Invited Session

Chair: Jean-Louis Goffin, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, jlg@crt.umontreal.ca

1) Polynomial Cutting Plane Algorithms for Stochastic Quadratic Programming with Recourse, ***K. A. Ariyawansa***, WA State Univ., Dept. of Pure & Applied Math., Pullman, WA 99164-3113

Stochastic programs have applications in diverse areas. They often are truly large scale optimization problems. Research on interior point methods for such problems is limited. We present three interior cutting plane algorithms for a class of such problems termed as stochastic quadratic programs with recourse.

2) A Path-Following Cutting Plane Method for Some Monotone Variational Inequalities, ***Faranak Sharifi Mokhtarian***, McGill Univ., Fac. of Mgmt., 805 Sherbrooke St. W, Montreal, Quebec, H3A 2K6, Canada, ***Jean-Louis Goffin***

We present a path-following cutting plane method adapted to two cases of variational inequality problems. The first case involves an affine operator, and the second a nonlinear operator both defined over a convex set defined by a separation oracle. We analyze convergence and complexity of this method.

3) A Formulation of Statistical Design Centering with Correlated Random Parameters, ***Abbas Seifi***, Univ. of Waterloo, Dept. of Elect. & Comp. Sci., Waterloo, Ontario, N2L 3G1, Canada, aseifi@vlsi.uwaterloo.ca, ***Jiri Vlach***

A new formulation is proposed for statistical design centering with correlated design variables. The method uses a polyhedral approximation of the feasible region and finds the maximum volume ellipsoid contained in the polyhedron. The orientation of the ellipsoid can be fixed by a maximum likelihood estimate of the correlation matrix...

4) Reoptimization with the Primal-Dual Interior Point Method, ***Jacek Gondzio***, Univ. of Geneva & HEC, Logilab, 102 Bd Carl Vogt, Geneva, 1205, Switzerland

Reoptimizations with the infeasible primal-dual interior point Method employed within different sequential linear programming applications are discussed. The following applications are addressed: solution of subproblems in Dantzig-Wolfe or Benders decomposition, solution of restricted master problems in column generation, solution of LP relaxations in b&b.

TA17 Applications of DEA to the Service Sector

Cluster: **Optimization Days**
Invited Session

Chair: Gary Ferrier, Univ. of AK, Dept. of Econ., 402 BADM, Fayetteville, AR 72701-1201, gferrier@comp.uark.edu

1) Economics of Diversification in the Provision of Federal Reserve Payments Services, ***Paul Bauer***, Fed. Reserve Bank of Cleveland, PO Box 6387, Cleveland, OH 44101, ***Gary Ferrier***

We develop a new measure of diversification economies that uses only quantity data to determine the magnitude of cost savings as a result of the joint production. We illustrate the use of the measure by applying DEA to data on the US Federal Reserve's provision of ACH, Fedwire, and Book Entry securities services.

2) Banking Efficiency & European Intergration: Productivity, Cost & Profits, ***Michel Dietsch***, Inst. d'Etudes Pol. de Strasburg, Universit Robert Schuman, 47 Ave. de la Fort-Noire, Strasburg, 67082, France, michel.dietsch@urs-u.strasb.fr, ***Gary Ferrier***, ***Laurent Weill***

Banking integration in Europe aims at favouring efficiency gains from increased competition for banks. In order to check those expected effects, we study the

evolution of productivity and efficiency of banks of European Union member states from 1993 to 1995. We use nonparametric techniques (DEA) to compute Malmquist indexes of productivity.

3) The Revenue Effects of Non-Payment for Services: Bad Debt & Hospital Performance, ***Gary Ferrier***, Univ. of AK, Dept. of Econ., 402 BADM, Fayetteville, AR 72701-1201, gferrier@comp.uark.edu, ***Vivian Valdmanis***

Non-payment for services provided can be viewed as a "negative" output in a hospital's production process. The non-payment will have both direct and indirect effects on a hospital's revenue - the direct effect is due to non-payment itself while the indirect effect is due to the opportunity cost of real resources consumed in the production of unreimbursed services.

4) Parametric & Nonparametric Approaches to Benchmarking the Regulated Firm, ***Gerald Granderson***, Miami Univ., Dept. of Econ., Oxford, OH 45056, ***Carl Linvill***

Rewarding regulated firms based on their relative performance requires benchmarks that reflect how performance is affected by regulation. This paper demonstrates how parametric and nonparametric efficiency measures can be employed to produce benchmarks that account for the effects of regulation. We apply measurement techniques to an eleven-year panel of...

5) Deregulation & Intermediation: An Analysis of the Spanish Savings Banks, ***Hasan Iftekhar***, NJIT, Sch. of Ind. Mgmt., University Heights, Newark, NJ 07102, hasan@tesla.njit.edu, ***Ana Lozano Vivas***

We attempt to address a direct investigation that inquires the impact of structural changes in the market due to the deregulation of banking industry in Spain. We use data fro the 1986 and 1995 which reflects the pre-and post-deregulatory environments in the depository market regarding deregulation of interest rate restriction, credit ceiling, reserve...

TA18 Tabu Search Applications

Cluster: Metaheuristics
Invited Session
Chair: Stefan Voss, Tech Univ. of Braunschweig, Inst. for Bus. Sci., Abt-Jerusalem-Str. 7, Braunschweig, D-38106, Germany, stefan.voss@tu-bs.de

1) A Tabu Search Heuristic for the Capacitated Lot Sizing Problem with Setup Carryovers, ***Jean-Marie Bourjolly***, Concordia Univ., 1455 de Maisonneuve Blvd. W, Montreal, Quebec, H3G 1M8, Canada, jean-m@crt.unmontreal.ca, ***Ke Ding***, ***Mohan Gopalakrishnan***

We present a TS heuristic for the capacitated lot sizing problem with setup carryovers from one period to the next. A bounding procedure is also proposed. The computational study carried out on a large number of instances indicates that our heuristic performs well in solving this computationally hard problem.

2) Order Sequencing in an Automated Warehouse System, ***Kai Gutenschwager***, Tech. Univ. Braunschweig, Info. Mgmt., Abt-Jerusalem-Str. 7, Braunschweig, D-38106, Germany, k.gutenschwager@tu-bs.de, ***Sven Sieckermann***, ***Stefan Voss***

We present a concept for a simulation-based DSS in warehouse management for a scheduling problem of orders related to CVRP with time windows. We provide an algorithm to find feasible solutions, an improvement procedure based on TS and results from a case study.

3) Applying Scatter Search & Tabu Search to Quadratic Binary Programs, ***Gary A. Kochenberger***, Univ. of CO, CB 165, PO Box 173364, 1250 14th St., Denver, CO 80217-3364, gkochenberge@castle.cuenver.edu, ***Bahram Alidaee***, ***Mohammad M. Amini***

Recent articles have demonstrated the effectiveness of both scatter search and TS for solving difficult quadratic binary programs. We discuss the application of such heuristics to well-known problems (such as the quadratic assignment problem) that have been re-formulated as quadratic binary programs.

4) A Tabu Search Approach for the Classification Problem, ***Said Hanafi***, Univ. of Valenciennes, LIMAV, Le Mont Houy-BP 311, Valenciennes Cedex, F-59304, France, hanafi@univ-valenciennes.fr, ***Nicola Yanev***

The two-group classification problem consists in determining an hyperplane that separates the groups optimally. The objective is to minimize the number of misclassified points. We develop a TS approach for solving the NP-hard problem, based on a more convenient equivalent formulation of the classification problem. Computational results are reported.

TA19 Tutorial: Intelligent Transportation Systems

Invited Session
Chair: Michel Gendreau, Univ. de Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, michelg@crt.umontreal.ca

1) Tutorial: Intelligent Transportation Systems, ***Hani S. Mahmassani***, Univ. of TX, Dept. of Civil & Env. Eng., ECJ 6.2, Austin, TX 78712-1076, masmah@mail.utexas.edu

ITS are predicted on the provision of real-time information to traffic controllers/fleet managers for optimal system operation. This presentation discusses challenging classes of OR problems that arise in conjunction with ITS technologies and presents an overview of recent developments in dynamic network assignment models for real-time ITS applications.

TA20 Tutorial: Strategic Operations Research/Management Science

Invited Session
Chair: Ann Langley, Univ. of Québec, Dept. of MS, Montréal, Québec, H3C 3J7, Canada

1) Tutorial: Strategic Operations Research/Management Science, ***Peter C. Bell***, Univ. of Western Ontario, Ivey Sch. of Bus., London, Ontario, N6A 3K7, Canada, http:\\www.business.uwo.ca\~msis\bell.html

Several major corporations now view their OR/MS work as a strategic asset. This tutorial introduces the concept of strategic OR/MS and presents examples from leading-edge organizations of both strategic OR/MS activities and strategic OR/MS problems. It will be argued that a strategic perspective of OR/MS provides many opportunities for future research.

TA21 Web- & JAVA-Based Simulation Modeling Environments

Sponsor: College on Simulation
Sponsored Session
Chair: To be announced

1) Hierarchical Control Flow Graph Models, ***Robert G. Sargent***, Syracuse Univ., Dept. of IE, 439 Link Hall, Syracuse, NY 13244, rsargent@syr.edu

Different hierarchical control flow graph models and how they were developed using Hi-MASS-j (Hierarchical Modeling and Simulation System-java) will be presented. HCFG Models use two complementary hierarchical specification structures (one for coupled components and one for atomic component behaviors) and these are specified in Hi-MASS-j via GUIs and dialog boxes.

2) JAVA & the Silk Simulation System, ***Kevin Healy***, ThreadTec, Inc., PO Box 7, St. Louis, MO 63017, healy@threadtech.com, ***Richard A. Kilgore***

We discuss the design and implementation of Silk, a Java-based simulation system that merges familiar process-oriented modeling structures with the power and flexibility of Java, the emerging standard for object-oriented and internet-capable programming. We also discuss the advancements in corporate model development and maintenance made possible through the combined use of the Internet and JavaBeans-based modeling components.

TA22 Frameworks for Group Decision & Negotiation: Multicriteria Methods

Sponsor: Group Decision & Negotiation Section
Sponsored Session
Chair: Jean-Marc Martel, Univ. Laval, Op et Systemes de Decision, CP 604 Fac des sci de l'admin, Quebec, Quebec, G1K 7P4, Canada, jean-marc.martel@fsa.ulaval.ca

1) Improving Multicriteria Group Decision Making with Automated Decision Guidance, ***Moez Limayem***, Univ. Laval, Pavillon Palasis Prince, Ste-Foy, Quebec, G1K 7P4, Canada, limayem.sio.ulaval.ca

The possibility of embedding decision guidance within MCDM Group DSSs is explored. Specific design rules for such guidance are suggested, and demonstrated in a MCDM GDSS for a resource-allocation task. Laboratory experiments indicate that the addition of guidance can improve group learning and perceptions and encourage consensus.

2) A Distance Based Collective Preorder (Weak Order), ***Slim Ben-Khelifa***, Univ. Laval, Fac. des Sciences de l'Admin., Ste. Foy, Quebec, G1K 7P4, Canada, ***Jean-Marc Martel***

We investigate the problem of combining individual preorders (weak orders) into a collective preorder. Axioms for distances between binary relations are related to systems of linear equations. The simple algorithm for group preorder ranks first the alternative nearest the first rank, second the alterntive nearest the second rank, etc.

3) The Search for Maximal Amplitude Consensus in a Group Decision Context, ***Laszlo Nandor Kiss***, Univ. Laval, 3202A Pap, Ste. -Foy, Quebec, G1K 7P4, Canada, laszlo.kiss@fsa.ulaval.ca

With multiple decision makers, each alternative in a finite set has a hierarchical level, which we represent using a binary matrix. The hierarchical level of the largest consensus can then be identified. When several candidates achieve this maximum, their consensus equivalence can be assessed using a new metric for concordance.

TA23 Perspectives on Experienced Utility

Sponsor: Decision Analysis Society
Sponsored Session
Chair: Susan E. Brodt, Duke Univ., Fuqua Sch. of Bus., Durham, NC 27708-0120, brodt@mail.duke.edu

1) Benthamite Utility for Decision Making, ***Rakesh K. Sarin***, UCLA, Anderson Sch. of Mgmt., 110 Westwood Plz. Box 951481, Los Angeles, CA 90095-1481, rsarin@anderson.ucla.edu, ***Peter P. Wakker***

Modern decision theory is based exclusively on observable preferences with hedonistic and introspective aspects of utility being irrelevant for the analysis of decisions. We argue that experienced utility provides insight into the formation of preferences which determine decision utility and that, in some situations, experienced utility may serve as a better guide to decisions.

2) Decision Processes that Maximize Experienced Utility, ***Joel Huber***, Duke Univ., Fuqua School of Bus., Durham, NC 27708-0120, jch8@mail.duke.edu, ***Baba Shiv***

We define maximizing experienced utility as optimizing how good one expects to feel about the outcomes of one's decisions. We examine the effectiveness of various kinds of processing strategies in achieving this goal, summarize biases in each and identify the contexts in which they are most appropriate.

3) Sources of Value: The Links Between Prescriptive Negotiating Techniques & Experienced Utility, ***Susan E. Brodt***, Duke Univ., Fuqua Sch. of Bus., Durham, NC 27708-0120, brodt@mail.duke.edu, ***Robert T. Clemen***

Using Brodt & Clemen's (1997) framework for thinking about a stream of value associated with negotiation, we show how to define and assess the effectiveness of prescriptive negotiation techniques, especially by identifying the psychological processes that link elements of a technique to assessments of experienced utility.

TA24 Multicriterion Decision Analysis III

Cluster: Multicriteria Decision Analysis
Invited Session
Chair: Joonas Hokkanen, Paavo Ristola Consulting Eng. Ltd., Vainonkatu 6, FIN 40100, Jyvaskyla, Finland, joonas.hokkanen@iproy.sci.fi

1) Using Multicriteria Decision Methods in Environmental Management, ***Joonas Hokkanen***, Paavo Ristola Consulting Eng. Ltd., Vainonkatu 6, FIN 40100, Jyvaskyla, Finland, joonas.hokkanen@iproy.sci.fi, ***Risto Lahdelma***, ***Pekka Salminen***

We consider the practical use of multicriteria methods in environmental management. Such problems typically have the following features: the number of DMs is great, the possibility to obtain preference information from the DMs is limited, the number of the criteria is great. In this kind of decision environment, there clearly is a need to use some kind of decision-aid.

2) withdrawn - author request of 3/3, ***Kaisa Miettinen***, Univ. of Jyvaskyla, Dept. of Math, PO Box 35, Jyvaskyla, 40351, Finland, miettine@math.jyu.fi, ***Pekka Salminen***

3) Combining Data Envelopment Anaysis & Stochastic Multiobjective Acceptability Analysis, ***Risto Lahdelma***, VTT Energy/Energy Systems, PO Box 1606, VTT, FIN 02044, Finland, ***Pekka Salminen***, ***Joonas Hokkanen***

DEA and SMAA are methods for evaluating alternatives based on multiple criteria. Whele DEA is used for classifying alternatives into efficient and inefficient ones, SMAA is used for supporting discrete multicriteria decision problems. Both methods use a kind of utility function, where the importance of criteria is modeled using weights.

TA25 Stochastic Optimization in Queues & Manufacturing

Sponsor: Applied Probability Section
Sponsored Session
Chair: Matthew J. Sobel, NYU Stern School, 40 West 4th St., Rm 7-01A, New York, NY 10012-1118, msobel@fac.har.sunysb.edu

1) Controlling Service When Service Completion is Uncertain, ***Donald P. Gaver***, Naval Postgrad. Sch., Dept. of OR, Monterey, CA 93940-5000, dgaver@wposmtp.nps.navy.mil, ***Patricia A. Jacobs***

A service system must handle tasks that are of uncertain completion adequacy and duration. Examples occur in medical diagnosis and treatment, failure rectification (e.g. computer systems), and military operations (did a particular weapon succeed?). We suggest and evaluate several control policies for various models of the above situations.

2) Optimal Control of Make-to-Stock Systems: A Large Deviations Approach, ***Dimitris Bertsimas***, MIT, Sloan Sch. of Mgmt., OR Ctr., E53-359, Cambridge, MA 02139, dbertsim@aris.mit.edu, ***Ioannis Paschalidis***

We consider a multiclass make-to-stock production facility with backordering and arbitrary (possibly dependent) demand and service stochastic processes. We propose a production policy which minimizes expected inventory costs while maintaining stockout probabilities within desired limits. The policy is obtained by using optimal control and large deviations techniques.

3) Computation of Optimal Policies in Infinite State Stochastic Dynamic Programs, ***Linn Sennott***, Illinois St. Univ., Dept. of Math, Normal, IL 61790-4520, sennott@math.ilstu.edu

A method is given for computing optimal policies in infinite state models with finite horizon, infinite horizon discounted, and average cost criteria. Illustrations include discrete time queues with reject option, adjustable service rates, and routing to parallel queues. Extensions of the method are indicated.

4) Optimal Lot Sizes in Production Lines with Stochastic Yield & Rework, ***Matthew J. Sobel***, NYU Stern School, 40 West 4th St., Rm 7-01A, New York, NY 10012-1118, msobel@fac.har.sunysb.edu

A previously analyzed model of a production line in which work stations have random yield is expanded to include reworking defective items. The demand process may be dependent and excess demand is backordered. An optimal policy is shown to be myopic and easily computed for various criteria.

TA26 Computational Methods in Queues & Applied Probability

Cluster: Queueing
Invited Session
Chair: Yiqiang Q. Zhao, Univ. of Winnipeg, Dept. of Math & Stats., 515 Portage Ave., Winnipeg, Manitoba, R3B 2E9, Canada, zhao@uwinnipeg.ca

1) Analyzing Fluid Flow Models, ***J. B. F. Ivo***, Eindhoven Univ. of Tech., Dept. of Math & Comp. Sci., POB 513, 5600MB Eindhoven, Eindhoven, 5600 MB, The Netherlands, iadan@win.tue.nl

We present approximations for the throughput of fluid flow models. These models are very useful for the design of production systems. The approximations are based on an aggregation procedure.

2) Applications of Numerical Inversion of Transforms, ***Gagan Lal Choudhury***, AT&T Labs, Room 1L-238, 101 Crawfords Corner Rd, Holmdel, NJ 07733, gagan@buckaroo.att.com

We show that numerical transform inversion is a powerful technique for solving a wide class of stochastic models with applications to telecommunications and computer systems.

3) Accurate Computation of the Fundamental Matrix of a Markov Chain, ***Daniel P. Heyman***, AT&T Labs., 101 Crawford Corners Rd., Rm. 1L-231, Holmdel, NJ 07733-3030, daniel.heyman@att.com

The fundamental matrix of a Markov chain is defined as a matrix inverse, and computing it from the definition can be fraught with numerical errors. I will describe 2 ways to compute the fundamental matrix that avoid explicit matrix inversion and are numerically robust. An example of a model of a telephone multiplexing system that requires accurate computation of a fundamental matrix will be given.

4) Computation of Invariant Probabilistic Measures Under Censoring of a Transition Matrix with Repeating Blocks, ***Yiqiang Q. Zhao***, Univ. of Winnipeg, Dept. of Math & Stats., 515 Portage Ave., Winnipeg, Manitoba, R3B 2E9, Canada, zhao@uwinnipeg.ca,

Wei Li, John W. Braun

Four probabilistic measures, which are independent of the censoring process, appear to be important in the study of the transition matrix of an infinite-state Markov chain with repeating blocks. Possible algorithms for computing these probabilistic measures will be discussed.

TA27 Inventory Management II

Contributed Session

Chair: Kaj Rosling, Lund Inst. of Tech., PO Box 118, Lund, S 22100, Sweden, kaj.rosling@ie.lth.se

1) Single-Item Inventory Policies with a Service-Level Constraint, ***Kaj Rosling***, Lund Inst. of Tech., PO Box 118, Lund, S 22100, Sweden, kaj.rosling@ie.lth.se

This paper investigates optimal policies for the single-item inventory problem with service-level constraints and discrete demands. Enumerative algorithms are suggested for (nQ,r) and (s,S) policies. Both optimal mixed and pure policies are considered.

2) Multiple Time Period Inventory Management with Two Sources of Uncertainties: The Level of Demand & the Timing of Demand, ***Joon B. Park***, GA Inst. of Tech., Dupree Sch. of Mgmt., 755 Ferst Dr., Atlanta, GA 30332-0520, gt7104d@prism.gatech.edu, ***Yihlong Chang***

The multiple time period inventory problem concerns the optimal order quantity for each period. However, the choice of a period's starting and termination times is also a managerial decision as well as the optimal order quantity decision. In this paper, optimality conditions for termination times of periods and order quantitites are established.

3) An Inventory Problem with Multiple Setup Costs, ***Katherine H. Pryor***, Univ. of MI, 2175 Lakeview Dr. #103, Ypsilanti, MI 48198, kpryor@engin.umich.edu, ***Roman Kapuscinski, Chelsea C. White, III***

In the traditional inventory model, ordering involves one setup cost. We associate this with one delivery vehicle of infinite capacity. Realistically, vehicles have finite capacities. We consider a generalization of the capacitated inventory problem with setups by associating one setup per vehicle. We discuss when an (s,S)-like policy is optimal.

4) Analysis of a 2-Echelon Single Item Inventory System with Returns, ***Aybek Korugan***, Northeastern Univ., MIME Dept., 334 Snell Eng. Ctr., Boston, MA 02115, ***Surendra M. Gupta***

We develop new control policies for a two-echelon inventory system with return flows. It is assumed that there is no correlation between the demand and the return rate. The system is modeled using an open queueing network with finite buffers. An example is considered to demonstrate the effectiveness of the policies.

TA28 New Realities of Teaching: Resources, Pulling Teeth & Reengineering

Sponsor: Forum on Education
Sponsored Session

Chair: Michael J. Wood, Univ. of Portsmouth, Portsmouth Bus. School, Locksway Rd., Milton, Southsea, Hants, PO4 8JF, UK, woodm@pbs.port.ac.uk

1) Pulling Teeth: Using Projects to Enhance the Directed Learning of Statistics, ***Michael J. Racer***, Univ. of Memphis, Dept. of INSE, Memphis, TN 38152, mracer@cc.memphis.edu, ***Robin H. Lovgren***

The Industrial and Systems Engineering Program is responsible for offering courses to its majors, as well as the instruction of statistics courses for Civil Engineering undergraduates. The purpose of this presentation is to discuss the development of a sequence of projects that directs the civil engineering students to situations in which the demand for a particular statistical tool becomes useful.

2) Resource Constrained Teaching, ***Robin H. Lovgren***, Univ. of Memphis, Dept. of INSE, Memphis, TN 38152, rlovgren@cc.memphis.edu, ***Michael J. Racer***

The Industrial and Systems Engineering Program recently began offering an undergraduate curriculum, to supplement the existing M.S. program. As with any such new program, the initial enrollments are low, but rising. To accommodate students in the face of budget restrictions, efforts have been made to coordinate graduate and undergraduate offerings.

3) Making OR/MS More User-Friendly: Reengineering the Maths, ***Michael J. Wood***, Univ. of Portsmouth, Portsmouth Bus. School, Locksway Rd., Milton, Southsea, Hants, PO4 8JF, UK, woodm@pbs.port.ac.uk

This paper suggests some principles for achieving a user-oriented framework for approaching OR/MS problems. The first four principles involve reengineering the conceptual and mathematical basis; the fifth addresses strategies for when this fails and users have to communicate with an unfriendly framework. They will all be illustrated by reference to statistical quality control.

4) How to Increase Student Learning & Knowledge Retention, ***Judith S. Liebman***, Univ. of IL, Dept. of MIE, Urbana, IL 61801, jliebman@uiuc.edu

Simple principles from cognitive psychology lead to 10 teaching strategies that promote active learning. Examples of using these strategies to teach OR will be provided.

TA29 Passenger Choice Modeling

Sponsor: Aviation Applications Section
Sponsored Session

Chair: To be announced

1) A Full-Scale Version of the Boeing Decision Window Model, ***Craig A. Hopperstad***, The Boeing Co., MS 75-14, PO Box 3707, Seattle, WA 98124-2207, craig.a.hopperstad@boeing.com

The standard decision window model contains no representation of the effects of fares and fare classes. This special version incorporates not only fares and the disutility of fare class restrictions but also the disutilities of trip replanning, stops/connects and unfavorite airline use.

2) Parameter Estimation for DWMISIM Using Interactive Web-Based Surveys, ***Roger A. Parker***, Boeing Co., MS 64-18, PO Box 3707, Seattle, WA 98124-2207, roger.a.parker@boeing.com

The innate situationality of the model constructs for DWMSIM prohibit the inference of parameter values directly from revealed preference. An interactive survey method must be used to create the requisite situational environment. An approach using internet-web-based survey techniques is described and preliminary results reported.

3) A Demonstration of DWMSIM, ***Roger A. Parker***, Boeing Co., MS 64-18, PO Box 3707, Seattle, WA 98124-2207, roger.a.parker@boeing.com, ***Craig A. Hopperstad***

No abstract supplied.

TA30 Management of Operations in Air Transport

Sponsor: Aviation Applications Section
Sponsored Session

Chair: Jacques Desrosiers, Ecole des HEC & GERAD, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, jacques@crt.umontreal.ca

1) ALTITUDE: An Optimization System for the Management of Operations in Air Transport, ***Guy Desaulniers***, Ecole Polytech. & GERARD, 3000 Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, guyd@crt.umontreal.ca, ***Jacques Desrosiers, M. Gamache, Francois Soumis, Marius M. Solomon***

We offer several perspectives on the 5-year project that consisted of the research, design, development and implementation of a system for the management of air transport operations. We present the operations phases to be managed, the research team and industrial partners, the structure of the problems solved, the optimization methods used and the benefits of the project.

TA31 Facility Layout & Warehouse Design

Cluster: Logistics
Invited Session

Chair: Andre Langevin, Ecole Polytech., Dept. of Math & Ind., CP 6079, Succ. Centreville, Montreal, Quebec, H3C 3A7, Canada, andrel@crt.unmontreal.ca

1) Heuristics & Optimal Algorithms for the Block Layout Problem with Shape Constraints, ***Marc Goetschalckx***, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, marc.goetschalckx@isye.gatech.edu

A review of the performance of heuristics, such as SA & GA, and optimal algorithms, such as B&B, to construct block layouts with shape constraints on the individual departments will be presented.

2) Order Batching in Warehouseing: Practical Considerations & Formulations, ***Gilles Cormier***, Univ. of Moncton, Ecole de genie, Moncton, E1A 3E9, Canada, cormier@umonton.ca, ***Andre Langevin, Diane Riopel***

Order batching is the process by which orders are assigned to tours of the order picking vehicle. We report on a recent case study that revealed some of the issues that are relevant to order batching in practice, many of which are currently ignored in the operations research literature. Finally, set partitioning models are proposed...

3) Dynamic Network Factory Organization & Layout, ***Benoit Montreuil***, Univ. Laval, Ctr. SORCIIER, Pavillon J.A.de Seve, Ste.-Foy, Quebec, G1K 7P4, Canada, benoit. montreuil@osd.ulaval.ca, ***Yannick Thibeau***, ***Marc Paquet***

We present a responsibility network based framework for developing the organization and layout of factories, and to plan their dynamic evolution. We illustrate the use of the framework through our NETFAC software prototype.

4) A Methodology to Determine When to Revise a Facility Layout, ***Nathalie Marcoux***, ***Diane Riopel***, ***Andre Langevin***

We propose a methodology to evaluate the state of a facility layout in order to determine when it should be revised. The question of when to revise a layout should be addressed before applying any facility layout design algorithm. The methodology is illustrated on a practical case.

TA32 Operations Research in Public Systems

Sponsor: Public Programs & Processes Section
Sponsored Session

Chair: Jonathan P. Caulkins, Carnegie Mellon Univ., Heinz Sch., 5000 Forbes Ave., Pittsburgh, PA 15213, caulkins@andrew.cmu.edu

1) On Smoothing Performance in Periodic Merit Reviews, ***Yigal Gerchak***, Univ. of Waterloo, Dept. of MS, 200 University Ave. W, Waterloo, Ontario, N2L 3G1, Canada, ygerchak@mansci.watstar.uwaterloo.ca

The number of articles an academic publishes fluctuates sharply from year to year. Since part of the reason is randomness in turnaround times, university administrators and granting agencies wish to smooth these fluctuating numbers. We discuss the effectiveness, pros and cons of the common methods.

2) Process Flexibility in a Service Center, ***Robert Shumsky***, Univ. of Rochester, Simon Grad. Sch. of Bus., Rochester, NY 14627, shumsky@ssb.rochester.edu, ***Gregory Dobson***

We describe queueing and staffing models which examine the operational and financial tradeoffs between specialists and full-service employees in a telephone service center. Insights derived from these models may be applied a variety of public services, such as emergency medical services and facilities which are multilingual personnel.

3) Route Identification in Wholesale Cocaine Trafficking, ***Jesse P. Johnson***, Logistics Mgmt. Inst., 2000 Corporate Ridge, McLean, VA 22102, jjohson@lmi.org www.asac.1mi.org, ***J. Hugh Ellis***

We discuss several math programming methods to aid in identifying routes used in cocaine trafficking. The methods are developed using a framework based on a multiple objective transportation problem with side constraints embedded in a standard economic choice model where smugglers optimize arc selection and amounts shipped to maximize utility.

4) Optimal Dynamic Allocation of Treatment & Enforcement in Illicit Drug Control, ***Gustav Feichtinger***, Vienna Univ. of Tech., Dept. of OR & Systems Theory, Argentinierstrasse 8/1192, Wien, A-1040, Austria, or@e119ws1.tuwien.ac.at, ***Gernot Tragler***

How to divide drug control efforts between supply and demand side interventions has been debatged vigorously. To date, the problem has been couched in a static framework. We use optimal control theory to examine how the mix of treatment and enforcement should vary over the course of a drug epidemic.

TA33 Innovation

Contributed Session

Chair: Martin E. Ginn, IL Inst. of Tech., Stuart Sch. of Bus., 565 W Adams St., Rm. 418, Chicago, IL 60661, ginn@stuart.iit.edu

1) Transitioning Decision Levels in Management of Technological Innovation, ***Martin E. Ginn***, IL Inst. of Tech., Stuart Sch. of Bus., 565 W Adams St., Rm. 418, Chicago, IL 60661, ginn@stuart.iit.edu

Criteria are developed for transitioning focus to strategic, creativity and cross-cultural management domains which are imbedded in integrated decision models for managing technological innovation and product development. From evolving theory, new decision models and propositions are presented. By facilitating transitioning, the models offer potential utility for improving management practice.

2) Innovation & Learning in High-Tech Small Firms, ***Francois J. Therin***, Groupe Esc Grenoble, 12 rue Pierre-Semard, Grenoble, 38000, France, therin@esc-grenoble.fr

This article presents a conceptual framework and the related hypotheses on the factors affecting product innovation in high-tech small firms. The influence of specific factors, and particularly the presence of a learning process, on product innovation will be tested on a sample and the results presented.

3) Issues of Information Technology Diffusion & Adoption in Sub-Saharan Africa, ***Kweku Ewusi-Mensah***, Loyola Marymount Univ., Coll. of Bus. Admin., 7900 Loyola Blvd., Los Angeles, CA 90045-8385, kewusi@popmail.lmu.edu

We discuss the role of IT in the economic development of the region and the nature and the extent of IT diffusion patterns as indicators of economic growth. What types of IT usage indicators can be used to measure the depth and extent of IT penetration in the public and private sectors of national economies.

4) Determinants of Successful Intranet Implementation: A Comparative Case Study, ***George A. Zolla***, Naval Postgrad. Sch., Dudley Knox Library, Rm. 105, Monterey, CA 93943, gazolla@nps.navy.mil http://131.120.51.194

This article identifies critical determinants for implementing successful Intranets. A comparative case study was conducted between two organizations, one beginning an Intranet implementation and one nationally recognized as a leader. Four critical success factors were identified: a reliable internal network, an open information culture, organizational support and a champion.

TA34 Software Demonstrations

Chair: To be announced

1) Software Demonstration: ERGO - A Comprehensive Decision Analysis Tool for Real World Problems, ***Edward S. Robbins***, Arlington Software, erobins@arlingsoft.com

ERGO is a new tool designed for large MCDA common business problems. These include procurement, risk analysis, Y2K, project monitoring/performance measurement and personnel hiring/performance measurement. The latest in graphical interfaces, ERGO elicits and portrays data in a way the average manager can understand. Specialized loss functions provide a normative approach to the implementation of MAU...

2) Software Demonstration: XPRESS-MP, ***Robert Daniels***, DASH Associates Ltd., Church Ln, Blisworth, Northants, NN7 3BX, UK, rcd@dash.co.uk

Release 10 of XPRESS-MP offers reengineering simplex optimizers and a new homogenous barrier algorithm. The MIP solver radically reduces the number of nodes required in the B&B search. The "top-end" models solve an order of magnitude faster. The XPRESS optimizers are now the fastest available across the board.

TA35 Decision Support Systems IV

Contributed Session

Chair: Art Warburton, Simon Fraser Univ., Fac. of Bus. Admin., Burnaby, BC, V5A 1S6, Canada, warburto@sfu.ca

1) A Decision Support System for Assigning Teaching Assistants to Courses, ***Art Warburton***, Simon Fraser Univ., Fac. of Bus. Admin., Burnaby, BC, V5A 1S6, Canada, warburto@sfu.ca, ***Flora Loong***

We describe a multiple criterion DSS for assigning teaching assistants to courses. The system can automatically assign teaching assistants (via a mathematical program or heuristic) or can operate in an interactive model.

2) Winpre: Workbench for Interactive Preference Programming, ***Jyri Helenius***, Helsinki Univ. of Tech., PO Box 1100, Otakaari 1 M, Espoo, FIN-02015, Finland, http://www.hut.fi/Units/Systems.Analysis, ***Raimo P. Hamalainen***

Winpre is a decision support software for multiattribute weighting models which allow imprecisely defined preferences. These are called preference programming methods and include PAIRS (interval value tree), SMARTER and interval AHP. The full software and related references can be downloaded from http://www.hut.fi/Units/Systems.Analysis/Downloadables/ for academic purposes.

3) A Business Opportunity Tracking System with VBA, ***Chaiho Kim***, Santa Clara Univ., Sch. of Bus., McKenna Hall, Santa Clara, CA 95053

We present an Excel-based business opportunity tracking system for a corporation with a worldwide network of field offices. We will show how VBA

of Excel can build a system where business opportunity databases must be uploaded from field offices to regional offices and then from regional offices to corporate headquarters.

TA36 Multicommodity Flows

Cluster: Networks
Invited Session
Chair: Antonio Frangioni, Univ. di Pisa, Dipt. di informatica, Corso Italia 40, Pisa, I-56125, Italy, frangio@unipi.it

1) A Comparison of Relaxation Methods for Multicommodity Capacitated Network Design, ***Teodor Gabriel Crainic***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, theo@crt.unmontreal.ca, ***Antonio Frangioni***, ***Bernard Gendron***

We present and compare relaxation methods for multicommodity capacitated network design problems. These methods are based on Lagrangean relaxation of different sets of contracts that yield knapsack or shortest path subproblems. The Lagrangean duals are optimized either by subgradient or bundle methods. Experimental results are presented...

2) An Interior Point Algorithm for Multicommodity Networks Flows, ***Jordi Castro***, Univ. Rivira i Virgili, Dept .of Stats. & OR, C. Salou s/n, Tarragona, 43006, Spain, jcastro@etse.urv.es

Interior point methods, despite of its efficiency in the solution of linear problems, permanently show a poor performance when applied to multicommodity flows instances, due to the fill-in produced by the inherent multicommodity structure. In this work a specialization of an interior point method is presented, which overcomes such a drawback. The specialization is based on the use of an ad-hoc preconditioned conjugate gradient solver, together with a sparse Cholesky decomposition of a positive system for each commodity. The computational results provided show the effectiveness of the method.

3) A Primal Partitioning Approach for Single & Non-Simultaneous Multicommodity Flow Problems, ***Yann Vaxes***, Lab. d'Informatique de Marseille, Fac. des Sciences de Luminy, 163 Av. de Luminy Case 901, Marseille Cedex 9, 13288, France, vaxes@lim.univ-mrs.fr, ***Jean-Francois Maurras***, ***Malika Hadjiat***, ***Jerome Chifflet***

We study the problem of routing at minimum cost a given traffic demand through a telecommunication network. This problem comes to compute a min. linear cost multicommodity flow with hop constraints, which we solve by a simplex method with delayed column generation. We refined a primal partitioning of the basis matrix, initially developed by Farvolden, powell & Lustig. The second part of our paper concerns network synthesis. We address also the problem of building a network such that each time a componant fails, all traffic demands can be re-routed. We model this problem as a non-simultaneous multicommodity flow problem and we suggest a primal partitionning algorithm. Our program has been tested on real world and randomly generated instances.

4) A Polyhedral Approach to an Integer Multicommodity Flow Problem, ***Lorenzo Brunetta***, Politecnico di Milano, Dpet. di Elettronica e Info., Piazza L. da Vinci 32, Milano, 20133, Italy, lorenzo@russel.math.unipd.it, ***Michele Conforti***, ***Matteo Fischetti***

We propose a branch-and-cut algorithm for the exact solution of an integer multicommodity flow problem. We consider alternative formulations of the problem and describe several classes of valid inequalities. We describe lifting procedures to extend a given valid inequality for the problem with k commodities, to that having a large number of commodities; two lifting theorems that prove the validity of the lifting procedures are proposed. We introduce a new large class of valid constraints, the multi-handle comb inequalities. The polyhedral structure of the integer multicommodity polytope is studied in the case of unit edge capacities. We prove that this polytope is full dimensional and show that some multi-handle comb inequalities are facet defining. Also, by proving several theorems and corollaries we show that the lifting procedures are facet preserving under certain conditions. The branch-and-cut algorithm is then outlined and seperation algorithms for the main classes of inequalities studied in the paper are proposed. Extensive computational results on several classes of test problems are reported, with a comparison between two different formulations. Finally an application of our integer multicommodity flow model to a real world problem in teltphone systems is addressed.

TA37 Constraint-Based Programming: Fielded Applications

Sponsor: CSTS
Sponsored Session
Chair: Scott Gualdoni, ILOG, Inc., 1901 Landings Dr., Mountain View, CA 94043, gualdoni@ilog.com

1) Constraint-Based Satellite Scheduling for Iridium, Inc., ***Fred L. Garrett***, ILOG, Inc., 5217 Old Spicewood Springs Rd., Ste. 202, garrett@ilog.com

Iridium, Inc. has embarked on a mission to create a global cellular telephone system. The satellite constellation is currently being populated and will soon contain enough satellites to initiate operations. We describe the scheduling of contacts between ground-station control centers and satellites. In particular, we discuss the use of a constraint-based scheduling library, Ilog Scheduler, in the current Iridium Link Scheduler.

2) Building Maintainable Scheduling & Resource Allocation Engines: LILCO's Experience, ***Jacob Feldman***, IntelEngine CTO, 2 Overview Ct., Edison, NJ 08817, feldman@ilog.com, ***Nicholas P. Sekas***

We discuss the development and maintenance of ILOG-based scheduling and resource allocation engines in real production mode for the Long Island Lighting Company. We concentrate on the importance of user involvement during the entire system life cycle. Several design patterns that support direct user involvment in order to customize/extend the engines' functionality will be presented.

3) Staff Scheduling with ILOG Solver, ***Donovan R. Hare***, Okanagan Univ. Coll., Dept. of Math. & Stats., 3333 College Way, Kelowna, BC, V1V 1V7, Canada, dhare@okanagan.bc.ca

We describe the design and development of a staff scheduling software product, the Expert Rotation Generator (ERG). ERG's engine uses ILOG's Solver library to create staff rotations. The user can interact with ERG during the generation process by modifying the constraints and by selecting a partial rotation. The search can also be controlled.

4) No Title Supplied, ***Didier Vergamini***, ILOG, Inc., 1901 Landings Dr., Mountain View, CA 94043, vergamini@ilog.com

We present the design and the implementation of a fielded application in the domain of car production sequencing. The main characterics of this application is that it deals with an heavily overconstrained problem. We describe the architecture of the combination of local optimizations and relaxations that produces operational results of outstanding quality.

TA38 Wireless Communication/Channel Assignment

Sponsor: TST
Sponsored Session
Chair: Brigitte Jaumard, Ecole Polytech. of Montréal, Dept. of Math & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, brigitt@crt.umontreal.ca

1) Column Generation & Lower Bounds For the Channel Assignment Problem, ***Brigitte Jaumard***, Ecole Polytech. of Montréal, Dept. of Math & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, brigitt@crt.umontreal.ca, ***Odile Marcotte***, ***Christophe Meyer***

We propose a generalized linear programming formulation of the channel assignment problem with co-channel, adjacent channel, cosite and intermodulation constraints. We discuss how to transfer some of the constraints in the auxiliary problem in order to solve the problem efficiently. Preliminary computational results will be presented on Bell MobilitÈ9 data.

2) A Tiling Approach To The Channel Assignment Problem, ***Jeannette Janssen***, Acadia Univ., Dept. of Math., Wolfville, NS, B0P 1X0, Canada, jeannette.janssen@acadiau.ca, ***Kyriakos Kilakos***, ***Lata Narayanan***

We will show a model of channel assignment problems based on re-assigned network pieces called tiles. This model makes optimal use of a certain repetivity in the structure which cellular networks frequently exhibit. The tiling approach has the advantage that methods from Mathematical Programming and the study of Integer Polyhedra can be used for its analysis.

3) Design of An Efficient Channel Block Retuning, ***Brigitte Jaumard***, Ecole Polytech. of Montréal, Dept. of Math & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, brigitt@crt.umontreal.ca, ***Vincent Barbera***

Cellular networks must be updated very often. Due to technical and economical reasons, the complete channel resetting of an urban network has to be done in several steps. We propose an ascent-descent method to retune a network over a given number of periods. Computational results will be presented on Bell MobilitE data for a network with 359 cells.

4) Comparing Lagrange & SDP Relaxations for Weighted Coloring Problems Arising in Frequency Assignment, ***Thierry Defaix***, Ctr. d'Elect. de l'Armement, CELAR/TCOM/TR, BP7, Rennes Armees, 35998, France, defaix@maths.univ-rennes1.fr,

Xavier Hardy, Benoit Rottembourg

Many frequency assignment problems can be formulated as weighted coloring problems asking: color sets to be balanced, or adjacent nodes to have sufficiently distant frequencies in the available spectrum. We will discuss comparisons of bundle based Lagrange and SDP relaxations for fixed frequency design problems arising in military applications.

Tuesday 09:45-11:15

TB01 Network-Level ATIS I: Analysis & Algorithms

Sponsor: TSS & IFORS
Sponsored Session
Chair: Hani S. Mahmassani, Univ. of TX, Dept. of Civil & Env. Eng., ECJ 6.2, Austin, TX 78712-1076, masmah@mail.utexas.edu

1) Modeling Commuter Behavior Under Real-Time Traffic Information, ***Peter S. Chen***, Univ. of TX, Dept. of Civil Eng., ECJ 6.2, Austin, TX 78712, Peter_Chen@mail.utexas.edu, ***Hani S. Mahmassani***

The behavioral processes underlying within-day departure time adjustment and en-route diversion decisions of commuters, along with day-to-day departure time and route choices, as influenced by the provision of ATIS are examined in this paper, including the modeling of day-to-day dynamics of travel time prediction by commuters on their next trip.

2) Development of Dynamic Control Strategies for Managing Freeway Incident Traffic, ***Omar Sawaya***, Northwestern Univ., Civil Eng., 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, obo720@hecky.acns.nwu.edu, ***Athanasios Ziliaskopoulos***

We propose an approach that computes alternate routes around incidents, as well as other control and management strategies on a time-dependent basis, in response to the prevailing traffic conditions. The approach consists of a System Optimum Dynamic Traffic Assignment (SO-DTA) algorithm, a traffic simulator, a heuristic control strategies general algorithm and various communication and data processing components. The proposed design is implemented and tested on a sizable network under various scenarios of incident severity and congestion levels.

3) Application of Simulation & Optimization for Special Event Route Guidance, ***Jun-Seok Oh***, Univ. of CA, Civil & Env. Eng., Irvine, CA 92697, jun@translab.its.uci.edu, ***R. Jayakrishnan***, ***Jeffrey Adler***

Real-time route guidance for traffic is constrained by factors such as the availability of information supply hardware, their locations, and display characteristics. Optimization results do not necessarily translate to implementable ATIS routing schemes. We describe the framework developed for the City of Anaheim, CA, based on simulation, and discuss the performance results.

4) Comparative Analysis & Testing of Hybrid Route Guidance Systems, ***Yi-Chang Chiu***, Univ. of TX, Dept. of Civil Eng., ECJ 6.2, Austin, TX 78712, ychiu@mail.utexas.edu, ***Yaser Hawas***, ***Hani S. Mahmassani***

Both centralized and decentralized DTA approaches have been proposed for route guidance in traffic networks, reflecting different viewpoints of control logic and required information. We present the framework of a hybrid system which integrates the two approaches, and discusses comparative numerical results.

TB02 Heuristic Approaches to Practical Vehicle Routing Problems with Time Windows

Sponsor: TSS
Sponsored Session
Chair: J. Wesley Barnes, Univ. of TX, Grad. Prog. in OR & IE, Austin, TX 78712, wbarnes@mail.utexas.edu

1) An Overview of Time Windows in Practical Vehicle Routing Problems, ***Alex Van Breedam***, Univ. of Antwerp, JPMG Orinoco, Neerveldstraat 101-103, Brussels, B-1200, Belgium, avanbreedam@kpmg.com rua.us.ac.be/~tew/php/alexvb.htm

Time windows are part of a frequently occurring category of side-constraints in real-life vehicle routing problems. However, their appearance can vary considerably with respect to their type, hard, soft, gliding, etc., as well as to their nature, customers, vehicles, drivers, depots, etc. An overview of different types of time windows together with their implementation problems in heuristics is presented.

2) Solving Vehicle Routing Problems with Time Windows from the Real World, ***Buyang Cao***, ESRI Inc., Dept. Transport/Log. Service, 380 New York St., Redlands, CA 92373, baco@esri.com

We present a heuristic to solve VRPTW with a set of complicated side constraints. The problems can be found in home delivery and home service industry. We also discuss how to apply the GIS techniques to solve the problems more efficiently. A system used to solve real VRPTW and the economic benefit achieved by this system are presented.

3) A Hierarchical Approach to Shortest-Path Problems in Vehicle Routing Problems, ***Kevin S. Ruland***, Systems & Electronics Inc., 201 Evans Ln, St. Louis, MO 63121, kruland@seistl.com, ***Roark D. Weil***, ***Asdrubal Garcia-Ortiz***

A hierarchical algorithm is presented by categorizing road types which can find good solutions to the SPP quickly on a 386-class embedded computer. The algorithm limits the search space by first routing the vehicle to a trunk road, then highway and back to a trunk road on the way to its destination.

4) Multiple Insertion: A Heuristic Algorithm for the VRP & Service Dispatching Problems with Time Windows, ***Xinnong Yang***, Transportation Services, ESRI. Inc., 380 New York St., Redlands, CA 92373, xyang@esri.com

We present a new heuristic algorithm for solving VRPs and service dispatching problems. It evaluates the insertion cost, violation cost and other constraints in consideration of multiple insertion candidates simultaneously. Depending on different types of problems, various insertion strategies could be employed to suit different purposes. Based on the initial solution, a post-insertion (transfer/swap) procedure is introduced...

TB03 HAZMAT Logistics

Sponsor: TSS
Sponsored Session
Chair: Vedat Verter, McGill Univ., Fac. of Mgmt., 1011 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, verter@management.mcgill.ca

1) Harmonization of Regulations on the International Transport of Dangerous Goods, ***Rolanda Kuncte***, Univ. of Montreal, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, rolanda@crt.umontreal.ca, ***Claire Laberge-Nadeau***, ***Teodor Gabriel Crainic***

The international regulation system relative to dangerous goods transportation by all modes and the activities of the international organizations related to the transport of hazardous materials will be presented. We also discuss the current process of harmonization of the international regulations for the different modes.

2) A New Network Model for HazMat Transportation, ***Amina Benterki***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, amina@crt.umontreal.ca, ***Teodor Gabriel Crainic***, ***Michel Gendreau***

Most models aimed at determining routes for hazardous materials do not measure the possible impact, in terms of risk or equity, of several routes, of various materials, transiting through a given region. We propose a new model to account for these "network effects". Algorithmic issues will also be discussed.

3) A Tabu Search Heuristic for the Location of Inspection Stations, ***Isabelle Parent***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, ***Michel Gendreau***, ***Gilbert Laporte***

We present a tabu search heuristic for the location of location inspection stations at vertices of a network. Given a traffic pattern described by O/D flows, the aim is to capture as much traffic as possible for a given number of stations. Computational results are presented.

4) On the Risks of Transporting Dangerous Goods, ***Vedat Verter***, McGill Univ., Fac. of Mgmt., 1011 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, verter@management.mcgill.ca

We focus on the societal risks of HAZMAT transportation. First, we provide a framework for HAZMAT transport risk assessment, then present a comparison of the risks of HAZMAT transport in the US, Canada and Germany. Finally, we summarize a recent risk assessment study conducted in Alberta, Canada.

TB04 Operations Management III

Contributed Session
Chair: Arvinder S. Loomba, Univ. of Northern IA, Coll. of Bus. Admin., Dept. of Mgmt., Cedar Falls, IA 50614-0125, arvinder.loomba@uni.edu

1) An Investigation of Forgetting in Batch Manufacturing,

Timothy L. Smunt, Wake Forest Univ., Babcock Grad. Sch. of Mgmt., Winston-Salem, NC 27109-7659, tim_smunt@mail.mba.wfu.edu, *Jack R. Meredith, John G. Wilson*

We investigate the existence and form of forgetting within a complex, batch manufacturing environment. The data analyzed comes from the market share leader of a health care products manufacturer and includes 4 years of production cost information for component parts and subassemblies.

2) Market-In Approach & Real Quality Assurance, *Carlos L. Yukimura*, Brazilian Quality & Productivity Inst., R Dr. Correa Coelho, 741 Jardim Botanico, Curitiba, Parana, 80210-350, Brazil, carlos@ibqppr.org.br

A customer oriented organization assume a series of conditions to create an environment and structure to develop a real quality assurance to its products. In this paper will be described the market-in approach and procedures to develop a real quality assurance system.

3) Inventory & Investment in Quality Improvement Under ROI Maximization, *K. Jo Min*, IA State Univ., IMSE Dept., 205 Engineering Annex, Ames, IA 50011, jomin@iastate.edu, *Toshitsugu Otake*

We first formulate an inventory model with an option to invest in quality improvement under return on investiment (ROI) maximization. Next, we characterize the unique global optimal solution and derive several interesting managerial insights. Finally, we obtain and analyze the closed-form solutions under a linear investment function.

4) withdrawn - author request of 2/19, *Arvinder S. Loomba*, Univ. of Northern IA, Coll. of Bus. Admin., Dept. of Mgmt., Cedar Falls, IA 50614-0125, arvinder.loomba@uni.edu, *Michael S. Spencer*

TB05 Pricing Issues in Supply Chain Management

Sponsor: MSOM
Sponsored Session
Chair: Ananth V. Iyer, Purdue Univ., Krannert Grad. Sch., 1310 Krannert Bldg., W Lafayette, IN 47907-1310, ayer@mgmt.purdue.edu

1) Pricing in a Supply Chain, *Ajay K. Asthana*, Diamond Tech. Partners Inc., 875 N Michigan Ave., Ste. 3000, Chicago, IL 60611, asthanaa@diamtech.com

Many experts assert that outsourcing non-core functions creates a pricing advantage, however, when demand volume is low this strategy may actually create a price disadvantage. This case study illustrates the movement of a retailer from outsourced manufacturing and distribution to batches and loads, in response to decrease in overall profitability.

2) Design of Pricing Contracts in Supply Chains Under Risk Aversion, *Sridhar Seshadri*, NYU, OP, Stats. & OR Dept., 40 W 4th St., Ste. 701B, New York, NY 10012-1118, sseshadr@stern.nyu.edu, *Vipul Agrawal*

We derive an optimal menu of contracts for a distributor selling to many risk averse retailers using parsimonious data. The contracts are shown to maximize the distributor's expected profit and joint welfare. We also investigate the influence of product/market characteristics on the design of the menu.

3) Optimal Bundle Pricing Under Risk, *Ralph Fuerderer*, Adam Opel AG, Tech. Development Ctr. Europe, Ruesselshiem, 65423, Germany, lo1be.rfeurd01@gmeds.com, *Arnd H. Huchzermeier*

We introduce a modeling approach which enables product planners to generate a high-profitability product line at an early stage of the new product development process. Both marketing and manufacturing concerns are considered, i.e., fixed manufacturing costs and random customer choices. The presented solution approach is powerful enough to tackle non-convex optimization problems of many applications.

4) The Impact of Pricing in a Grocery Supply Chain, *Ananth V. Iyer*, Purdue Univ., Krannert Grad. Sch., 1310 Krannert Bldg., W Lafayette, IN 47907-1310, ayer@mgmt.purdue.edu, *Jianming Ye*

We model a grocery supply chain with stores that are supplied inventory from a warehouse whose inventory is managed by a vendor. We use a dataset of sales of canned tomato soup to model the promotional environment and determine optimal store price promotions. We evaluate the impact of market share constraints, wholesale price changes and scanner based vendor promotions on the manufacturer and the retailer.

TB06 Production Systems Modeling in Industry

Sponsor: MSOM
Sponsored Session
Chair: Dennis E. Blumenfeld, GM R&D Ctr., OR Dept., MC 480-106-359, 30500 Mound Rd., Warren, MI 48090-9055, dblumenf@cmsa.gmr.com

1) Practical Issues in Supply Chain Management, *Shuchen Li*, IBM Corp., Consulting Group, 522 South Rd., Poughkeepsie, NY 12601-5400, li@us.ibm.com, *Ramakrishna Desiraju*

We discuss complex supply chain management issues in today's environment. Increased performance of computers has made quantitative optimization viable in redesigning logistics networks. To consider real estate issues, tax incentives and third party logistics, we use optimization techniques in an iterative manner. The extended supply chain management concept is also discussed.

2) Decision Support System for the Management of an Agile Repair Supply Chain, *Christophe Begue*, Philips Research, Industrial Dynamics Group, 345 Scarborough Rd., Briarcliff Manor, NY 10510-2027, cxb@philabs.research.philips.com, *Roger Gung, Omer Bakkalbasi*

A prototype software for a supply chain management DSS for the repair operation of the E3A aircraft is presented. It supports three decision processes: (1) Demand Management, (2) Repair-Demand Reconciliation, and (3) Repair Management. It is built around a discrete event simulation of the entire supply chain process.

3) Optimizing Production & Inventory in a Global Specialty Chemicals Supply Chain, *David B. Kletter*, Booz Allen & Hamilton, 101 Park Ave., New York, NY 10178, kletter_david.@bah.com

We will describe the application of an optimization model for tactical planning of a global specialty chemicals supply chain. this model uses linear programming with heuristics to minimize worldwide production, distribution and inventory holding costs under demand constraints. The application context, the model, implementation challenges, and results will be discussed.

4) Evaluation & Selection of Projects in Decentrally Controlled Production/Distribution Systems, *Stephan R. Biller*, GM R&D Ctr., OR Dept., MC 480-106-359, 30500 Mound Rd., Warren, MI 48090-9055, stephan_biller@notes.gmr.com

We evaluate capacity expansions in 2-stage multi-facility sysstems based on leadtime performance. This is especially important in decentrally controlled systems since investing in ?wrong? projects might result in a worse performance (Braess-like paradox). We select a project portfolio to maximize the reduction in leadtime given a budget constraint. An industry application is discussed.

TB07 Panel: Publishing in Manufacturing & Operations Management

Sponsor: MSOM
Sponsored Session
Chair: Mark L. Spearman, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332, mark.spearman@isye.gatech.edu

1) Panel: Publishing in Manufacturing & Operations Management, *Patrick T. Harker*, Univ. of PA, OPIM Dept., Wharton Sch., 1300 SH-DH, 3620 Locust Walk, Philadelphia, PA 19104-6366, harker@wharton.upenn.edu, *Wallace J. Hopp, Leroy B. Schwarz, Mark L. Spearman*

In recent years there has been great changes in both the number of outlets and the means of publishing scientific papers. In spite of these advances, the time to have a paper reviewed does not appear to have decreased while the quality of the reviews appears to have gotten worse. This panel will address these and other issues.

TB08 Management of Technological Hazards

Sponsor: Technology Management Section
Sponsored Session
Chair: Bernard Sinclair-Desgagne, Ecole Polytech. of Montreal, Dept. of Math. & IE, PO Box 6079, Sta. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, desgagnb@cirano.umontreal.ca

1) Sharing Responsibilities for Major Technological Risks, *Marcel Boyer*, Ecole Polytech. of Montreal, CP 6079, Succ. Centreville, Montreal, Quebec, H3C 3A7, Canada, boyerm@cirano.umontreal.ca

2) Decision Support Systems & Risk Management: What Can We Learn From Past Events?, *Marie-Christine Therrien*, SAIC, 455 rue Saint-Antoine Ouest, Bureau 311, Montreal, Quebec, H2Z 1J1, Canada, eyquem@cam.org

3) Asymmetries of Information in the Prevention of Back

Injuries, ***Daniel Leblanc***, Ecole Polytech. of Montreal, CP 6079, Centreville, Montreal, Quebec, H3C 3A7, Canada, ***Robert Gilbert, Sylvie Nadeau***

4) Risk Audits, ***Bernard Sinclair-Desgagne***, Ecole Polytech. of Montreal, Dept. of Math. & IE, PO Box 6079, Sta. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, desgagnb@cirano.umontreal.ca

TB09 Modular Product & Knowledge Architecture in New Product Development

Sponsor: Technology Management Section
Sponsored Session
Chair: Michael Pich, INSEAD, Boulevard de Constance, Fontainebleau Cedex, 77305, France, mpich@insead.fr

1) Authority & Control in the Product Development Process, ***Sharon Novak***, MIT, Sloan Sch. of Mgmt., 77 Massachusetts Ave., Cambridge, MA 02139, ***Steven D. Eppinger, Charles Fine***

We argue that "make/buy" is an inadequate representation of the supply organization problem faced by industrial firms. We frame the question as "own/operate/manage", where the latter choices refer to the deployment of the organization's productive assets. Our model is based on extensive data collection at luxury performance auto manufacturers worldwide.

2) Product Platform Strategies in the World Automobile Industry, ***Andreas Cornet***, McKinsey & Co. Inc., Koenigsallee 60c, Dusseldorf, 40027, Germany, andreas_cornet@mckinsey.com, ***Arnd H. Huchzermeier***

A survey we conducted on the use of product platforms in the worldwide automobile industry shows that significant economic benefits can be achieved. Furthermore, we develop a tradeoff model explicitly taking into account development costs, product costs, product performance and time-to-market issues. Data from application case studies are presented.

3) The Real Options Value of Modular Product Architecture, ***Christoph H. Loch***, INSEAD, Blvd. de Constance, Fontainebleau, 77305, France, loch@insead.fr, ***Michael Pich***

In predevelopment activities, a design organization must decide on the product architecture and performance targets for each of the components within this architecture, well ahead of observing actual market demand. We show that modular product architecture can have real options value in terms of the degrees of freedom that it provides in meeting multiple, possible correlated market demand attributes.

4) The Architecture of Knowledge & Information Flows in New Product Development Processes, ***Anil Khurana***, Boston Univ., Sch. of Mgmt., 595 Commonwealth Ave., Boston, MA 02215, akhurana@bu.edu, ***P. R. Balasubramanian***

Participants in the new product development process have to deal with several types of knowledge, information, and data. Current research does not distinguish between these different types. We present a framework for the architecture of knowledge management, and show how an information systems environment could be modeled.

TB10 Practical Scheduling Algorithms

Cluster: Scheduling
Invited Session
Chair: Surya D. Liman, TX Tech. Univ., Dept. of IE, Lubbock, TX 79409, sliman@coe3.coe.ttu.edu

1) Multi-Processor Tasks Scheduling on Two Machines with Maximum Tardiness Criteria, ***Xiaoqiang Cai***, Chinese Univ. of Hong Kong, Dept. of Systems Eng., Shatin NT, Hong Kong, xqcai@se.cuhk.hk, ***Chung-Yee Lee, T. L. Wong***

We discuss the multiprocessor tasks scheduling with objective of minimizing maximum tardiness. We provide dynamic programming algorithm to solve special cases and discuss the approach for solving general problems.

2) Single Machine Scheduling to Minimize the Number of Early Jobs, ***Shrikant S. Panwalkar***, TX Tech. Univ., Dept. of IE, Lubbock, TX 79409, ***Surya D. Liman***

We consider a single machine, static, non-preemptive, deterministic scheduling problem to minimize the number of early jobs with the restriction that no inserted idle time is allowed. The problem is transformed into a mirror problem that can be solved using the well-known Moore-Hodson's algorithm to minimize number of tardy jobs.

3) Minimizing the Weighted Tardiness in the Two-Machine Flow Shop, ***Chen-Sin Lin***, Bradley Univ., IMET Dept., Peoria, IL 61625, clin@bradley.edu

We consider a two-machine flow shop scheduling problem with the criterion of minimizing the sum of weighted tardiness. A branch and bound algorithm is developed for finding an optimal solution.

4) Multiple Resource Constrained Scheduling Problem, ***Elliot J. Montes***, TX Tech. Univ., Dept. of IE, Lubbock, TX 79416, ***Milton Louis Smith, Surya D. Liman, Mario G. Beruvides***

Heuristic solutions that minimize makespan are presented for the MRCS problem. The MRCS problem exists in systems where n jobs require processing by m machines (each machines can process only a subset of jobs) and k workers subject to job specific training requirements.

TB11 Human Factors in Planning, Scheduling & Supply Chain Management I

Cluster: Flexible Manufacturing Systems
Invited Session
Chair: John R. Wilson, Dept. of Man. Eng. & OPs. Man, Univ. of Nottingham, Univ park, Nottingham, NG7 2RD, Nottingham, ng7 2rd, UK, John.Wilson@nottingham.ac.uk

1) Feasible Meets Optimal - The Limits of Information Processing Capacity in Manufacturing Scheduling, ***Janet Efstathiou***, Univ. of Oxford, Dept. of Eng. Sci., Parks Rd., Oxford, OX1 3PJ, UK, janet.efstathio@eng.ox.ac.uk, ***Ani Calinescu, John Schirn***

Methods of modelling manufacturing facilities have assumed implicity that all the information necessary for perfect schedules is always available. We describe a long-term case study which highlights the importance of modelling the quality of information. Its value is assessed together with the optimality of the information processing practices, both human and computer-based.

2) The Effectiveness of the Scheduling Function: A Critical Appraisal of Contemporary Practice in UK Manufacturing, ***Bart L. MacCarthy***, Univ. of Nottingham, Dept. of Mfg. Eng. & Ops., University Pari, Nottingham, NG7 2RD, UK, bart.maccarthy@nottingham.ac.uk, ***Caroline Vernon***

The critical importance of planning and scheduling for responsibe manufacturing enterprises is increasingly recognized. This paper reports on methods and observations from an on-going study of planners and schedulers in six manufacturing companies in the UK. Important issues in the organization management and control of the scheduling function are highlighted.

3) withdrawn - author request of 3/11, ***Alan Harrison***, Cranfield School of Mgmt., Cranfield, Bedford, MK43 OAL, UK, a.harrison@cranfield.ac.uk

4) Accounting for the Human in Scheduling Systems: A Sociotechnical View, ***Kenneth N. McKay***, Memorial Univ. of Newfoundland, Fac. of Bus. Admin., St. John's, NF, AIB 3X5, Canada, kenmckay@plato.ucs.mun.ca, ***Vincent C.S. Wiers***

Too often, scheduling tools fail to satisfy the requirements of the scheduling task and do not reflect the situation in which the tool is intended to be used. The problem definition extends beyond modelling and algorithms. We use two recent field studies to illustrate the sociotechnical issues in scheduling systems.

TB12 Health Care Scheduling

Cluster: Health Applications
Invited Session
Chair: Michael W. Carter, Univ. of Toronto, Dept. of MIE, Toronto, Ontario, M5S 3G8, Canada, carter@mie.utoronto.ca

1) Analyzing Policy Options with Operations Research: Examples from Ontario, ***John Blake***, DalTech., Dept. of II, PO Box 1000, Halifax, NS, B3J 2X4, Canada, blakejt@tuns.ca, ***Michael W. Carter***

Governments implement policies to influence the behaviour of individuals and/or organizations. Often the effects of policies are difficult to predict ahead of time. As a result, surprising results are occasionally observed when policies are put into effect. In this paper we describe the use of operations research techniques to investigate the implications of policy options...

2) A Tabu Search Heuristic for Scheduling Physicians, ***Sebastien Labbe***, Ecole Polytech., CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, patrick@crt.umontreal.ca, ***Michel Gendreau, Sophie D. Lapierre, Patrick Soriano***

We consider a scheduling problem arising when designing physician shifts in

emergency wards. This problem consists in designing a cyclic schedule satisfying requirements among which that the shift rotation must be forward and longer rest period must follow night shifts. We present a TS heuristic that generates such cyclic schedules.

3) System Implementation Decisions in the Health Care Setting, ***Amy Fish***, Univ. of Toronto, Health Care Productivity, Dept. MIE, 4 Taddle Creek Rd., Toronto, Ontario, M5S 3G8, Canada, afish@torhosp.toronto.on.ca, ***Allison J. Hewlitt***

System implementation decisions in the health care setting are unusually complex. Competing needs of patients clinicans, researchers and administration along with limited funds for meeting these needs yield an invironment of decision making that is often unstructured. Classic decision analysis structure can benefit hospital administrators when faced with system implementation decisions.

4) Effective Practices in Implementing Improved Information Tools in a Health Services Organization, ***Douglas A. Samuelson***, PUMA Systems, Inc., 5201 Leesburg Pike, Ste. 801, Falls Church, VA 22041, samuelsd@pumasys.com

The Clincial Business Area of the Office of the Assistant Secretary of Defense/Health Affairs is using electronic collaboration tools to improve communication and information transfer while reducing the need for travel to meetings. We discuss lessons learned from this organization's early experience with this new technology, with emphasis on the effect of group leaders' communication, training and leadership practices.

TB13 Innovations from Industry

Cluster: Discrete Optimization
Invited Session

Chair: Robin Lougee-Heimer, IBM, TJ Watson Research Ctr., PO Box 218, Rm. 03-205, Yorktown Heights, NY 10598, rlh@watson.ibm.com

1) Optimizing Customer Relationships, ***Eric Bibelnieks***, IBM Global Bus. Intelligence Solutions, 650 Third Ave. South, Minneapolis, MN 55402, ebibeln@us.ibm.com, ***Harlan P. Crowder, Mark T. Bullock, Wayne Kugel***

Many industries are now focusing on maintaining and profiting from long term relationships with their customers. Our approach has been to leverage company data warehouses to maximize the company's profitability and/or value the customer receives. Integral to this is an integer optimization problem which selects what treatments the customer will receive over a window of time. Empirical results will be presented.

2) Effective Relaxation Approaches for Nonlinear Integer Programming Problems, ***Timothy L. Jacobs***, SABRE Tech. Solutions, 1 E Kirkwood Blvd., MD 7390, Southlake, TX 76092, tim_jacobs@sabre.com, ***Barry C. Smith, Ellis L. Johnson***

Many large optimization problems are nonlinear and require integer solutions. Furthermore, many problems require the convergence of solutions to subproblems. We discuss efficient techniques for decomposing problems, such that the relaxed master problem remains linear and the nonlinear aspects are isolated in the subproblem, substantially reducing the computational effort required.

3) Applications of Integer Programming in Physical Distribution, ***Moshe Rosenwein***, AT&T, 233 Mt. Airy Rd., Rm. 2E, Basking Ridge, NJ 07920

We describe 2 applications of IP in physical distribtuion. One IP, solved via Lagrangean relaxation, optimizes the location of items stored in a warehouse. A second IP, solved heuristically to near-optimality, consolidates outbound transportation shipments.

4) Plant Location with Minimum Inventory, ***Francisco Barahona***, IBM Watson Research Ctr., PO Box 218, Yorktown Heights, NY 10598, ***David Jensen***

We present an IP model for plant location with inventory costs. The LP relaxation has been solved by Dantzig-Wolfe decomposition. In this case the subproblems reduce to the minimum cut problem. We have used subgradient optimization to accelerate the convergence of the D-W algorithm. We present our experience with problems arising in the design of a distribution network for computer spare parts...

TB14 Global Optimization I

Cluster: Global Optimization
Invited Session

Chair: Pierre Hansen, HEC, 3000 Ch Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, pierreh@crt.umontreal.ca

Co-Chair: Brigitte Jaumard

1) Visualization of Search by Means of Multidimensional Scaling, ***A. Zilinskas***, Inst. of Math. & Informatics, Akademijos str.4, Vilnius, LT2600, Lithuania

The visualization of optimization process is important to understand the strategies of global search. The visualization by means of 2-dimensional scaling is based on global minimization of a stress function, which expresses the difference of the structures of multidimensional and 2-dimensional sets. The features of stress function are analyzed...

2) Families of Cuts Improved Generalized Benders Decomposition in Bilinear Programming, ***Eric Gourdin***, Univ. Libre de Bruxelles, Service de Math de la Gest., Blvd. du Triomphe CP 210/0, Bruxelles, 1050, Belgium

Bilinear problems are difficult nonlinear nonconvex problems. Generalized Benders decomposition behaves poorly when the iterate point falls in an infeasible region (a sub-region in which the primal problems are infeasible). Some variants of the classical feasibility cuts and new exploration strategies are proposed in order to accelerate the convergence of the algorithm.

3) Simplicial Lower Bound & Convergence of Conical Algorithm for Concave Minimization, ***Brigitte Jaumard***, Ecole Polytech. of Montréal, Dept. of Math & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C3A7, Canada, brigitt@crt.umontreal.ca, ***Christophe Meyer***

We show that the dual solution of the linear problem occurring in the computation of the simplicial lower bound naturally yields a hyperplane with better properties than the one used so far. The properties of this new hyperplane are exploitated to prove the convergence of Tuy's cone splitting algorithm with a pure w-subdivision strategy.

4) Adaptive Random Search for the Minimum, ***James Calvin***, NJIT, Simulation & Modeling Lab., Dept. of CIS, Newark, NJ 07102-1982, calvin@cis.njit.edu

We describe a randomized algorithm for global optimization of continuous functions on a multidimensional domain. For a broad class of functions, given any polynomial P, a version of the algorithm can be constructed so that the error converges to 0 faster than P(1/n).

TB15 Complementarity & Variational Problems I

Cluster: Nonlinear Programming
Invited Session

Chair: George Isac, Royal Military Coll. of Canada, Dept. of Math. & Comp. Sci., PO Box 17000 STN Forces, Kingston, Ontario, K7K 7B4, Canada, isac-g@rmc.ca

1) Exceptional Families of Elements, Feasibility & Complementarity, ***George Isac***, Royal Military Coll. of Canada, Dept. of Math. & Comp. Sci., PO Box 17000 STN Forces, Kingston, Ontario, K7K 7B4, Canada, isac-g@rmc.ca

Exceptional family of elements for a function is a new concept introduced in complementarity theory by G. Isac, V. Bulavski & V. Kalashnikov. We show how this concept can be adapted to the study of feasibility of ??????

2) Minimax Solutions of a Steady-State Control Problem, ***Michael M. Kostreva***, Clemson Univ., Dept. of Math. Sci., Martin Hall, Clemson, SC 29634-1907, flstgla@clemson.edu, ***A. Ward***

The problem of minimizing the maximum value of a solution to a steady-state flow system is formulated as an optimal control problem. The main features control at the boundary and a lower bound on the solution lead to unilateral constraints. Large scale linear programming provides an approximal solution.

3) Impact Contact Problems: A Linear Complementarity Approach, ***P. D. Panagiotopoulos***, Aristotle Univ., Dept. of Civil Eng., Thessaloniki, 54006, Greece

In dynamic contact problems the consideration of the impact effect leads to a new class of variational expressions in inequality forms which include besides the displacment variations, the variations of the impact time. We discuss these variational inequalities and the corresponding linear complementarity problems.

TB16 Linear Programming

Cluster: Linear Programming
Invited Session

Chair: Tamas Terlaky, Delft Univ. of Tech., Dept. of Tech. Math. & Info., Fac. of ITS, Mekelweg 4, Delft, 2600 GA, The Netherlands, t.terlaky@twi.tudelft.nl

1) An Epsilon-Out-of-Kilter Method for LP & Network Flows, ***Paul Tseng***, Univ. of WA, Dept. of Math., Box 354350, Seattle, WA 98195, tseng@math.washington.edu

We extend ideas from epsilon-relaxation method for single-commodity network flow to obtain an epsilon-out-of-kilter method for LP (and for monotropic optimization). Complexity of the method and specialization to network flow with side constraints, which depend on resolving certain theorem of the alternative, will be discussed.

2) Complexity of Interior-Point Methods in Terms of the Conditioning of the Set of Optimal Solutions of an LP, ***Manuel Nunez***, Chapman Univ., Sch. of Bus. & Econ., 333 N Glassel St., E40-194, Orange, CA 92866, mnunez@chapman.edu

We discuss several measures for conditioning the set of optimal solutions of a LP. Using these measures, we show results concerning the stability of the central trajectory, its curvature, and its convergence. Finally, we show polynomial complexity bounds for an interior-point method in terms of these conditioning measures

3) The Facial Structure of Convex Programs: A Unifying Theory, ***Gabor Pataki***, Columbia Univ., IEOR Dept., Mudd 331, New York, NY 10027, gabor@ieor.columbia.edu

Using a classic result in convex analysis, we give simple and intuitive extensions of the definitions and results on the solution set, of its faces, on nondegeneracy and struct complementarity in linear programs to general convex programs. Our theory subsumes many previous results on the geometry of convex programs.

TB17 Assembly Line Balancing

Cluster: Optimization Days
Invited Session

Chair: Ken Doerr, Univ. of Miami, Sch. of Bus. Admin., Coral Gables, FL 33124-9145, kdoerr@homer.bus.miami.edu

1) Process Improvement for a Can Line, ***Elena Katok***, CO Sch. of Mines, Div. of Econ. & Bus., Golden, CO 80401-1887, ekatok@mines.edu, ***Tomas Serrander***, ***Matthias Wennstrom***, ***Dennis Ott***

We report here on a process improvement project for the Coors Brewing Company. Our primary focus is the 16 oz. aluminum can production facility, currently producing approximately 200,000,000 cans annually. The purpose is to decrease scrap and line downtime due to starvation and blocking.

2) Stochastic U-Line Balancing, ***David Sparling***, Univ. of Guelph, Dept. of Agri. Econ. & Bus., Cambridge, Ontario, N1G 2W1, Canada, dsparlin@uoguelph.ca, ***John Miltenburg***

Recently assembly line balancing research has placed greater emphasison problems with stochastic task processing times. Although some of the research involves just-in-time production systems, none has considered the problem of stochastic U-line balancing. Under such conditions the operating characteristics of U-lines differ from those of straight assembly lines.

3) Genetic Algorithms for Designing U-Lines, ***Haldun S. Aytug***, Univ. of NC, Belk Coll. of Bus. Admin., IOM Dept., Charlotte, NC 28223, haytug@email.uncc.edu, ***Ram Rachamadugu***

We present genetic algorithms for designing U-lines, Both Types I and II. We develop dynamic update procedures (for Type I, and a polynomial time dynamic programming procedure, Type II, for evaluating the genes. Computational results for a widely used set of problems from the literature will be discussed.

4) Order Strength for Precedence Diagrams, ***Ken Doerr***, Univ. of Miami, Sch. of Bus. Admin., Coral Gables, FL 33124-9145, kdoerr@homer.bus.miami.edu, ***Anuj Mehrotra***

Order strength or graph density is often used to estimate the difficulty of line balancing problems. We provide an improved estimate of order strength by establishing a stronger bound on the maximun number of possible precedence relations in a precedence diagram, and prove that this bound is tight.

TB18 Improving Decision Trees Using Tabu Search

Cluster: Metaheuristics
Invited Session

Chair: Michel Toulouse, Univ. of OK, Sch. of Comp. Sci., 200 Felgar St., Rm. 114, Norman, OK 73019, toulouse@cs.ou.edu

1) MOTS: A MultiObjective Tabu Search Procedure for Solving the Multiobjective 0-1 Knapsack Problem, ***Arnaud Freville***, Univ. de Valenciennes, LIMAV, Le Mont Houy, BP 311, Valenciennes Cedex, 59236, France, arnaud.freville@univ-valenciennes.fr, ***Nazik Mezdaoui***, ***Xavier Gandibleux***

A procedure based on TS principles for solving multi-objective combinatorial optimization problems, able to determine at least a good inner approximation of the efficient set. Numerical experiments with the multi-objective 0-1 knapsack problems show that the approach is quite promising.

2) Rules for Collaborations Among Cyber Agents, ***Sarosh Talukdar***, Carnegie Mellon Univ., Dept. of Elect. & Comp. Eng., Pittsburgh, PA 15213, talukdar@ece.cmu.edu

Any program, machine or person engaged in computer-enabled work is a cyber agent. Empirical evidence and theory suggest that there are simple rules for designing organizations in which collaboration among cyber agents is automatic, unrestricted by agent granularity or intelligence, and scale-effective. This presentation develops these rules.

3) Can Self-Organization Improve Response Time of Self-Healing Capabilities in Telecommunication Networks?, ***Michel Toulouse***, Univ. of OK, Sch. of Comp. Sci., 200 Felgar St., Rm. 114, Norman, OK 73019, toulouse@cs.ou.edu, ***Anindya Das***, ***Teodor Gabriel Crainic***

Self-organization is a spontaneous process by which complex systems reach stability without external interference. We model network crashes and recoveries using the evolution of a discrete-time dynamical system. We study how the system's self-organization dynamics can provide heuristics aimed at reducing the response time of the self-healing network's capabilities.

4) Improving Decision Trees Using Tabu Search, ***Rene Seguin***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, rene@crt.umontreal.ca, ***Michel Gendreau***, ***Francois Guertin***, ***Jean-Yves Potvin***

We consider the problem of constructing plans of actions over a planning horizon to satisfy resource and service constraints. Those plans are represented as decision trees, since the outcome of each action is uncertain. TS is used to add and remove actions from an initial plan to maximize its utility.

TB20 Tutorial: Branch & Cut & Price

Invited Session

Chair: Paolo Toth, Univ. of Bologna, DEIS, Viale Risorgimento 2, Bologna, 40136, Italy, ptoth@deis.unibo.it

1) Tutorial: Branch & Cut & Price, ***George L. Nemhauser***, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, george.nemhauser@isye.gatech.edu

Branch-and-cut (price) integrates B&B and cutting plane (column generation) methods for solving MIPs. At each node of the tree, cuts may be added (columns may be generated) to tighten (improve) the LP relaxation. Our presentation explains why and when these methods work and how to use them in practice.

TB21 Advances in Simulation Methodology

Sponsor: College on Simulation
Sponsored Session

Chair: Bruce W. Schmeiser, Purdue Univ., Sch. of IE, 1287 Grissom Hall, W Lafayette, IN 47907-1287, bruce@purdue.edu

1) Numerical Retrospective Optimization, ***Jihong Jin***, Purdue Univ., Sch. of IE, 1287 Grissom Hall, W Lafayette, IN 47907-1287, ***Bruce W. Schmeiser***

We extend ideas from Fen Chen's retrospective approximation for stochastic root finding to optimization problem, requiring improving approximations in both increasing sample size and decreasing solution error. Almost-sure convergence is shown and computational issues are discussed.

2) Augmentations of Cramer-von Mises Variance Estimators for Simulations, ***David Goldsman***, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332, sman@isye.gatech.edu, ***Keebom Kang***, ***Murat Koksalan***, ***Daniel Ockerman***, ***Andrew F. Seila***, ***Gamze Tokol***

We give new point and confidence interval estimators for the mean and variance parameter arising from a steady-state simulation process. The estimators are augmentations and generalizations of standardized time series Cramer-von Mises estimators. Analytical and empirical examples demonstrate the good performance of the estimators.

3) Balanced Likelihood Ration Methods for Analyzing Highly Reliable Systems, ***Christos Alexopoulos***, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, ***Bruce Shultes***

We present a class of variance reduction methods for computing performance

measures of highly reliable systems. These methods are importance sampling with "well-behaved" likelihood ratios and rely on semi-Markov or semi-stationary formulations based on sets of states with a fixed number of failed components. We use examples to show that the proposed methods overcome limitations of existing methods in moderate-to-large networks.

TB22 Frameworks for Group Decision & Negotiation: Group Composition, Relationships & Task Performance

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: Harris Sondak, Stanford Univ., Graduate School of bus., Stanford, CA 94305-5015, sondak1@leland.Stanford.EDU

1) Team Diversity as a Decision Making, *Karen Jehn*, Univ. of PA, Wharton School, Philadelphia, PA 19104-6330, jehnk@wharton.upenn.edu, ***Sherry Bushnell-Thatcher***

We present an overview of current research on diversity in workgroups and its influence on group processes and outcomes. We then introduce a model which predicts decision quality based on a newly developed typology of group diversity. Conflict, communication, and identity fit are considered mediators in the model.

2) Groups After Upheaval: The Influence of Relationships and Attitudes, *Kathleen L. Valley*, Harvard Univ., Harvard Bus. School, Boston, MA 02163, kvalley@hbs.edu, ***Tracey Thompson***

Group "products" have 3 dimensions: tangible production, generation of ideas, and intragroup relationships. In times of upheaval, individually held attitudes and mutually practiced relations can affect these products. Using data on organizational upheaval, we model how individually held attitudes and relations with others interact to influence group products.

3) Egalitarian Values in Self-Managing Teams: Positive & Negative Effects on Team Processes, *Ruth Wageman*, Columbia Univ., Graduate School of Bus., NY, NY 10027, rwageman@research.gsb.columbia.edu

Individuals differ in their values about equity of effort distribution and outcome distribution in teams. This longitudinal survey study examines the influence of high task and outcome interdependence on these values. Team conflict and performance are affected by strong collective equity values, individual self-esteem, and group idientification.

4) The Relational Models Approach to Group Decision Making, Status & Allocation, *Harris Sondak*, Stanford Univ., Graduate School of bus., Stanford, CA 94305-5015, sondak1@leland.Stanford.EDU

I discuss the the resolution of fundamental paradoxes of group process in performing groups according to Fiske's catgegories of social structure (communal sharing, authority ranking, equality matching, market pricing). The constitution of these groups, their decision making, and their concern with status reveal how combinations of relational models affect group performance.

TB23 Implications of Recent Psychological Results for DA Practice

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Elke U. Weber, Ohio State University, 1885 Neil Avenue, Dept. of Psych. & Mngmnt. & hr, Columbus, OH 43210, weber.211@osu.edu

1) Predicting Choices from Emotions, *Barbara Mellers*, OH St. Univ., Psych. Dept., 1885 Neil Ave., Columbus, OH 43210, mellers.1@osu.edu

People often imagine how they will feel about the outcomes of decisions and those imagined feelings serve as guides to choice. We provide an account of experienced emotions called decision affect theory. Despite these differences between emotional experiences and utilities, there is considerable overlap between maximizing subjective expected pleasure and subjective expected utility.

2) Quality Adjusted Life Years Utility Assessment Under Non-EU Assumptions, *John Miyamoto*, Univ. of WA, Box 351525, Dept. of Psych., Seattle, WA 98195, jmiyamot@u.washington.edu

The QALY utility model is usually applied in medical DA under EU assumptions and the assumption of linear utility of survival duration. We present work on QALY utility assessment under the less restrictive assumptions of rank-dependent utility and nonlinear utility of survival duration.

3) Predicting Health Decisions: The Application of Subjective Expected Utility & Remaining Challenges, *Young-Hee Cho*, Univ. of Missouri, Dept. of Psych., Columbia, ***Robin L. Keller, M. Lynne Cooper***

We critically examine the application of the SEU to modeling risk-taking behaviors and review the studies which investigate the predictive validity of SEU for risk-reducing or preventative measures. We then discuss challenges in modeling health decisions, including the complexity of health decision making and difficulty in eliciting the decision components.

4) Reasons for Rank-Dependent Utility Evaluation, *Elke U. Weber*, Ohio State University, 1885 Neil Av, Dept. of Psych. & Mngmnt. & hr, Columbus, OH 43210, weber.211@osu.edu

Three reasons for evaluating utility in a rank-dependent fashion have been suggested: perceptual biases, individual predispositions in weighting and rational adaptation to an asymmetric loss function. We present evidence for all 3 processes which have different implications for successful debiasing procedures.

TB24 Multicriteria Decision Making I

Contributed Session

Chair: John F. Wellington, Capital Univ., GSA, 2199 E Main St., Columbus, OH 43209-2394, runnerjohn@aol.com

1) An Attempt to Provide Characterization of Some Discrete Multicriterion Decision Aid Procedures, *Adel Guitouni*, Univ. Laval, Op. et Sytemes de Decision, CP 604, Fac des Sci de l'admin, Quebec, Quebec, G1K 7P4, Canada, guitouna@osd.ulaval.ca, ***Jean-Marc Martel***

The great number and the diversity of MCDA procedures proposed in the literature suggest to carry out a systematic and axiomatic analysis. The purpose of this analysis is to provide elements (axioms) to characterize these MCDA procedures on one hand, and to show the weaknesses and strengths of each procedure on the other. As emphasized by Pirlot (1994), the axiomatization of a procedure is not in general unique...

2) A Genetic Algorithm for the Multiple Criteria Decision Problem, *Juan C. Leyva-Lopez*, Univ. Autonoma de Sinaloa, Priv. San Pedro 2292, Fracc. Nueva Vizcaya, Culiacan, Sinaloa, 80020, Mexico, jleyva@uas.uasnet.mx

A new genetic algorithm that allows exploit a known fuzzy outranking relation is introduced with the purpose of construct a prescription for the ordering multiple criteria decision problem.

3) Application of Multicriteria Methods in Statistical Estimation, *John F. Wellington*, Capital Univ., GSA, 2199 E Main St., Columbus, OH 43209-2394, runnerjohn@aol.com, ***Subhash C. Narula***

The least squares criterion of minimizing the sum of squared deviations is well known, well understood and for these reasons well applied to estimating the unknown parameters of the multiple linear regression model. We propose methods for incorporating other less known, less understood but meaningful criteria in the same estimation setting.

TB25 Stochastic Models in Manufacturing

Sponsor: Applied Probability Section
Sponsored Session

Chair: Martin L. Puterman, Univ. of British Columbia, Fac. of Comm., BRAMMS, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, marty@markov.commerce.ubc.ca

1) Throughput for CONWIP Controlled Assembly-Type Queueing Networks, *Hayriye Ayhan*, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, hayhan@isye.gatech.edu

We examine the throughput of CONWIP controlled assembly-type queueing networks where machine processing times are drawn from general distributions. The system dynamics are characterized via a set of stochastic difference equations; it is shown that the system state can be modeled by a discrete index Markov chain on a continuous state space.

2) Stochastic Asset Replacement with Budget Constraints, *James C. Bean*, Univ. of MI, 1205 Beal St., Ann Arbor, MI 48109-2117, james.bean@umich.edu

Many real equipment replacement problems, such as those arising in manufacturing, have the characteristics that assets degrade according to a stochastic process, and replacement decisions are constrained by capital expenditure budgets. The problem can be modeled as a set of nonhomogeneous Markov decision processes with coupling constraints from the capital budgets.

3) Computation of Optimal Policies in a Two-Time Scale Switching Diffusion Manufacturing Model, *Alain B. Haurie*, HEC-Uni Mail, 102 Carl Vogt, Geneve 4, CH-1211, Switzerland,

haurie@ibm.unige.ch, ***Jerzy A. Filar***

Manufacturing flow control models have been developed with the use of a piecewise deterministic control system paradigm. Manufacturing systems are often composed of two subsystems, the production process and the machine failure and repair process, that are represented as a continuous and a discrete random process respectively.

4) Stochastic Tool Life Models in Flexible Manufacturing, ***Bernard F. Lamond***, Univ. Laval School of Bus., Dept. Op. & Dec. Systems, Fac. of Admin. Sci., Quebec, Quebec, G1K 7P4, Canada, bernard.lamond@fsa.ulaval.ca, ***Manbir S. Sodhi***, ***Martin Noel***

We address the problem of choosing the cutting speed of a flexible machine-tool to minimize the expected total processing time. The tool life is a random variable with a known distribution. Tool failures cause a setup time and thus increase processing time. We assume the coefficient of variation is given and the mean tool life is a function of the cutting speed governed by Taylor's formula.

TB26 Priority Queues

Cluster: Queueing
Invited Session
Chair: David A. Stanford, Univ. of Western Ontario, Dept. of Stats., Western Sci. Ctr., Rm. 262, London, Ontario, N6A 5B7, Canada, stanford@fisher.stats.uwo.ca

1) Multiclass General Preemptive Queue with Markovian Arrivals and Phase Type Service, ***Attahiru S. Alfa***, Univ. of Manitoba, Dept. of Mech. & IE, Winnipeg, Manitoba, R3T 5V6, Canada, alfa@cc.UManitoba.ca

We use the matrix-geometric method to study a general multiclass preemptive priority queue with Markovian arrivals and phase type services. We show that the structure of the R matrix is still upper triangular and in layers. We present a simple approach for constructing the associated Markov chain and obtaining key performance measures.

2) A Priority Queue with a Hysteretic Policy, ***Srinivas Chakravarthy***, Dept. of Science/Math, GMI Eng. & Mnmt. Inst., Flint, MI 48504, schakrav@nova.gmi.edu, ***Karuna Ramachandran***, ***David A. Stanford***

A two priority MAP/PH/1 queue is considered with a hysteretic control policy. When the high-priority queue length exceeds a threshold, the service rates are sped up and maintained until the queue length drops to a specified lower level. Various performance measures are determined, and numerical examples are presented.

3) Interdeparture Times in Preemptive Priority Queues, ***Steve Drekic***, Univ. of Western Ontario, Dept. of Stat. & Actuarial Sci, Dept. of Actuarial Sci., London, Ontario, N6A 5B7, Canada, drekic@fisher.stats.uwo.ca, ***David A. Stanford***

We present an exact transform result for the interdeparture time (IDT) distribution in a M/G/1 preemptive priority queue. These confirm previous preemptive resume results and consider preemptive repeat queues, for which no earlier expressions existed, and a preemptive repeat queue with changing service distributions. Numerical examples for the variability are presented.

TB27 Inventory Management III

Contributed Session
Chair: Moula Cherikh, VA State Univ., Dept. of IS & Dec. Sci., POB 9038, Petersburg, VA 23806, mcherikh@vsu.edu

1) Style Goods Pricing with Competition, ***Alper Sen***, Univ. of Southern CA, IOM Dept., Los Angeles, CA 90027, asen@usc.edu http://www-rcf.usc.edu/~asen, ***Alex X. Zhang***

We study the pricing decisions of two companies which have to sell their fixed stock of items over a finite horizon. Both companies have the option to change the price once in the horizon with the objective of maximizing their (expected) profits. Equilibrium price switching times and some structural properties are derived for the deterministic ans stochastic demand.

2) Effects of Centralization on Expected Profits in a Multi-Location Newsboy Problem with Excess Demand Reallocation, ***Moula Cherikh***, VA State Univ., Dept. of IS & Dec. Sci., POB 9038, Petersburg, VA 23806, mcherikh@vsu.edu

A decentralized multi-location newsboy problem where portions on excess demand at each location are reallocated to other locations is considered. The model is compared to the centralized model where all demands are satisfied from one central warehouse. Expected profits are evaluated and conditions are derived under which centralization is better.

3) A Logistics DSS: An Inventory & a Field Service Support System, ***Chrissoleon Papadopoulos***, University of the Aegean, Dept. of Bus. Admin., Chios, 82100, Greece, hpap@aegean.gr

Two DSSs are integrated into a single unified logistics DSS. The first is an inventory DSS and the second is a support system for field service which utilizes a queueing network model developed by Waller and a simulation model. Both models are useful tools for strategic allocation of resources by a field service manager to improve customer service.

TB28 The WWW for Classroom Teaching & for Distance Learning

Sponsor: Forum on Education
Sponsored Session
Chair: Thomas A. Grossman, Univ. of Calgary, Fac. of Mgmt., 2500 University Dr. NW, Calgary, Alberta, T2N 1N4, Canada, grossman@mgmt.ucalgary.ca;informs.org/informed/

1) New Web Technologies & Distance Education, ***Ronald S. Tibben-Lembke***, Univ. of NV, MS 028, MS & Logistics, Reno, NV 89557, rtl@unr.edu

We will focus on the use of new technologies, including telephony and video via the Web, whiteboardls, remotely accessing pc's via the Web, and other methods for sharing information via the Web. Also, other observations teaching 60 students on 3 sites, some over 300 miles away.

2) Testing Students on What You Expect Them to Know: Online Exams & Semi-Automated Marking for a Large Management Science Course, ***Armann Ingolfsson***, Univ. of Alberta, Fac. of Bus., Edmonton, Alberta, T6G 2R6, Canada, armann.ingolfsson@ualberta.ca ualberta.ca/~aingolfs/

As the focus of an OR/MS course shifts from algebraic manipulation to spreadsheet-based modeling, changes in how students are evaluated are needed. I will discuss some of the challenges (on-line exams) and opportunities (semi-automated marking) of doing this, based on experience with online exams in a class of 350 students.

3) Using the Web for Faculty Development & Student Mentoring, ***Ruth A. Maurer***, Walden Univ., 155 5th Ave. S, Minneapolis, MN 55401, rmaurer@waldenu.edu

Many colleges and universities are developing web-based instruction with students in mind. Walden University has extended this idea to faculty development. Online seminars are provided for faculty by faculty. These seminars address such topics as online instructional pedagogy and use of technology, mentoring of students, and collaborative research techniques.

TB29 Airline Cargo Revenue Management

Sponsor: Aviation Applications Section
Sponsored Session
Chair: Bob Phillips, Decision Focus Inc., Suite 300, Mountain View, CA 94041, bobp@dfi.com

1) Demand Forecasting for Air Cargo, ***Brian Monteiro***, DFI/Aeronomics, 650 Castro St., Ste. 300, Mountain View, CA 94041

Demand forecasting for air cargo RM presents special challenges not encountered in passenger RM applications. In particular, both the weight and volume of the shipment must be forecast. In addition, the characteristics of the shipment as received may be significantly different from those of the booking. We discuss these and other aspects of air cargo forecasting and how they have been addressed in application.

2) Target Pricing at UPS, ***Mark Rudel***, UPS, 55 Glenlake Parkway NE, Mail B3F6, Atlanta, GA 30328, ***Tom Guardino***, ***Robert A. Marshalla***

Target pricing applies RM to account pricing by setting guidelines that maximize expected profit through balancing margin and market share in each customer market segment. Target pricing at UPS integrates market-based pricing within a bid performance monitoring process. Price sensitivity is measured by statistical analysis of historical bid outcomes.

3) Scheduling Railway Freight Delivery Appointments Using a Bid Price Approach, ***Chip Kraft***, AMTRAK, 400 Capitol St. NW, 7th Fl., Washington, DC 20001, chipkraft@aol.com

Gain coefficients represent customer recapture probabilities in a modified MCNF formulation. The problem is solved within 1% gap using the subgradient algorithm. Service offers are determined using a modified shortest path procedure. A primal Lagrangian heuristic will also be described.

TB30 Military OR Programming in the UK, US & Canada

Cluster: Military Applications
Invited Session
Chair: Kevin Y. K. Ng, Univ. of Ottawa, Faculty of Admin., 101 Colonel By Drive, Ottawa, Ontario, K1N 6N5, Canada, kevinng@ora.dnd.ca

1) Post-Cold War Operational Analysis in the UK Ministry of Defence, ***Roger A. Forder***, Centre for Defence Analysis, DERA, Farnborough, Hants, GU14 0LX, UK, raforder@dera.gov.uk

During the 1990s, OR in the UK Ministry of Defence has undergone major changes in organization as well as having to respond to the transformation of the world strategic environment. We describe the ways in which these changes have interneted and survey their impact on the characteiristics of the work undertaken.

2) Educating Military Revolutionaries, ***Peter Purdue***, Naval Postgrad. Sch., Dept. of Naval Ops. & Ap. Sci., Hermann Hall, Monterey, CA 93943

Joint Vision 2010, the US vision of future warfare, implies a need for officers with strong analytical and technical skills and the ability to apply them to warfare issues. The NPS existing strong programs in technical military education are being adapted to the new requirements implied by JV2010.

3) Canadian Defence Operational Research Challenges for the Next Decade, ***A. Bradfield***, Ntl. Defense Headquarters, George R. Pearkes Bldg., Ottawa, Ontario, K1A 0K2, Canada

No abstract supplied.

TB31 EUGENE: An Optimization Model for Integrated solid Waste Management Planning: Model & Results

Cluster: Logistics
Invited Session
Chair: Diane Riopel, Ecole Polytech., Dept. of Math & Ind., CP 6079, Succ. Centre-Ville, Montreal, Quebec, H3C 3A7, Canada

1) EUGENE: An Optimization Model for Integrated Solid Waste Management Planning - Model & Results, ***Claude Berger***, GERAD, Ecole des HEC, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, claudeb@crt.umontreal.ca, ***James F. Campbell, Fabien Chauny, Andre Langevin, Richard J. Loulou, Diane Riopel, Gilles Savard, Philippe Waaub***

A sophisticated mixed integer linear programming model, EUGENE, has been developed to help the regional decisional makers in the long-term planning of the solid waste management system. This presentation will describe the model's features and will present analyses resulting from its application to the case of the City of Montreal. A decision support system for analysing complex logistics systems is also presented.

TB32 Threats to Life & Limb

Sponsor: Public Programs & Processes Section
Sponsored Session
Chair: Arnold I. Barnett, MIT, Sloan Sch. of Mgmt., OR Ctr., E53-379, Cambridge, MA 02139-4307, abarnett@mitvma.mit.edu

1) Isolating Cohort & Period Effects in the Recent Rise in Youth Violence, ***Alfred Blumstein***, Carnegie Mellon Univ., The Heinz School, 5000 Forbes Ave., Pittsburgh, PA 15213-3890, ab0q@andrew.cmu.edu

Youth violence grew dramatically in 1985-93. A cohort effect would show itself in a continuation of the elevated rates of violence. A period effect would show even those youth returning to prior age-specific levels. We examine cohort-specific trends to separate the cohort from the period effect.

2) Would Reducing the Harm Drugs Cause a User Reduce or Increase Total Harm to Society?, ***Jonathan P. Caulkins***, Carnegie Mellon Univ., Heinz Sch., 5000 Forbes Ave., Pittsburgh, PA 15213, caulkins@andrew.cmu.edu

Total harm equals use times average harm per unit use. Traditional policies seek to reduce use, sometimes driving up harm per unit use in the process. Progressives advocate reducing harm per unit use, but how much would that increase use? A simple model yields interesting answers.

3) Priority Dispatching in Emergency Medical Services Systems, ***Marvin B. Mandell***, UMBC, Policy Sciences Grad. Program, 100 Hilltop Circle, Baltimore, MD 21250, mandell@umbc.edu

4) Safe at Home? Some Analyses of Domestic Aviation Security, ***Arnold I. Barnett***, MIT, Sloan Sch. of Mgmt., OR Ctr., E53-379, Cambridge, MA 02139-4307, abarnett@mitvma.mit.edu

Terrorist bombs have never destroyed US domestic aircraft; after Oklahoma City, the World Trade Center, and the Olympic bombings, however, it is unclear that the future in this regard is simply the extrapolation of the past. We consider some quandaries about the cost and effectiveness of various measures meant to reduce the risk of domestic air terrorism.

TB33 Facility Planning & Design

Contributed Session
Chair: Gunter P. Sharp, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., MC 0205, Atlanta, GA 30332-0205, gsharp@isye.gatech.edu

1) Application of Weighted Sums of Order p to Distance Estimation, ***Halit Uster***, McMaster Univ., MS/S Dept., 1280 Main St West, Hamilton, Ontario, L8S 4M4, Canada, usterh@mcmaster.ca www.business.mcmaster.ca/msis/phd/halit/halit.htm, ***Robert F. Love***

We examine the properties of weighted sums of order p and the goodness-of-fit criterion Sum of Squared Deviations used in modelling distances. We discuss the distance fitting procedures using these functions and present comparisons with weighted Lp-norm.

2) Difference of Convex Optimization Methods for Multisource Location Problems, ***Faiz A. Al-Khayyal***, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, faiz@isye.gatech.edu, ***Hoang Tuy***, ***Fangjun Zhou***

Finding the optimal locations of many copies of the same facility is formulated as a DC optimization problem and solved by an extension to our early method for single facility location problems. Customers may either be attracted to or repelled by a facility. Computational results are reported.

3) An Algorithm for the Unequal Area Facility Layout Problem Considering Production Uncertainty, ***Bryan A. Norman***, Univ. of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA 15261, banorman@engrng.pitt.edu, ***Alice E. Smith***

We propose an evolutionary solution methodology for the unequal area facility layout problem where there is product flow uncertainty. Layouts are developed that are robust across a range of different product flows. We evaluate these layouts using an aisle distance metric that considers input and output location placement.

4) Consideration of Demand Variability & Demand Correlation in Product Storage Space Requirements, ***Gunter P. Sharp***, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., MC 0205, Atlanta, GA 30332-0205, gsharp@isye.gatech.edu

Product storage space requirement based on textbook formulas for shared storage are too optimistic. We examine the effects of product demand variability, correlations among product demands, and the frequency of product re-assignment, using date from a parts distributor. Implications for activity-based and family-based storage are discussed.

TB34 Software Demonstrations

Chair: To be announced

1) Software Demonstration: Optimization Solutions, ***Gyana Parija***, IBM, 522 South Rd., Dept. 33DA, MS P35, Poughkeepsie, NY 12601

We demonstrate the power and flexibility of IBM's new Stochastic Solutions product for defining, modifying and solving stochastic systems. The stand alone stochastic solver and the callable DLL will be shown, as well as the powerful, yet easy to use, capabilities for inputting SMPS, saving stochastic models, modifying stochastic distributions and solving the resulting models. This will be followed by a brief update on the rest of the Optimization Solution products.

2) Software Demonstration: A Simple Interface for a Complex Modeling System, ***Joseph B. Creegan***, Ketron Management Science, 1755 Jefferson Davis Hwy, Ste. 901, Arlington, VA 22202

Ketron's Logistics Optimization System, LOPTIS, is a multi-period mixed-integer modeling system that models industrial logistics from acquisition of raw materials through delivery of finished products. The simple MS Access interface that controls execution and provides model data management will be demonstrated.

TB35 Object-Oriented Approaches

Contributed Session
Chair: Chang-Ouk Kim, Korea Univ., Inst. for Info. & Comm. Tech., Anam-Dong 5-Ga, Sungbuk-Gu, Seoul, 136-701, Korea, kimco@kuccnx.korea.ac.kr

1) An Object-Oriented Domain Analysis/Design for Hierarchical Manufacturing Systems, ***Chang-Ouk Kim***, Korea Univ., Inst. for Info. & Comm. Tech., Anam-Dong 5-Ga, Sungbuk-Gu, Seoul, 136-701, Korea, kimco@kuccnx.korea.ae.kr, ***Sung-Schick Kim***

Hierarchical manufacturing system is characterized by functional integration and physical distribution. To develop a reusable production control S/W for such a system, we propose an object-oriented domain analysis and design methodology which generates several reusable production control frameworks.

2) An Application of Object-Oriented CIM S/W, ***Sung-Schick Kim***, Korea Univ., Dept. of IE, Anam-Dong, Sungbuk-Gu, Seoul, 136-701, Korea, sungskim@kuccnx.korea.ac.kr, ***Chang-Ouk Kim***

To ensure flexibility, reusability, and extensibility, we propose an object-oriented framework for CIM S/W. The framework-based S/W is being applied to automate the production process of an automobile part company

3) Constructions Ambigues Pour les Objets de Base de Donnees, ***Samuel F. Coppage***, Old Dominion Univ., 2621 Myrtle Ave., Norfolk, VA 23504

La consideration des constructions ambigues pour la specification des operations sur une base de donnees basee sur son calcul des types et des dictions naturelles variees. Une explication des methodes automatiques de desambiguisation.

TB36 Multicommodity Flow & Related Issues

Cluster: Networks
Invited Session
Chair: Serge Plotkin

1) Network Design using Epsilon-Approximate LPs, ***Daniel Bienstock***, Columbia Unv., Dept. of IEOR, New York, NY 10027, dano@ieor.columbia.edu

We describe current work on a generic network design algorithm that approximately solves linear proframming relaxations using recent techniques of Plotkin, Shmoys and Tardos and Grigoriadis and Khachiyan.

2) Improved Approximation Algorithms for Unsplittable Flow Problems, ***Clifford Stein***, Dartmouth College, Hanover, NH 03755

In the unslittable flow problem, we are given a network and set of commodities (source-sink pairs) with associated demands. We seek a single source-sink flow path for each commodity so that the demands are satisfied and the total flow routed across any edge is bounded by its capacity. The problem is an NP-hard variant of max flow and a generalization of single-source disjoint paths with applications to scheduling, load balancing and virtual-circut routing problems. We give a simple framework which leads to small constant-factor approximation algoriths for, in the single source case, minimizing congestion, maximizing total flow and minimizing the number of rounds needed to route all the flow. In the multiple source case, this framework yields an approximation algorithm for maximizing the total flow and for the disjoint paths problem.

3) An Implementation of a Combinatorial Approximation Algorithm for Minimum-Cost Multicommodity Flow, ***Jeffrey Oldham***, Stanford Univ., Stanford, CA

The minimum-cost multicommodity flow problem involves simultaneously shipping multiple commodities through a single network so the total flow obeys arc capacity constraints and has minimum cost. These problems can be expressed as linear programs and most theoretical and practical algorithms are linear programming algorithms specialized for their structures. Combinatorial approximation algorithms by Karger and Plotkin (1995) and Plotkin, Shmoys and Tardos (1995) yield flows with costs slightly larger than the minimum cost and capacity use slightly larger than the given capacities, while the running time is experimentally at most a linear function of the number of commodities. We combined the theoretical ideas to form a provably-correct computer program. Guided by the theory, we modified the program using provably-correct but practically faster techniques. Experimentally, the resulting implementation solves problems instances (with costs at most one percent larger than the minimum cost) two to three orders of magnitude faster than the CPLEX linear programming package and the PPRN multicommodity code.

TB37 Pre-Solution Analysis of Mathematical Programs

Sponsor: CSTS
Sponsored Session
Chair: John W. Chinneck, Carleton Univ., Systems & Computer Eng., 1125 Colonel By Dr., Ottawa, Ontario, K1S 5B6, Canada, chinneck@sce.carleton.ca

1) Look Before You Leap: Preprocessing through Random Sampling, ***Richard J. Caron***, Univ. of Windsor, Dept. of Math., Stats. & Econ., 401 Sunset Ave., Windsor, Ontario, N9B 3P4, Canada, rcaron@uwindsor.ca, ***Arnon Boneh***

We present a technique for sampling points in n-space that generate a set of binary words containing information about feasibility and redundancy. The words form a set-covering matrix whose corresponding feasible solutions provide information on minimal infeasible sets, on irreducible inconsistent systems, and on minimal representations. The technique is applicable to very general constraint sets.

2) Compiling & Solving 100,000 Nonlinear Equations in Minutes on a PC, ***Arthur W. Westerberg***, Carnegie Mellon Univ., Dept. of Chem. Eng., Pittsburgh, PA 15213, a.westerberg@cmu.edu, ***Benjamin A. Allan***, ***Kenneth H. Tyner***

We analyze the par/whole structure of complex models to preorder equations for LU factorization and to determine the number of types of equations to compile, getting significant time reductions for both. We also describe a new robust yet fast solver.

3) Estimating the "Shape" of Nonlinear Functions & Regions, ***John W. Chinneck***, Carleton Univ., Systems & Computer Eng., 1125 Colonel By Dr., Ottawa, Ontario, K1S 5B6, Canada, chinneck@sce.carleton.ca

How do you determine the "shape" (convex? concave? both? linear?) of a nonlinear function of many variables? MProbe is a software system for estimating "shape". This paper gives an overview of MProbe, including the new facility for estimating the convexity of a region defined by a set of constraints.

TB38 Wireless Networks

Sponsor: TST
Sponsored Session
Chair: Cem U. Saraydar, Rutgers Univ., WINLAB, Dept. of Elect. Eng., PO Box 909, Piscataway, NJ 08855-0909, saraydar@winlab.rutgers.edu

1) Optimum Power Schedules for CDMA Access Channels, ***Aylin Yener***, Rutgers Univ., PO Box 909, WINLAB, Dept. of Elect. Eng., Piscataway, NJ 08855-0909, yener@winlab.rutgers.edu, ***Christopher Rose***, ***Roy Yates***

We consider the system access problem for CDMA networks where accessing users' transmissions interfere with active traffic channels and study how transmit power should be varied with each successive access attempt so that the linear combination of average power expended and the average delay experienced by the accessing user is minimized.

2) Computation of Lower Bounds for Channel Block Assignment Problem, ***Pascal Adjakple***, Ecole Polytech. of Montreal, GERAD & Dept. of M&IE, CP 6079 Station centre-ville, Montreal, Quebec, H3C 3A7, Canada, pascal@crt.umontreal.ca, ***Brigitte Jaumard***

We propose a new linear 0-1 formulation for the channel assignment problem with co-channel and adjacent channel constraints which requires column generation techniques for its solution. This leads to a new class of lower bounds. =20 Preliminary results are presented on two Bell Mobility problems.

3) Planning Issues in Wireless ATM, ***Brunilde Sanso***, Ecole Polytech. of Montreal, CRT, GERAD, Math. & IE Dept., CP 6079 Succ Centreville, Montreal, Quebec, H3C 3A7, Canada, bruni@crt.umontreal.ca, ***Kayetan Litwin***

We make an overview of the most important issues related to the deployment of ATM wireless systems. In particular in what concerns dimensioning, quality of service and the relationship with wired ATM.

Tuesday 11:30-12:30

TK05 Keynote: SABRE's Practical Business Applications Solving Complex Business Problems Using OR, IE & IT

Keynote Session
Chair: Michael A. Florian, Univ. of Montreal, CRT & Dept. DIRO, CP 6128, CP 6128, Succ. Centerville, Montreal, Quebec, H3C 3J7, Canada, mike@crt.umontreal.ca

1) Keynote: SABRE's Practical Business Applications Solving Complex Business Problems Using OR, IE & IT, ***Thomas M. Cook***, SABRE Decision Tech., 4255 Amon Carter Blvd., PO Box 619615, MD 4462, Ft. Worth, TX 75261-9616

Dr. Thomas Cook will discuss how SABRE combines the principles of OR, IE and IT to solve the complex business problems in the travel and transportation industry. He will review the major milestones in the company's history, from the early days when SABRE solved American Airlines airline inventory problem with a technique called "yield management" to the more recent challenges faced

as SABRE extended its solutions to the rail and hospitality industries...

TK20 CORS/SCRO

Keynote Session

Chair: Michel Gendreau, Univ. de Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, michelg@crt.umontreal.ca

1) Keynote: CORS/SCRO Harold Lardner Memorial Lecture - Models & Algorithms for Crew Management, ***Paolo Toth***, Univ. of Bologna, DEIS, Viale Risorgimento 2, Bologna, 40136, Italy, ptoth@deis.unibo.it

Crew management concerns building the work schedules (rosters) of crews to cover a set of timetabled trips. The problem is generally decomposed into 2 subproblems: crew-scheduling and crew-rostering. Different ways of modeling and solving the subproblems are outlined. Two main approaches are illustrated, based on set-covering and graph-theoretical formulations. Computational results for real-world railway applications are presented.

Tuesday 13:30-15:00

TC01 Network-Level ATIS II: Effect of Information

Sponsor: TSS & IFORS

Sponsored Session

Chair: To be announced

1) Commuter Route & Departure-Time Choice Behavior Under Congested Conditions, ***Karthik K. Srinivasan***, Univ. of TX, Civil Eng., ECJ 6.2, Austin, TX 78712, USA, kksriniv@alpha61.ce.utexas.edu, ***Hani S. Mahmassani***, ***Peter S. Chen***

Tripmakers' route and departure time choices directly determine both within-day and day-to-day dynamics commuting systems. Commuter behavior under congested conditions is examined, based on data from laboratory experiments, using a multinomial probit framework.

2) ATIS Market Penetration Under Multiple Objective Dynamic Traffic Assignment, ***Jeffrey Adler***, RPI, Dept. of Civil Eng., 110 8th St., Troy, NY 12180, adlerj@rpi.edu, ***Tzu-li Wu***, ***Victor Blue***

We look at market penetration rates for ATIS under multiple objective DTA. Sensitivity analysis is carried out for sets of competing objectives and various weighting functions.

3) Effect of Information Supply in Transmit Systems: Simulation Study, ***R. Jayakrishnan***, Univ. of CA, Dept. of Civil & Env. Eng., Irvine, CA 92697, rjayakri@uci.edu, ***Ana C. Fill***

A simulation model is developed for bus transit systems, to study the effect of information supply schemes. The model operates in conjunction with an arterial/freeway traffic simulator and uses realistic traffic variables for modelling bus movements. Results on studying the effect of information supply strategies such as bus arrival information at the stops, partial supply strategies such as information only for certain stops and bus lines, are discussed.

4) Transit Route Guidance System: Data Requirements & Algorithms, ***Jeffrey Adler***, RPI, Dept. of Civil Eng., 110 8th St., Troy, NY 12180, adlerj@rpi.edu, ***Jack Reilly***

The development of a route guidance system for transit that will assist travelers to plan transit trips is discussed. The system takes as inputs an OD location in a network, a desired travel time, and a travel objectives and generates for a rider the best transit path and estimated travel times. The focus of this presentation is on the data requirements and the analytical specification of the algorithm.

TC02 Real-Time Vehicle Dispatching

Sponsor: TSS

Sponsored Session

Chair: Jean-Yves Potvin, Univ. of Montreal, CRT, CP 6128 Succ Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, potvin@iro.umontreal.ca

1) A Parallel Heuristic to Assist Real-Time Ambulance Redeployment Operations, ***Frederick Semet***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal Quebec, H3C 3J7, Canada, frederic@crt.umontreal.ca, ***Michel Gendreau***, ***Gilbert Laporte***

The potential of emergency medical service to save lives is related to the time needed by a paramedic team to arrive on scene. This time can be reduced by a redeployment of available ambulances to potential location sites. In this talk, we present a parallel tabu search heuristic to find good solutions to the real-time redeployment problem.

2) Parallel Tabu Search for Dynamic Vehicle Routing & Dispatching with Pick-Ups & Deliveries, ***Jean-Yves Potvin***, Univ. of Montreal, CRT, CP 6128 Succ Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, potvin@iro.umontreal.ca, ***Michel Gendreau***, ***Francois Guertin***, ***Rene Seguin***

We address the problem of dispatching a fleet of vehicles in real time to service requests with both a pick-up and a delivery location. The problem is solved as a sequence of static problems using a parallel TS heuristic with a neighborhood structure based on ejection chains. Numerical results for different search strategies are presented.

3) Diversion for Real-Time Vehicle Dispatching, ***Soumia Ichoua***, Univ. de Montreal, CRT & DIRO, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, soumia@crt.umontreal.ca, ***Michel Gendreau***, ***Jean-Yves Potvin***

In real-time vehicle dispatching, the ability to divert a vehicle away from its current destination to serve a request that just occurred in the vicinity of its current position may be a valuable alternative. An empirical evaluation of diversion is performed in a context where each request contains a single pick-up (or, exclusive, delivery) location.

TC03 Operating to a Plan: On Target for a Scheduled Railway

Sponsor: RASIG

Sponsored Session

Chair: Michael Beeby, Canadian National Railway, 935 de LaGauchetiere Ouest, Montréal, Québec, H3B 2M9, Canada, beeby@cn.ca

1) Operating to Plan, ***Anshu A. Pathak***, Canadian National Railway, 935 rue de LaGauchetiere Ouest, PO Box 8100, Montreal, Quebec, H3C 3N4, Canada, pathak@cn.ca

In their bid to become more competitive, cost efficient and customer responsive, many North American railways are moving towards the "Operating to Plan" or a scheduled railway philosophy. Canadian National's efforts in this direction will be discussed. This includes the OPT architecture and components (forecasting, train planning, resource validation) and a discussion of our experience with these system components.

2) Operating to Plan: Forecasting Train Workload, ***George Rowan***, Canadian National Railway, 935 rue de LaGauchetiere Ouest, Montreal, Quebec, H8Z 2S2, Canada, rowan02@cn.ca

As part of the CN's "Operating to Plan" initiative, much emphasis was placed on the forecasting of expected train workload. This workload includes traffic originating on CN's lines and traffic received at interchanges from other railroads. The trials, failures and triumphs of the forecasting layman will be presented.

TC04 Operations Management IV

Contributed Session

Chair: Mohammad M. Amini, Univ. of Memphis, Fogelman Coll. of Bus. & Econ., Memphis, TN 38152, mamini@cc.memphis.edu

1) Profit Maximization of By-Product Manufacturing Processes, ***Wendell G. Gilland***, Univ. of NC, Kenan-Flagler Bus. Sch., 316 Old Forest Creek Dr., Chapel Hill, NC 27514, wendell_gilland@unc.edu

We analyze a manufacturing process that naturally produces 2 or more products that are differentiated by their quality. We assume the option is available to downgrade higher quality products and sell them into the lower quality market and derive conditions for when this option will be exercised.

2) The Worker Scheduling Scheme for Maximum Work Efficiency & Minimum Load Deviation, ***Hongchul Lee***, Korea Univ., IE Dept., 1 5-Ka Anam-dong, Sungbuk-ku, Seoul, 137-701, Korea, hclee@kuccnx.korea.ac.kr, ***Sung-Schick Kim***

We present the mathematical formulation and the network flow based solution procedure for assigning workers to machines, in such a way that the overall utilization of workers is maximized as well as the variation of workload among workers is minimized, simultaneously. this problem can be formulated as a preemptive goal programming....

3) A Model of Learning & Turnover by Telephone Call Center Employees, ***Yongpin Zhou***, Univ. of PA, OPIM Dept., The Wharton Sch., Philadelphia, PA 19104-6366, yongpin@wharton.upenn.edu, ***Noah F. Gans***

Telephone call centers employ service representatives who learn and turn over in a systematic fashion. Intelligent call-routing and staffing decisions are vital to their success, yet traditional queueing models are not applicable in this setting.

We develop and analyze models for these systems. Results and insights will be discussed.

4) Improving Service Quality within Roche's International Supply Chain: Optimization Models for Maintenance Crew Domicile Selection, ***Mohammad M. Amini***, Univ. of Memphis, Fogelman Coll. of Bus. & Econ., Memphis, TN 38152, mamini@cc.memphis.edu, ***Donna L. Retzlaff-Roberts***

Roche, an international pharmaceutical and medical equipment company, introduced a new multi-million dollar laboratory equipment that is capable of conducting a number of medical tests on a single blood sample. With hundreds of maintenance crews to provide a 6-hour maintenance cycle time for a large number of installations, the issue at hand is to determine crew domiciles...

TC05 Retail Assortment & Inventory Planning

Sponsor: MSOM
Sponsored Session
Chair: Garrett J. van Ryzin, Columbia Univ., 412 Uris Hall, New York, NY 10027, gjv1@columbia.edu

1) Managing Inventory of Products with Substitutes & Complements in Retailing, ***Naren Agrawal***, Santa Clara Univ., OMIS, Leavey Sch. of Bus., Santa Clara, CA 95053, ***Stephen Smith***

We present an analytical model to determine the optimal retail assortment when customers can purchase complementary sets of items, and may substitute among sets if some items are unavailable. The effect of complements and substitutes on item demand and service level is discussed along with key insights from numerical examples.

2) Managing Variety on the Retail Shelf: Using Scanner Data to Rationalize Assortments, ***Ravi Anupindi***, Northwestern Univ., KGSM, 2001 Sheridan Rd., Evanston, IL 60208, r-anupindi@nwu.edu, ***Sachin Gupta, N. Venkataramanan***

We propose a model for the rationalization of retail assortment and stocking decisions for retail category management. Important features include customer heterogeneity in intrinsic preferences for items, substitution, disutility incurred by consumers due to limited assortment. We demonstrate an empirical application of our proposed model using household scanner panel data for ten items in a popular grocery category.

3) Assortment Planning in Fashion Retailing: Models, Application & Analysis, ***Kumar Rajaram***, UCLA, Anderson Sch., Op. & Tech. Mgmt., Box 951481, Los Angeles, CA 90095-1481, krajaram@anderson.ucla.edu

In assortment planning, retailers typically classify their merchandise into classes. The questions of how many and what classes to include in the line relate to other basic issues of the mix between basic and fashion products, inventory depth and breadth, etc. We develop models to address these issues and apply them to a large catalog retailer.

4) Stocking an Assortment of Substitutable Products: Structure & Computation, ***Garrett J. van Ryzin***, Columbia Univ., 412 Uris Hall, New York, NY 10027, gjv1@columbia.edu, ***Siddharth Mahajan***

We discuss stocking an assortment of products under a discrete choice, utility maximizing consumer demand process. We investigate convexity and submodularity properties of the profit function and propose an efficient method for computing optimal stocking levels.

TC06 Production/Inventory Planning & Control Under Uncertainty

Sponsor: MSOM
Sponsored Session
Chair: Valerie Tardif, Univ. of TX, Grad. Program in OR/IE, Dept. of Mech. Eng., Austin, TX 78712-1063, vtardif@mail.utexas.edu

1) Production/Inventory Systems with Failures & Limited Repair Capacity, ***Seyed M. R. Iravani***, Univ. of MI, IOE Dept., Ann Arbor, MI 48109-2117, iravani@engin.umich.edu, ***Izak Duenyas, Tava Lennon Olsen***

We consider a problem where multiple heterogeneous machines are operating as separate production/inventory systems but must share repair crews (the machine-interference problem). We study methods to concurrently set inventory targets and to schedule the repair crews so as to minimize holding and lost-sale penalty costs.

2) An Extended PAC System & its Optimization using Simulation, ***Sherman X. Bai***, Univ. of FL, ISE Dept., 303 Weil Hall, Gainesville, FL 32611, bai@ise.ufl.edu

We extend the PAC system by Buzacutt and Shanthikumar to include the Hedging Control policy by Bai and Gershwin. The production control system can be optimized via simulation optimization using frequency and wavelet analysis.

3) Analysis of Kanban Controls for Systems Prone to Defects with Lost Sales, ***Paul H. Zipkin***, Duke Univ., Fuqua Sch. of Bus., Durham, NC 27708-0120, zipkin@mail.duke.edu, ***Yves P. Dallery, Rolf Forsberg***

Consider a multi-stage production system with lost sales, controlled by a kanban policy. Each stage may occasionally produce defective units. The yields, production times, and customer demands are stochastic. We present and evaluate an approximation method for performance analysis.

4) Finite-Capacity Production Planning & Diagnostic Under Uncertainty, ***Valerie Tardif***, Univ. of TX, Grad. Program in OR/IE, Dept. of Mech. Eng., Austin, TX 78712-1063, vtardif@mail.utexas.edu

We present scheduling and diagnostic procedures for the problem of planning production in a finite-capacity manufacturing environment with supply and demand uncertainty. We make use of stochastic optimization models and heuristics to get feasible and robust schedules.

TC07 Technology Management Issues

Contributed Session
Chair: R. Ray Gehani, Univ. of Akron, Dept. of Mgmt., 259 S Broadway, Akron, OH 44325-4801, rgehani@uakron.edu

1) withdrawn - author request of 3/24, ***X. Michael Song***, MI State Univ., N334 North Bus. Complex, E Lansing, MI 48824-1122, songx@pilot.msu.edu, ***Jinhong Xie***

2) withdrawn - author request of 4/2, ***Joris Meijaard***, Erasmus Univ., Burg. Oudlaan 50, Rm. H9-12, Rotterdam, 3062 PA, The Netherlands, meijaard@few.eur.nl

3) Transition Management in NetWorking (Mode 3) Organizations, ***Dottie J. Eastman***, The Fielding Inst., PO Box 61122, Kensington RPO, Calgary, Alberta, T2N 4S6, Canada, dartt@ibm.net http://www.dartt.com, ***Niels Agger-Gupta, Efrem G. Mallach***

Strategic shifts in management of technology, operations, personnel and information occur in organizations that successfully transition from using networks to increase efficiency (Mode 1) and effectiveness (Mode 2), to become NetWorking Organizations (Mode 3) that use technology to redesign operations. New responsibilities involve integration management, information quality assurance...

4) The Dual Product Warranty & Life Cycle Stages of Technology Intensive Products, ***R. Ray Gehani***, Univ. of Akron, Dept. of Mgmt., 259 S Broadway, Akron, OH 44325-4801, rgehani@uakron.edu, ***Jay G. Patankar, Amit Mitra***

A manufacturer of a technology intensive product may offer an initial product warranty during its introductory stage and offer a different product warranty during the growth stage of its product life cycle. The initial product warranty may be either liberal or conservative. We discuss the dual warranty problem in the 2 stages of a product life cycle.

TC08 Knowledge for Development: Management & Policy Initiatives

Sponsor: Technology Management Section
Sponsored Session
Chair: Pedro T. Conceicao, Univ. of TX, iC2 Inst., 2815 San Gabriel Ave., Austin, TX 78705, pedroc@uts.cc.utexas.edu

1) Policies to Promote Development Through Knowledge Accumulation, ***Jeffrey W. Amos***, Univ. of TX, iC2 Institute, 2815 San Gabriel Ave., Austin, TX 78705, ***Pedro T. Conceicao***

The impact of technological change for economic growth has been increasingly re-conceptualized as a relationship between knowledge accumulation and economic development. The key factor in this new understanding is the ability to learn, at the individual, organizational, national, and regional levels, replacing the traditional perspective associated with innovation.

2) The Evolution of Industrialization Policies in Mexico, ***Vidal Garza-Cantu***, Univ. of TX, LBJ Sch., 2815 San Gabriel Ave., Austin, TX 78705, vidalg@uts.cc.utexas.edu

This paper analyzes the historical evolution of industrial policies in Mexico from

the 1930's to date. It revises the role of the state and the business sector in stimulating growth and in policy making. It reveals that the present policies should be ones that stimulate regional capabilities instead of nation wide strategies...

3) Building & Exploiting the Core Competencies of Firms: The Role of Technology, ***Alejandro Ruelas-Gossi***, Univ. of TX, Austin, TX 78705, ruelas-gossi@mail.utexas.edu

We analyze the interrelationships among Core Competencies, Knowledge Management, Technology, Strategy. Building and Exploiting the Core Competencies deals with the continuous process that involves Knowledge Management, and the progression from Organization Learning to the inventory accumulation of Intellectual Capital, and on, to the measurement of the impact of the process on Aggregated Value in the Business Units. ...

4) Innovation Policies for Portugal, ***Francisco Veloso***, MIT, Cambridge, MA 02139

TC09 Managing Technology Networks

Sponsor: Technology Management Section
Sponsored Session

Chair: John W. Medcof, McMaster Univ., Sch. of Bus., Hamilton, Ontario, L8S 4M4, Canada, medcof@mcmaster.ca

1) Relationship Networks in the Semiconductor Industry, ***Tim Rowley***, Univ. of Toronto, Rotman Ctr. for Mgmt., 105 St. George St., Toronto, Ontario, M5S 3E6, Canada, rowley@fmgmt.mgmt.utoronto.ca

Inter-firm relationships have often been studied from a dyadic perspective. Using social network analysis, this paper empirically examines how the web of technology-based relationships between semi-conductor manufacturers produces constraints and opportunities for firms in the network. It is argued that the network's structure and firms' locations influence relationship behaviours.

2) The Role of Networking & Regional Impact in Contract Research & Teaching at Universities, ***Jerome Doutriaux***, Univ. of Ottawa, Faculty of Admin., PO Box 450, Ottawa, Ontario, K1N 6N5, Canada, doutriaux@admin.uottawa.ca, ***Manfred Szabo***

3) Alliances & Survival Among Canadian Biotech Startups, ***Brian S. Silverman***, Univ. of Toronto, Rotman Ctr. for Mgmt., 105 St. George St., Toronto, Ontario, M5S 3E6, Canada, silvarman@fmgmt.mgmt.utoronto.ca, ***Joel Baum***

Prominent among the strategies adopted by Canadian biotech startups is the formation of alliances with large chemical and pharmaceutical firms. The results of an empirical study of the role of alliances, technological capabilities, and technological flows/linkages in the survival of these biotechs are reported.

4) Organizational Power in Transnational Technology Networks, ***John W. Medcof***, McMaster Univ., Sch. of Bus., Hamilton, Ontario, L8S 4M4, Canada, medcof@mcmaster.ca

Assignment of strategic work to overseas technology units and creation of strong communication networks among them are usually undertaken for reasons unrelated to power, but have important, often unanticipated, consequences for organizational power relationships. Strategic contingencies theory of power is used to articulate directions for research and adv ice for managers.

TC10 New Developments in Scheduling I

Cluster: Scheduling
Invited Session

Chair: Lei Lei, Rutgers Univ., Fac. of Mgmt. & RUTCOR, 180 University Ave., Newark, NJ 07102, llei@andromeda.rutgers.edu

1) Scheduling a CNC Machine with Tool Changes, ***Selim Akturk***, Bilkent Univ., Dept. of IE, Ankara, 06533, Turkey, akturk@bilkent.edu.tr, ***Jay B. Ghosh***

We address the sheduling of a CNC machine in presence of tool changes (due to tool wear) and the simultaneous controlling of the cutting speed and the feed rate for each job (under job parameter and machine horse power constraints). Our objective is to minimize the total weighted job completion time.

2) Job-Flow Time Reduction in an Automated Guided Vehicle System Through Home Location Selection, ***Pius J. Egbelu***, IA State Univ., Dept. of IMSE, Ames, IA 50011, pegbelu@iastate.edu, ***Chih-Hsiung Hu***

In automated guided vehicle systems, the effect of vehicle scheduling and dispatching techniques on job flow times is well recognized. Not well studied is the effect of locating home locations for idle vehicles. In this study, the problem of determining the home location of idle vehicles with the objective of minimizing job flow times will be discussed.

3) New Approaches to the Optimal Shift Scheduling Problems: An Overview & a New Branch & Cut Algorithm, ***Turgut Aykin***, Lucent Tech. & Bell Labs, Eng. Research Ctr., Princeton, NJ 08542, turgut.aykin@worldnet.att.net

We review the new approaches recently developed for the optimal shift scheduling problem. A new composite rounding-B&C algorithm will be presented together with computational results. Extensions of the new approaches to the tour scheduling problem will also be discussed.

4) Solving Hoist Scheduling Problems Using Non-Traditional Methods, ***Kokin Lam***, City Univ. of Hong Kong, MS Dept., Tat Chee Ave., Kowloon, Hong Kong, mskkl@cityu.edu.hk, ***Raymond Mak***

Hoist scheduling problems have attracted the attention of many OR researchers in the past several years due to its practical importance in the PCBelectroplating industry. We describe the AI methods (constraint satisfaction and SA) to solve problems in hoist scheduling. Several benchmark problems and real life application problems are solved using these methods. We will present the results and discuss future directions.

TC11 Human Factors in Planning, Scheduling & Supply Chain Management II

Cluster: Flexible Manufacturing Systems
Invited Session

Chair: Bart L. MacCarthy, Univ. of Nottingham, Dept. of Mfg. Eng. & Ops., University Pari, Nottingham, NG7 2RD, UK, bart.maccarthy@nottingham.ac.uk

1) Empowering Organizational Learning Within Customer-Supplier Relationships, ***Joy Batchelor***, Research Fellow, Coventry Bus. Sch. Coventry U., Priory St., Coventry, cv1 5fb, UK, bsx071@coventry.ac.uk

This paper is concerned with a framework within which a greater understanding of organisational learning may be developed and applied to the development of supply capabilities. The framework integrates both behavioural and cognitive approaches towards learning. Examples will be drawn from case study work in the UK automotive industry.

2) Computer-Assisted Scheduling of Steel Hot Rolling Mills, ***Peter Cowling***, Dept. Man. Eng. & OPs Man., Univ. of Nottingham, Univ. Park, Nottingham, ng7 2rd, UK, Peter.Cowling@nottingham.ac.uk

BetaPlanner is a system for computer-aided scheduling of steel hot rolling mills, currently used at several steel plants throughout the world. We discuss the modelling techniques used to capture constraints, from marketing, production, and scheduling personnel and how BetaPlanner has evolved as a result of ingenious use by human schedulers.

3) Scheduler Profiling: The Issues, ***John R. Wilson***, Dept. of Man. Eng. & OPs. Man, Univ. of Nottingham, Univ park, Nottingham, NG7 2RD, Nottingham, ng7 2rd, UK, John.Wilson@nottingham.ac.uk, ***Sarah Crawford***

Selection, training, and support for planners and schedulers in manufacturing has emerged as an important issued from the authors' fieldwork. In the context of occupational psychology, we discuss factors related to these issues and outline a framework for profiling the attributes, knowledge, skills, and abilities for successful performance in scheduling.

4) The Application of Social Theory in Supply Chain Management: A Case Study Analysis, ***Stefan Bungart***, Univ. of Warwick, Warwick Mgmt. Group, Coventry, CV4 7AL, UK, s.bungart@warwick.ac.uk, ***Michael Newton***

This paper is founded on Gregory Bateson's concept of schismogensis. A framework for the analysis of case studies from the automotive industry is developed and used for the analysis of customer - supplier relationships. The paper explores the explanatory power of social theory in its application in supply chain management.

TC12 Health Care Management

Cluster: Health Applications
Invited Session

Chair: Sophie D. Lapierre, Ecole Polytech., CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, sophiel@crt.umontreal.ca

1) The Relationship Between Medicaid Status & Hospital Length of Stay, ***Sandra Potthoff***, Univ. of MN, Dept. of Healthcare Mgmt., Carlson Sch. of Mgmt., Minneapolis, MN 55455-9940,

potth001@tc.umn.edu

The impact of Medicaid status of elderly patients on hospital length of stay was investigated across 9 stated by merging several large national data sets, controlling for hospital, patient and post-acute care market characteristics.

2) Mammographic Screening of Women in Their Forties: Why Can't We Agree on a Policy?, ***Eric Wolman***, George Mason Univ., 7806 Hidden Meadow Terr., Potomac, MD 20854-1792

Much is known but experts disagree passionately, as shown by vociferous conflict at last year's Consensus Conference. This presentation summarizes many conflicting issues in cancer biology, screening-tests, and data interpretation that make policy formulation difficult. The "answer" depends more on human values than on science, but this may change.

3) Mammographic Screening Centers: Where Should We Locate Them?, ***Sophie D. Lapierre***, Ecole Polytech., CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, sophiel@crt.umontreal.ca, ***Vedat Verter***

We present the problem of locating breast cancer screening centers in the Montreal area. We address the practical implications of using an analytical approach to the location problem. We will compare our results with the current policy which let the existing health care providers deciding whether or not to open screening centers.

TC13 Industrial Applications of Integer Programming

Cluster: Discrete Optimization
Invited Session

Chair: Arthur L. Fenaroli, IBM, 522 South Rd., Poughkeepsie, NY 12601, artf@us.ibm.com

Co-Chair: Fanny Soohoo

1) GAMS, OSL & a Petroleum Reservoir Production Problem, ***Sriram Vasanthrajan***, Mobil Strategic Research Ctr., 13777 Midway Rd., Farmers Branch, TX 75244, ***Robert H. Clark***, ***Gyana R. Parija***, ***Ramesh Raman***

Our experiences with solving a large and difficult problem in the field of petroleum production are discussed. The model was developed in GAMS, and OSL, is used as the solver engine. Several MIP strategies were developed in the GAMS/OSL integrated solver and made available to the GAMS model. The effects of GAMS/OSLp on this problem are discussed. Various issues related to the development of a standard OSLp interface are mentioned.

2) Optimal Petroleum Product Delivery Scheduling, ***Emmanuel D. Chajakis***, Maritrans Mgmt. Services Inc., One Logan Square, 26th Fl., Philadelphia, PA 19103, echajakis@maritrans.com, ***Frederic H. Murphy***

A fleet of vessels delivers petroleum products from refineries along the Gulf Coast to Florida ports. Good fleet schedules serve product demands with the minimal numbers of vessel trips and keep inventory levels low with no stockouts at the discharge ports. We find near-optimal fleet schedules through integer programming.

3) Integer Programming in the Process Industry, ***Jayant Kalagnanam***, IBM, TJ Watson Research Ctr., Yorktown Heights, NY 10598, jayant@us.ibm.com, ***Milind W. Dawande***, ***Ho Soo Lee***, ***Mark Trumbo***

We introduce 2 IP problems that arise from operations planning applications in the process industry. These problems can be formulated as variations of the multiple knapsack problem and the variable size bin packing problem. We provide preliminary results regarding the computational behavior from a set of real instances.

TC14 Global Optimization II

Cluster: Global Optimization
Invited Session

Chair: Brigitte Jaumard, Ecole Polytech. of Montréal, Dept. of Math & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, brigitt@crt.umontreal.ca

1) The 8-Optimal Heuristic for Computing Evolutionary Trees, ***Guoliang Xue***, Univ. of VT, Dept. of Comp. Sci., Burlington, VT 05405, xue@cs.uvm.edu

Given n binary sequences of length k, we are interested in finding the minimum Steiner tree interconnecting these sequences. This is an NP-hard problem. We present a simple 8-optimal heuristic algorithm for computing near-optimal solutions to the problem. Computational results show that this algorithm outperforms existing algorithms on many test cases.

2) On the Solution of Infinite Horizon Optimization Problems Through Global Optimization Algorithms, ***Seksan Kiatsupaibul***, ***Robert L. Smith***

We show how to transform an infinite horizon optimization problem into a one-dimensional global optimization problem over a closed and bounded feasible region whose objective function is Holder continuous with known parameters. The deep connection elicted between the 2 areas of study introduces several opportunities for cross-fertilization which we exploit.

3) A Global Optimization Method for Nonlinear Bilevel Programming Problems, ***Mahyar A. Amouzegar***, Massey Univ., Mathematics Dept., Palmerston North, New Zealand

Nonlinear 2-level programming deals with optimization problems in which the constraint region is implicitly determined by another optimization problem. We present the nonlinear 2-level programming problem as a reverse convex program with a special structure and apply some recently developed global optimization techniques in solving the transformed problem.

4) Branch & Cut Algorithms for Nonconvex Quadratically Constrained Quadratic Programming, ***Charles Audet***, GERAD & HEC, Polytech. of Montreal, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, charlesa@crt.umontreal.ca, ***Pierre Hansen***, ***Brigitte Jaumard***, ***Gilles Savard***

We present a B&C algorithm that yields in finte time, a globally(-optimal solution of the nonconvex quadratically constrained quadratic programming problem. Quadratic terms are estimated by successive linerizations within a branching tree. The best cuts, with respect to a precise criterion, are selected from four general (depending on one to three parameters)...

TC15 Complementarity & Variational Problems II

Cluster: Nonlinear Programming
Invited Session

Chair: George Isac, Royal Military Coll. of Canada, Dept. of Math. & Comp. Sci., PO Box 17000 STN Forces, Kingston, Ontario, K7K 7B4, Canada, isac-g@rmc.ca

1) Application of Topological Degree to Semidefinite Complementarity Problem, ***Vyacheslav Kalashnikov***, Russian Academy of Sci., Central Econ. & Math. Inst., Nakhimovski Pr. 47, Moscow, 11 7418, Russia

The question of existence of a solution of the SDCP is considered. The notions of an exceptional family and normed exceptional family of matrices are introduced, and existence theorems are obtained. The theorems assert that either the semidefinite complementarity problem has a solution or there exists and exceptional family (normed exceptional family) of matrices...

2) Functions Without Exceptional Families of Elements & Complementarity Theory, ***George Isac***, Royal Military Coll. of Canada, Dept. of Math. & Comp. Sci., PO Box 17000 STN Forces, Kingston, Ontario, K7K 7B4, Canada, isac-g@rmc.ca, ***T. Obuchowska***

It is known that in R*n if F:R*n\to R*n is a continuous function without exceptional families of elements with respect to a convex cone K\subset R*n, then the problem CP(f,K) has a solution. We present several classes of functions without exceptional families of elements.

3) Unified Approach for Solvable & Unsolvable Linear Complementarity Problems, ***Michael M. Kostreva***, Clemson Univ., Dept. of Math. Sci., Martin Hall, Clemson, SC 29634-1907, flstgla@clemson.edu, ***X. Q. Yang***

Solvable and unsolvable linear complementarity problems, with non-Empty seasible sets are studied via multiobjective optimisation. For and matrix M, existence of an efficient point is shown. Global first-order and second-order sufficient optimality conditions are derived for some related scalarized otimization problems.

TC16 Theoretical Complexity Issues in Linear & Convex Optimization

Cluster: Linear Programming
Invited Session

Chair: Robert M. Freund, MIT, Bldg. E40-149A, 77 Massachusetts Ave., Cambridge, MA 02139, rfreund@mit.edu

1) Search Directions in Semidefinite Programming & Monotone Semidefinite Linear Complementarity: Generalizations & Inexact Computation, ***Masakazu Kojima***, Tokyo Inst. of Tech., Dept. of Math. & Comp. Sci., Oh-Okayama Meguro, Tokyo, 152, Japan, kojima@is.titech.ac.jp, ***Masayuki Shida***, ***Susumu Shindoh***

We propose a family of directions that generalizes many directions studied so far in interior-point methods for SDP and for the monotone semidefinite LCP.

We present a predictor-corrector infeasible IPM and provide a theoretical basis for inexact computation of directions in primal-dual interior-point methods for SDP.

2) Geometric Properties of the Distance to Ill-Posedness, ***Javier Pena***, Cornell Univ., Ctr. for Applied Math., 657 Rhodes Hall, Ithaca, NY 14850, jpena@cam.cornell.edu

Given a conic linear system, we propose a way of finding a feasible solution by reformulating the system as an optimization problem to be solved via an interior point method. We study how some properties of this interior point approach are related to the distance to ill-posedness of the conic system. Such relations have nice geometric interpretations.

3) Solving Large-Scale Sparse Semidefinite Programs for Indefinite Quadratic Programming, ***Yinyu Ye***, Univ. of IA, Dept. of MS, Iowa City, IA 52242, yyye@dollar.bix.uiowa.edu, ***Steven J. Benson***, ***Alex X. Zhang***

We consider approximating the global optimum of a QP subject to linear, quadratic, as well as boolean constraints. We use a semi-definite relaxation and analyze its solution quality. We also present a dual potential reduction algorithm and report computational results for solving sparse semi-definite programs up-to 1000 by 1000 matrices.

4) Practical Estimation & Numerical Properties of the Condition Number of a Convex Program, ***Jorge R. Vera***, Univ. of Chile, Dept. of IE, PO Box 2777, Republica 701, Casilla 2777, Santiago, Chile, jvera@dii.uchile.cl, ***Robert M. Freund***

We analyze various characterizations of the condition measure of a conic linear system, as the solution of particular optimization problems. We discuss their use in the practical estimation of the condition number of a convex program, together with their numerical properties.

TC17 Network Optimization & Simulation

Cluster: Optimization Days
Invited Session

Chair: Tsevi Vovor, Ecole Polytech. de Montreal, Dept. of Math. & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada

1) withdrawn - author request of 3/4, ***Jocelyn Demers***, Univ. of Montreal, CRT & Comp. Sci. & OR Dept., CP 6128, Succ. Centreville, Montreal, Quebec, H3C 3J7, Canada, ***Michel Gendreau***, ***Teodor Gabriel Crainic***

2) Sequential & Parallel Algorithms for Dynamic Allocation of Empty Containers, ***Jawad Abrache***, CRT & Comp. Science & OR Dept., Univ. de Montreal, CP 6128, Succursale Centre Ville, Montreal, H3C 3J7, Canada, jocelyn@crt.umontreal.ca, ***Teodor Gabriel Crainic***, ***Michel Gendreau***

We give a brief description of the general empty container allocation problem and identify its main characteristics, particularly time dependencies and the multicommodity characteric induced by the substitution between different types of containers. Then, we present sequential and parallel resolution strategies based on an efficient implementation of the generalized network simplex. Comparative results on different test networks are also presented.

3) Solving the Bicriterion Shortest Path Problem from both ends, ***Pierre Hansen***, HEC, 3000 Ch Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, pierreh@crt.umontreal.ca, ***Brigitte Jaumard***, ***Tsevi Vovor***

A new two-end algorithm is presented for the bicriterion shortest path problem. Efficient tests are developed to quickly eliminate dominated lables. An extension is also provided to generate all efficient labels satisfying specified bounds on both criteria. Comparative computational results will be presented.

TC18 No Title Supplied

Cluster: Metaheuristics
Invited Session

Chair: Celso Ribeiro, Catholic Univ. of Rio de Janeiro, Dept. of Comp. Sci., R Marques de Sao Vicente 225, Rio de Janeiro, 22453-900, Brazil

1) Ascent-Descent Methods for Frequency Assignments Problems, ***Brigitte Jaumard***, Ecole Polytech. of Montréal, Dept. of Math & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, brigitt@crt.umontreal.ca, ***D. Boyer***

We propose an ascent-descent method for channel assignment subject to co-channel, adjacent channel, ntermodulation and co-site constraints. Computational experience are presented on two Bell Mobility cellular networks.

2) Ten Years of GRASP: A Survey, ***Mauricio G.C. Resende***, AT&T Labs Research, Room C241, 180 Park Ave., Florham Park, NJ 07932-0971, mgcr@research.att.com

GRASP is a metaheuristic for finding approximate solutions to combinatorial optimization problems. It was first applied in 1988 by Feo & Resende to set ocvering. Since then, numerous applications of GRASP have appeared in the literature, as well as several extensions and enhancements to the procedure have been proposed. We survey the first ten years of GRASP.

3) A Comparative Study of Heuristics for the Computation of Phylogenic Trees, ***Alexandre Andreatta***, Cath. Univ. of Rio de Janeiro, Dept. of Comp. Sci., R. Marques de Sao Vicente 225, Rio de Jaeiro, 22453-900, Brazil, ***Celso Ribeiro***

We present the formulation of the problem of computing optimal phylogenetic trees under a parsimony criterion. An object-oriented framework based on design patterns is used for the development of several heuristics using different construction algorithms and local search schemes. Computational results illustrating their effectiveness are presented.

TC19 Tutorial: Software for Linear & Integer Programming

Invited Session

Chair: Bruce L. Golden, Univ. of MD, PO Box 149, Simpsonville, MD 21150, bgolden@umdac.umd.edu

1) Tutorial: Software for Linear & Integer Programming, ***Robert Fourer***, Northwestern Univ., Dept. of IE/MS, 2225 N Campus Dr., Evanston, IL 60208-3119, 4er@iems.nwu.edu

Having grown in variety and sophistication over the past decade, LP software is now available in a profusion of formats and packages. This presentation surveys current software for formulating, solving, analyzing and managing LPs, with or without integer variables. Recent trends in language, interface and algorithm design are emphasized.

TC20 Tutorial: An Introduction to Tabu Search

Invited Session

Chair: James P. Kelly, Univ. of CO, College of Bus., Boulder, CO 80309

1) Tutorial: An Introduction to Tabu Search, ***Michel Gendreau***, Univ. de Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, michelg@crt.umontreal.ca

Over the past 10 years, TS has proven to be one of the most efficient heuristic techniques for tackling complex combinatorial problems. This tutorial is intended for newcomers to TS. Basic concepts will be carefully reviewed and tips for developing successful TS heuristics will be provided.

TC21 Regenerative Simulation & Variance Reduction

Sponsor: College on Simulation
Sponsored Session

Chair: James Calvin, NJIT, Simulation & Modeling Lab., Dept. of CIS, Newark, NJ 07102-1982, calvin@cis.njit.edu

1) Steady-State Simulation Using the Almost Regenerative Method, ***Sigrun Andradottir***, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, ***Peter W. Glynn***

The almost regenerative method treats hitting times of an "almost regenerative" return set as regeneration times. We study the asymptotic behavior of this method as visits to the almost regenerative set get more and more rare. The limiting distribution we identify involves both Brownian motion and the Erlang distribution

2) Some Results Related to the Estimation on Nonlinear Performance Measures in Simlation Experiments, ***David F. Munoz***, Inst. Tecnologico Autonomo de Mexico, Dept. of IE/OM, Rio Hondo No. 1, Mexico DF, Mexico

We discuss experimental results from the application of a general methodology to produce asymptotically valid confidence intervals for estimation of functionals of a distribution (including quantile estimation) in simulation experiments. Our propsosed methodology can be used in both transient or steady-state simulation. For the case of quantile estimation we discuss the application of Nelson's ILRT estimator for variance reduction.

3) Variance Reduction with Permuted Regenerative Estimators, ***James Calvin***, NJIT, Simulation & Modeling Lab., Dept. of CIS, Newark, NJ 07102-1982, calvin@cis.njit.edu, ***Marvin Nakayama***

We propose a new estimator for a calss of performance measures obtained from a regenerative simulation of a system having at least two distinct sequences of regeneration times. The new estimator, constructed by permuting the cycles, has

the same bias and lower variance than the standard regenerative estimator.

4) Central Limit Theorems for Permuted Regenerative Estimators, ***James Calvin***, NJIT, Simulation & Modeling Lab., Dept. of CIS, Newark, NJ 07102-1982, calvin@cis.njit.edu, ***Marvin Nakayama***

We prove strong laws of large numbers and central limit theorems for some permuted estimators from regenerative simulations. These limit theorems provide the basis for constructing confidence intervals for the estimators.

TC22 Frameworks for Group Decision & Negotiation: Intercultural Negotiation

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: Gregory E. Kersten, Carleton Univ., Sch. of Bus., 1125 Colonel By Drive, Ottawa, Ontario, K1S 5B6, Canada, gregory@business.carleton.ca

Co-Chair: Melvin F. Shakun

1) Inspire: A System for Web-Based Negotiation Research, ***Gregory E. Kersten***, Carleton Univ., Sch. of Bus., 1125 Colonel By Dr, Ottawa, Ontario, K1S 5B6, Canada, gregory@business.carleton.ca, ***Sunil J. Noronha***

INSPIRE, the first Web-based negotiation support system, has been used by over one thousand people from more than forty countries. Not just a successful training tool, INSPIRE provides a unique opportunity for cross-cultural comparisons of negotiation technique, and of negotiation effectiveness and satisfaction.

2) A Cross-Cultural Electronic Negotiation, ***Rachel Croson***, Univ. of PA, 1322 SH-DH, Dept. of OPIM, Wharton School of Bus., Philadelphia, PA 19104-6366, crosonr@opim.wharton.upenn.edu, ***Rami Zwick***

This paper reports the results of an integrative negotiation run cross-culturally via e-mail. Students in the US and Hong Kong negotiated both within-and between-cultures. WE compare negotiated outcomes of intercultural pairs with those of intracultural pairs. An analysis of negotiation process is presented as well.

3) Intercultural Negotiation with Evolutionary Systems Design, ***Melvin F. Shakun***, NYU Stern School of Bus., 44 West 4 St., NY, NY 10012-1126, mshakun@stern.nyu.edu

Using ESD, players in a multicultural group can be supported by an ESD computer culture in generating and formally representing an evolving common joint culture (a situational culture) with regard to the specific problem at hand--an intercultural evolving group problem representation and solution.

TC23 A Tutorial on Life & Death Decision Making

Sponsor: Decision Analysis Society
Sponsored Session

Chair: David G. Lowell, Strategic Decisions Group, 2440 Sand Hill Rd., Menlo Park, CA 94025-6900, DLowell@sdgnet.com

1) A Tutorial on Life and Death Decision Making, ***Ronald A. Howard***, Stanford Univ., Dept. of EES & OR, Stanford, CA 94305-4025, rhoward@sdg.com

Major life risks arise in health crises; minor ones in everyday life. A model incorporating life quality and quantity treats both. Simplification for minor risks: assess the risk in micromorts, 1/1,000,000 chances of death, multiply by the model's micromort value. Extensions cover major health risks and risks to a couple.

TC24 Multicriteria Decision Making II

Contributed Session

Chair: Vinai Trichur, Univ. of MD, Coll. of Bus. & Mgmt., College Park, MD 20742, vtrichur@mbs.umd.edu

1) A Multi-Objective Approach to Policy Evaluation & Development, ***Kimberly A. Killmer***, Univ. of PA, Dept. of Systems, 220 S 33rd St., Philadelphia, PA 19104-6315, killmer@seas.upenn.edu seas.upenn.edu/~kilmer, ***G. Anandalingam***

We describe a multi-objective framework for the evaluation and development of policy alternatives. A bi-level programming approach is utilized with the behavior of the agents modeled as a spatial price equilibrium (SPE) problem. A case study of international trade in hazardous waste is presented.

2) Investment Decisions: A Simulation of Ambiguity & Uncertainty, ***Paul D. Chwelos***, Univ. of British Columbia, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, chwelos@unixb.ubc.ca, ***Kenneth R. MacCrimmon***

A rule-based simulation of investment decision explores the trade-off between implementing investment opportunities immediately or delaying them to a partially resolve uncertainty. The decision rules are refined by a GA, yielding results comparable to net present value. Different base cases allow an analysis of changes in ambiguity.

3) A Multiobjective Integer Programming Approach for New Product Development, ***Vinai Trichur***, Univ. of MD, Coll. of Bus. & Mgmt., College Park, MD 20742, vtrichur@mbs.umd.edu, ***Michael O. Ball***

We describe a multiobjective integer programming based model for new product development. Our model incorporates multiple, conflicting metrics that influence component, process, and supplier decisions at the design stage. We discuss an interactive solution procedure that generates efficient designs, and permits the evaluation of other quantities of economic interest.

4) withdrawn - author request of 1/26, ***Larry Jenkins***, Royal Military Coll. of Canada, Business Admin., PO Box 17000, Stn Forces, Kingston, Ontario, K7K 7B4, Canada, jenkins-l@rmc.ca

TC25 Statistical & Warranty Models for Reliability Analysis

Sponsor: Applied Probability Section
Sponsored Session

Chair: Sudha Jain, Univ. of Toronto, Dept. of Stats., 100 St. George St., Toronto, Ontario, M5S 1A1, Canada, jainsu@utstat.utoronto.ca

1) Warranty Contracts & Equilibrium Probabilities, ***Singpurwalla Nozer***, George Washington Univ., Dept. of OR, 707 22nd St. NW, Washington, DC 20052, nozer@gwuvm.gwu.edu

For every warranty contract that is specified there are equilibrium probabilities that the offeror and the purchaser implicity hold. These define a region within which the prior probabilities must lie for the contract to be consumated. We discuss this and related topics.

2) Extended Warranties, Self Insurance, Adverse Selection & Moral Hazard, ***Izzet Sahin***, Univ. of WI, Sch. of Bus. Admin., Milwaukee, WI 53201, sahin@csd.uwm.edu, ***Hakan Polatoglu***

Based on an imperfect-repair process, we investigate: (1) cost to the provider of a given extended warranty or service contract, in the presence of user adverse selection or moral hazard, and (2) value to the user of a given contract, measured in terms of the cost of self insurance.

3) System-Based Component Test Plans with Dependent Failure Times, ***Mainak Mazumdar***, Univ. of Pittsburgh, Dept. of IE, Pittsburgh, PA 15261, mmazumd@engrng.pitt.edu, ***Jayant Rajgopal***

We examine the design of system-based component test plans for evaluating reliability of a series system for the case where the failure times of the components of the system are not assumed to be independent. Specifically, we examine the case where the times follow a Marshall-Olkin distribution.

4) Statistical Methods to Test Equipment Reliability, ***Sudha Jain***, Univ. of Toronto, Dept. of Stats., 100 St. George St., Toronto, Ontario, M5S 1A1, Canada, jainsu@utstat.utoronto.ca, ***R. K. Jain***

A sequential probability ratio test is employed for reliability testing and acceptance of sampling data. From using this test, a decision concerning the equipment's status can then be reached in its early stages. The operating characteristic curve and average sample number are computed and examined for various parameters of the model.

TC26 Telecommunication & Applied Probability

Sponsor: Applied Probability Section
Sponsored Session

Chair: Les D. Servi, GTE Labs., 40 Sylvan Rd., Waltham, MA 02254, ldsO@gte.com

1) Queueing Models for Assembly Operations, ***Harry Groenevelt***, Univ. of Rochester, Grad. Sch. of Bus. Admin., Rochester, NY 14627, ***Robert Shumsky***

We discuss a number of queuing networks with assembly or merge steps. Applications of such models can be found in re-manufacturing, airline operations, and telecommunications.

2) Delay & Blocking in Webservers & Firewalls, ***Julian Keilson***, Univ.of Rochester, Simon Grad. Sch. of Bus., Dewey Hall, Rochester, NY 14627, ***Pavan Gundepudi***

The queuing theoretic difficulty of webservers and firewalls arises from the

order of service complexity associated with multithreading. A simplified approximation is presented addressing blocking and loss.

3) Optimizing Bernoulli Routing Policies for Balancing Loads on Call Centers & Minimizing Transmission Costs, *Les D. Servi*, GTE Labs., 40 Sylvan Rd., Waltham, MA 02254, ldsO@gte.com, *S. Humair*

We address the problem of assigning probabilities at discrete times for routing toll-free calls to a given set of call center. Also examined is the practical variant in which the number of changes to the routing probabilities in each time instant is severely constrained. Empirical simulation rfesults will be presented.

4) Dynamic Scheduling of Jobs in Operating Systems, *Yingdong Lu*, Columbia Univ. IEOR Dept., 306A SW Mudd Bldg., IEOR Dept., New York, NY 10027, lyd@ieor.columbia.edu, *David D. Yao*

Motivated by job scheduling in computer operating systems (e.g., UNIX-based), we study the optimal dynamic scheduling of multiclass jobs in a queueing network. We present some new insight in the problem structure, focusing on the geometry of the so-called extended polymatroid.

TC27 Electricity Market Design Issues

Sponsor: ENRE
Sponsored Session
Chair: Hung-Po Chao, Stanford Univ., Electric Power Research Inst., 3412 Hillview Ave., Palo Alto, CA 94303, hchao@epri.com

1) Capacity Reservation Tariff & Reliability Differentiation of Electricity Transmission, *Chi-Keung Woo*, Energy & Environ. Economics, Inc., 353 Sacramental St., Ste. 1700, San Francisco, CA 94111, c._k._woo@ethree.com, *Ira Horowitz*, *Jennifer Martin*

Restructuring the electricity industry leads to the development of a power pool into which generators bid to supply energy and from which end users seek to satisfy their demands. An independent system operator (ISO) dispatches generation and establishes the pool's market-clearing price. The ISO's problem is complicated by occasional transmission shortages. Efficient allocation of limited capacity can be implemented by differentiating transmission reliability through unbundled charges.

2) Priority Network Access Pricing for Electricity: An Option Pricing Approach, *Shijie Deng*, Univ. of CA, IEOR Dept., Berkeley, CA 94720, dengsj@uclink.berkeley.edu, *Shmuel S. Oren*

We propose a priority insurance scheme in which the Independent System Operator (ISO) offers transmission access insurance to bulk power traders. The premium and compensation are based on the option value corresponding to a self-selected price revealing the opportunity cost of the bulk power trader. Congestion management by the ISO minimizes compensation payments.k

3) Mechanism Design for Multilateral Trading in a Simple Transmission Network, *Joel Singer*, Stanford Univ., Crothers Memorial Hall, Stanford, CA 94305, jsinger@leland.stanford.edu, *Hung-Po Chao*

We examine the problem of optimal mechanism design for trading between energy sellers and energy buyers, with the active participation of transmission capacity providers, in a simple electric power network. The objective is to maximize expected total gains from trade subject to an asymmetric information structure. We characterize the traders' equilibrium strategies under alternative assumptions and show the impossibility of ex post efficiency...

4) Water & Power: Hydroelectric Resources in the Era of Competition in the Western US, *James B. Bushnell*, Univ. of CA, Energy Institute, 2539 Channing Way, Berkeley, CA 94720, jimb@ieor.berkeley.edu

Many electricity markets may be divided into competitive off-peak hours and peak hours with the potential for market power. Hydroelectric resources provide the ability to "merge" these markets, or to create a more distinct division. I analyze the potential strategic use of hydro resources in the Western US.

TC28 Industry Views of OR/MS Education

Sponsor: Forum on Education
Sponsored Session
Chair: Matthew W. Carlyle, Arizona State University, Dept. of IMSE, PO Box 875906, Tempe, AZ 85287-5906, mcarlyle@asu.edu;

1) Today's Educational Prerequisites for Successful Operations Research Practice, *Charles J. McCallum, Jr.*, AT&T Labs., 101 Crawfords Corner Rd., HO 3L-323, Holmdel, NJ 07733-3030

The practice of OR has a rich history at AT&T, dating from the 1950's and evolving significantly since then. Today, an expanded educational approach is needed to adequately prepare students for successful careers as OR practitioners. Real-life examples at AT&T are used to illustrate the change and define today's needs.

2) What I Wished I Had Learned in School..., *Yosun Denizeri*, Decision Focus Inc., 650 Castro St., Ste. 300, Mountain View, CA 94041-2057, yosun@dfi.com

The demands of OR practice require a range of skills and abilities that are not taught (and perhaps not even acknowledged) in many OR programs. In this talk, I discuss what I wish I knew before I started, including software engineering, process improvement, and the relative unimportance of optimality.

3) Suggestions for Practical Training in an OR/MS Curriculum, *Amit Garg*, IBM, TJ Watson Research Ctr., PO Box 218, Yorktown Heights, NY 10598, agarg@watson.ibm.com

New OR/MS hires at IBM always have a strong technical background, but in my instances they lack some of the practical skills necessary to contribute effectively to projects. In this talk we focus on a few suitably generalized examples from a supply chain group at IBM and suggest how these shortcomings could have been easily remedied by even a small amount of practical training in an OR/MS Masters or Ph.D program.

4) The Realities of Life in Industry, *Robert C. Kwit*, Eastman Kodak Co., 343 State St., Rochester, NY 14650-0309

OR has a long and successful history at Kodak. I discuss the things I've learned about successful OR practice, the need for relevance and communications, and the challenges of proving value in a cost-conscious company.

TC29 Cargo

Sponsor: Aviation Applications Section
Sponsored Session
Chair: Greg Reinhardt

, AIR1gxr@air.ups.com

1) A Simulation Model of Airport Ramps & Taxiways, *W. Swain Ottman*, UPS, Louisville, KY

We describe the development of a discrete-event simulation model of the UPS airlines aircraft parking ramps and taxiways of the Louisville International Airport in Louisville, Kentucky. The simulation model is used to evaluate various aircraft parking plans and departure schedules. The objectives are to reduce traffic congestion, taxi times and rollout wait times.

2) Expedited Cargo Scheduler, *Alysia M. Wilson*, UPS

Given a set of delivery requirements with time windows and a limited number of drivers from different areas of the country with different costs, the problem builds and selects a minimum cost set of trips within the given constraints. We describe a system for developing that uses column generation and B&B techniques to develop a minimum cost set of driver routes for delivering these loads while satisfying time window constraints.

3) A Package Allocation System to Assist in Multimodal Route Design, *Keith Ware*, MIT, OR Ctr., E40-149, Cambridge, MA 02139

When developing future airlift requirements, a planner needs to be able to quickly evaluate the capacity of a particular schedule to move an expected package load. We present a system that develops a maximal movement allocation of packages for a given multi-modal schedule and set of package movement requirements. The system takes time windows on package pick-up and delivery into account...

4) Multimodal Routing & Scheduling, *Cynthia Barnhart*, MIT, OR Ctr., Rm. E40-149, Cambridge, MA 02139-4307

No abstract supplied.

TC30 Aggregation & Disaggregating in Combat Modeling

Cluster: Military Applications
Invited Session
Chair: K. R. McNaught, Cranfield Univ., Appl. Math. & OR Dept., RMCS Shrivenham, Swindon, SN6 8LA, UK, mcnaught@rmcs.cranfield.ac.uk

1) Some Aspects of Aggregation in Stochastic Lanchester Models, *K. R. McNaught*, Cranfield Univ., Appl. Math. & OR Dept., RMCS Shrivenham, Swindon, SN6 8LA, UK, mcnaught@rmcs.cranfield.ac.uk

The effects of resolving attrition using stochastic Lanchester-type models at different levels of aggregation are explored using some simple auxiliary models. It is shown that outcome measures of effectiveness such as win probabilities, mean survivors and the exchange ratio, are dependent on the level of aggregation assumed in the model.

2) Context-Dependent Multi-Resolution Modeling, *P. K. Davis*, RAND Corp., 1700 Main St., PO Box 2138, Santa Monica, CA 90407-2138

We describe HRV modeling for assessing use of long-range fires in halting an invasion. This approach provides conceptual connections across levels, uses information from diverse sources and permits exploratory analysis prior to detailed component-level work. It supplements detailed imulation. The work depends on context-dependent approximations and avoiding simplistic aggregations that assume independent events and linearity.

3) withdrawn - author request of 3/27, *C. Allard*, Cetre for Defense Analysis, Defense Evaluation & Res. Agnt, DERA Fort Halstead, Sevenoaks, Kent, tn14 7bp, UK

TC31 New Technologies in Logistics

Sponsor: Section on Logistics
Sponsored Session
Chair: Ronald S. Tibben-Lembke, Univ. of NV, MS 028, MS & Logistics, Reno, NV 89557, rtl@unr.edu

1) Data Mining: Rough Sets or Neural Networks?, *Henry Amato*, Univ. of NV, MS 028, Reno, NV 89557, hna@unr.edu

Although rough sets have been around since 1980 they lack the popularity of neural networks as a data mining method. Yet, there are applications that are more suited to rough set analysis. This presentation will address the issue of when and how to use each method for data mining.

2) Demand Management: Optimizing Distribution Systems, *Edward Sitarski*, Numetrix, Ltd., 655 Bay St., Ste. 1200, Toronto, Ontario, M5G 2K4, Canada, edward.sitarski@numetrix.com

Demand Management tools allow companies to create a detailed model of their production/distribution systems, and optimize their production and distribution strategy, considering many different demand scenarios. We will present an overview of DM tools, and a detailed look at how one major software package achieves this optimization.

3) Reverse Logistics in the U.K. Beer Industry, *Scott W. Hadley*, Numetrix, Ltd., 65 Bay St., Ste. 1200, Toronto, Ontario, M5G 2K4, Canada, scott.hadley@numetrix.com, ***Edward Sitarski***

Bass Brewers owns more than two million returnable containers, valued at over $150 million. The problem of managing the logistics of the reverse supply chain (return of empty containers to breweries) provides significant challenges and opportunities. We describe how Bass realizes substantial savings in capital, equipment, and vehicle utilization costs.

4) Reverse Logistics: Current Trends, *Ronald S. Tibben-Lembke*, Univ. of NV, MS 028, MS & Logistics, Reno, NV 89557, rtl@unr.edu, ***Dale Rogers***

We have recently published a survey of current trends and practices in reverse logistics. We share results from the study, focusing on what is currently being done in industry, what factors are critical to a successful RL system, and how future developments may affect RL growth.

TC32 Location Modeling & Public Policy

Sponsor: Public Programs & Processes Section
Sponsored Session
Chair: Marvin B. Mandell, UMBC, Policy Sciences Grad. Program, 100 Hilltop Circle, Baltimore, MD 21250, mandell@umbc.edu

1) A Trauma Resource Allocation Model for Ambulances & Hospitals, *Charles C. Branas*, Univ. of CA, Sch. of Public Health, 140 Warren Hall, Berkeley, CA 94720-7360, cbranas@socrates.berkeley.edu, ***Ellen J. MacKenzie, Charles ReVelle***

The TRAMAH was formulated as a deterministic optimization problem. Trauma centers and aeromedical depots were sited to maximize coverage of severe injuries. The TRAMAH adequately distributed trauma care resources as per spatial neeed and response time standards in Maryland.

2) A Decision Support System for Location of Subsidized Housing, *Michael P. Johnson*, Carnegie Mellon Univ., Heinz Sch. of PP&M, Pittsburgh, PA 15218-3890, johnson2@andrew.cmu.edu heinz.cmu.edu/heinz/faculty/MiJohnson.html

A new application area for facility location is subsidized housing. For planning purposes, decision makers must evaluate the economic and social impacts of different allocations of families in subsidized housing across a metropolitan area. I present a prototype DSS for single-period subsidized housing location. Model extensions are discussed.

3) A P-Median Model for EMS Systems with Priority Dispatching, *Marvin B. Mandell*, UMBC, Policy Sciences Grad. Program, 100 Hilltop Circle, Baltimore, MD 21250, mandell@umbc.edu

We present a p-median model for locating emergency units in a two-tiered EMS system that utilizes priority dispatching. In addition to identifying optimal unit locations, the model is used to examine the effects of different system parameters, including the balance between ALS and BLS units and different dispatch rules.

TC33 Strategic Sizing Issues

Contributed Session
Chair: Brian Talbot, Univ. of MI, Sch. of Bus., Rm. 8200, Ann Arbor, MI 48109-1234, btalbot@b.imap.itd.umich.edu

1) Volume Heterogeneity Flexibility: An Examination of its Technological & Infrastructural Enablers, *Brian Talbot*, Univ. of MI, Sch. of Bus., Rm. 8200, Ann Arbor, MI 48109-1234, btalbot@b.imap.itd.umich.edu, ***Ashok Mukherjee, Will Mitchell***

We argue that diversity of routines, available slack in information processing ability, and horizontal information processing mechanisms enable volume heterogeneity flexibility. Technology is often employed to provide flexibility of aggregate production volume. In multi-product environments, even when aggregate volume remains constant, the heterogeneity of volume may change, requiring a distinction...

2) Managing for Growth, *Denise Fleck*, McGill Univ., COPPEAD/UFRJ, 6259 Wilderton Ave., Montreal, Quebec, H3S 2L3, Canada, fleck@management.mcgill.ca

Growth strategies are examined by means of the organizational, financial and market dimensions. Strategic trade-offs associated with the determination of the growth rate of the firm are identified and implications for the management of the growth of the firm are analyzed.

3) Layoff Strategies & Corporate Governance, *Richard Pouder*, Clemson Univ., Dept. of Mgmt., Clemson, SC 29634-1305, rpouder@clemson.edu, ***Stephen R. Cantrell, Subodh P. Kulkarni***

This study investigates the influence of corporate governance mechanisms on the stock market's reaction to layoff announcements. The proportion of independent directors and increases in institutional ownership are positively related to gains in shareholder wealth. Joint increases in the levels of both governance mechanisms are associated with declining marginal gains.

TC34 Software Demonstrations

Chair: To be announced

1) Software Demonstration: MPL & Optimization on the Internet, *Bjarni Kristjansson*, Maximal Software Inc., 2111 Wilson Blvd., Ste. 700, Arlington, VA 22201

Over the last few years, the Internet and the WWW have become increasingly more important in the computer world as a new way of interfacing with the user. We will discuss how the MPL Modeling System is currently being developed to give the user new ways to solve optimization problems through the Internet as well as the new MPL On-line Tutorial on the Web.

2) Software Demonstration: ILOG, CPLEX: The Merger Between Constraint-Based Scheduling & Linear Programming, *Younes Alaoui*, ILOG, 1901 Landings Dr., Mountain View, CA 94043

Many already realize the power of LP with CPLEX. Problems such as scheduling can be difficult to solve using only a linear model. ILOG constraint-based programming algorithms combined with the proven CPLEX linear algorithms is the solution for solving complex scheduling problems. We will explain the benefits of the merger of these 2 technologies.

TC35 Dynamic Network Models

Cluster: Networks
Invited Session
Chair: Gregory D. Glockner, Pacific Gas & Electric Co., PO Box 770000, MC B17K, San Francisco, CA 94177, gdg8@pge.com

1) Network Design for Express Shipment Delivery, *Andrew P. Armacost*, MIT, OR Ctr., Rm. E40-149, Cambridge, MA 02139, armacost@mit.edu, ***Cynthia Barnhart, Niranjan Krishnan, Greg Reinhardt, Keith Ware***

Express air shipment service design, requiring that shipments be picked up and delivered within very tight time windows, involves the determination of aircraft routes and schedules, ground vehicles movements and shipment flows. We present new models and computational results.

2) A Dynamic Network Model for Air Traffic Flow Management

Air traffic delays occur when demand exceeds available capacity. In day-to-day operations, delays can be reduced by modifying flight plans. We propose a dynamic network flow model that used random arc capacities to reflect uncertain airport capacities. Based on our simulation, this can reduce annual delay costs by $330 million

3) Dynamic Programming Approximations for Dynamic Networks, ***Gregory A. Godfrey***, Princeton Univ., Program in Stats. & OR, Princeton, NJ 08544, ***Warren B. Powell***

We summarize our latest results on solving both deterninistic and multistage, stochastic dynamic networks that arise in resource allocation problems. We summerize an adaptive estimation method that provides separable, piecewise linear functions of the value function. Finite horizon and rolling horizon results are provided. We also discuss results with single and multiperiod travel times.

4) Railroad Blocking: A Network Design Application, ***Pamela Vance***, Auburn Univ., 207 Dunstan Hall, Dept. of ISE, Auburn, AL 36849, pvance@eng.auburn.edu, ***Cynthia Barnhart, Hong Jin***

We formulate the railroad blocking problem a network design problem with maximum degree constraints on the nodes and propose a heuristic Lagrangian Relaxation approach to solve the problem. The new approach decomposes the complicated mixed integer programming problem into two simple subproblems. An advanced dual feasibile solution is generated to speed up the convergence of the algorithm. The model is tested on blocking problems from a major railroad.

TC36 Hyperpaths & Hyperflows

Cluster: Networks
Invited Session
Chair: Maria Grazia Scutella, Univ. di Pisa, Dipt. di Informatica, Coso Italia 40, Pisa, 56125, Italy, scut@di.unipi.it

1) More on Capacitated Assignment Models, ***Patrice Marcotte***, Univ. of Montreal & DIRO, CP 6128 Succ. Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, marcotte@iro.umontreal.ca, ***Sang Nguyen***

Recently, these authors have proposed a new paradigm for traffic assignment with rigid capacities, based on the notion of a 'travel strategy'. We present new computational and theoretical results pertaining to this model. both for the 'priority' and 'non priority' cases. The applicability of the model to address the time-dependent traffic assignment problem will also be discussed.

2) Probabilistic Logic: Consistency for Logical Formulas Represented by B-Hypertrees, ***Kim Allan Andersen***, Univ. of Aarhus, Dept. of Math. Sci., Bldg. 530 Ny Munkegade, Aarhus C, DK-800, Denmark, kima@mi.aau.dk

For each B-hypertree we define a set of logical formulas (Horn formulas) which it represents. Our aim is to consistently assign probabilities to this set of logical formulas. We use probabilities to the formulas. If a certain condition is imposed on B-hypertree the problem can be solved in closed form thus describing exactly how probabilities can be consistently assigned to the formulas in question.

3) Combinatorial Assembly Plan Problems, ***Maria Grazia Scutella***, Univ. di Pisa, Dipt. di Informatica, Coso Italia 40, Pisa, 56125, Italy, scut@di.unipi.it, ***Giorgio Gallo***

We consider problems arising in robotic assembly systems, where an item needs to be produced by assembling together several parts given in input according to a properly defined assembly plan. We represent the problem data by means of an undirected graph G=(N,E), where N is the set of the initial parts and there is an edge between nodes i and j if and only if the parts i and j can be connected by an assembly operation. We show how hyperpath and hyperflow models and algorithms can be used to model and solve the problem of finding an optimal plan, under a certain set of assumptions, that is the problem of finding an assembly plan which can be realised with minimum makespan on a given set of parrellel identical machines.

4) Auction Algorithms for Shortest Hyperpaths, ***Daniele Pretolani***, Univ. di Camerino, Dpt. di Matematica e Fisica, Via Madonna delle Carceri, Camerino, 62032, Italy, deleone@camserv.unicam.it, ***Renato De Leone***

The Auction method with reduction is known to be competitive with classic algorithms for shortest paths in graphs. We extend this method to the shortest hyperpath problem. Our approach essentially consists in dynamically reducing the hypergraph to a graph, while keeping shortest distances unchanged. Computational experiences comparing the Auction method to other known shortest hyperpath algorithms are presented.

TC37 Integer Programming Models with Industrial Applications

Sponsor: CSTS
Sponsored Session
Chair: Djangir A. Babayev, US West Advanced Tech., 4001 Discovery Dr., Ste. 220, Boulder, CO 80301, dbabayev@advtech.uswest.com

1) Adaptive Memory Method for Solving Knapsack Problems, ***Fred W. Glover***, Univ. of CO, Sch. of Bus., CB 419, Boulder, CO 80309-0419, fred.glover@colorado.edu, ***Djangir A. Babayev, Jiyang Xu***

A new method for solving the integer knapsack problem is developed. The adaptive memory method endows each variable with its own memory, instead of relying on a tree based memory as in B&B or on a state-based memory as in DP. The method simultaneously solves 2 interrelated minimization and maximization problems at each iteration. The method demonstrated high computational efficiency when solving hard knapsack problems.

2) Dynamic Hierarchial Packing by a Genetic Algorithm to Minimize Wireless Switch Capacity Costs, ***Tony Cox***, Cox Associates, 503 Franklin St., Denver, CO 80218, tcoxdenver@aol.com, ***Warren Kuehner, Leonard Lu, David Davis***

A wireless switch holds up to 9 switch modules (SMs). There are 4 SM types, each providing 2 resources (erlangs, packet-pipes) to cover subscriber demand. How many of each should one buy each month to minimize costs of covering demand? A GA solves this hard NLIP problem quickly and well.

3) Strategic Capital Budgeting Analysis, ***Paul M. Thompson***, US WEST Advanced Tech., 4001 Discovery Dr., Boulder, CO 80303, pthomps@advtech.uswest.com

Some strategic capital budgeting decisions require an analysis of the tradeoffs between very rough revenue opportunity estimates and well-defined capital cost projections. We present a nonlinear MIP which supports such an analysis, and discuss our success in building and implementing an algorithm for this problem.

TC38 Analysis & Synthesis of Multiservice Networks

Sponsor: TST
Sponsored Session
Chair: Andre Girard, INRS Telecom, 16 Place du Commerce, Verdun, Quebec, H3E 1H6, Canada, andre@inrs-telecom.uquebec.ca

1) On the Queueing Analysis & Simulation of ATM Multiplexing Networks, ***Michael Shalmon***, INRS Telecom., 16 Place du Commerce, Verdun, Quebec, H3E 1H6, Canada, shalmon@inrs-telecom.uquebec.ca

We examine ATM networks multiplexing multimedia sources. We assume that each individual exogenous traffic source is of ON-OFF type, only the OFF periods being expontentially distributed. We point out that the network is, roughly speaking, a single distributed queue and we discuss its queueing analysis and stimulation, particularly for long tailed ON periods.

2) Adaptive Revenue Optimization of Multi-Service Networks, ***Andre Girard***, INRS Telecom, 16 Place du Commerce, Verdun, Quebec, H3E 1H6, Canada, andre@inrs-telecom.uquebec.ca, ***Catherine Rosenberg, Philippe Couture***

We investigate the optimal routing aiming at revenue maximization in any multi-service network that supports the notion of effective bandwidths, providing QoS-guaranteed services. We show that the group of Lagrangian multipliers needed centralized information does not need to be constantly evaluated. This leads to efficient adaptive routing implementation.

3) Reliability in ATM Network Synthesis, ***Andre Girard***, INRS Telecom, 16 Place du Commerce, Verdun, Quebec, H3E 1H6, Canada, andre@inrs-telecom.uquebec.ca, ***Brunilde Sanso, F. Mobiot***

We propose a model that takes into account reliability at the synthesis stages. It takes into account the fact that failures occur at the transmission level and their impact is propagated into the switched network. Comparative results with other methods will be presented for ATM and multirate networks.kj

4) Multiservice Virtual Subnetwork Dimensioning Methods, ***Brunilde Sanso***, Ecole Polytech. of Montreal, CRT, GERAD, Math. & IE Dept., CP 6079 Succ Centreville, Montreal, Quebec, H3C 3A7, Canada, bruni@crt.umontreal.ca

We review the state of the art and propose a classification of the different methods for the dimensioning of multiservice virtual subnetworks. Comparisons based on performance evaluation studies will be provided.

Tuesday 15:15-16:45

TD01 Dynamic Traffic Assignment I: Algorithms

Sponsor: TSS & IFORS
Sponsored Session
Chair: Srinivas Peeta, Purdue Univ., Sch. of Civil Eng., W. Lafayette, IN 47907, peeta@ecn.purdue.edu

1) A Linear Programming Approach for the System Optimum DTA Problem for Multiple Destinations & Fixed Arrival Windows, ***Irene Yue Li***, Northwestern Univ., 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, liyue@nwu.edu, ***Athanasios Ziliaskopoulos***, ***Steven T. Waller***

A Fixed Arrival Time (FAT) System Optimum Dynamic Traffic Assignment (SO DTA) model is formulated as a linear program (LP) by using the cell transmission model. It is shown that the multi-origin, multi-destination problem can be solved with the first in, first out (FIFO) condition "softly" observed. The model simultaneously optimized departure time and route choices.

2) A Framework for On-Line Dynamic Traffic Assignment Using the A-priori Optimization Approach, ***Srinivas Peeta***, Purdue Univ., Sch. of Civil Eng., W. Lafayette, IN 47907, peeta@ecn.purdue.edu, ***Chao Zhou***

A framework to solve the on-line dynamic traffic assignment problem using on-line adjustment measures is proposed under an a priori optimization scheme. Conditions for switching control between the a priori solution and on-line adjustment measures are established. Experiments are conducted to analyze the effectiveness of the on-line adjustment measures.

3) A Chance-Constrained Based Stochastic Dynamic Traffic Assignment Model: Analysis, Formulation & a Solution Algorithm, ***Steven T. Waller***, Northwestern Univ., Dept. of ISE, 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, travis@trans.civil.nwu.edu, ***Athanasios Ziliaskopoulos***

This paper is concerned with the System Optimum-Dynamic Traffic Assignment (SO-DTA) problem, when the origin-destination time-dependent demands are random variables with known probability distributions. The model is an extension of a deterministic linear programming (LP) formulation for SO-DTA introduced by Ziliaskopoulos, 1996. The proposed formulation is Chance Constrained Based (CCB) and we domonstrate that is provides a robust SO solution with a user specified level of reliability.

4) Real-Time Computing of Dynamic Traffic Assignment Models, ***Ismail Chabini***, MIT, 77 Massachusetts Ave., Room 1-263, Cambridge, MA 02139, chabini@mit.edu, ***Yiyi He***

We have developed a computer system that implements solution algorithms for a family of analytical dynamic traffic assignment models. Using the beltway network of the city of Amsterdam, these computer algorithms find an optimal solution for an assignment period of 2 hours and 20 minutes in 18 minutes (7 times faster than real-time). This is a positive answer for analytical approaches to dynamic traffic assignment since it was ginerally believed that realistic large instances of these problems were not solvable.

TD02 Vehicle Routing II

Contributed Session
Chair: Oli B. Madsen, Tech. Univ. of Denmark, Dept. of Math. Modeling, Bldg. 321, Lyngby, DK-2800, Denmark, ogm@imm.dtu.dk

1) Vehicle Routing Problems with Time Windows: The State-of-the-Art, ***Oli B. Madsen***, Tech. Univ. of Denmark, Dept. of Math. Modeling, Bldg. 321, Lyngby, DK-2800, Denmark, ogm@imm.dtu.dk

Vehicle routing problems with time windows is a generalization of the vehicle routing problem in which the service of a customer must start within a given time window. In this presentation a survey of the existing heuristic and exact methods will be given.

2) Solving the Vehicle Routing Problem with Time Windows Using Branching on Resource Constraints, ***Jesper Larsen***, Tech. Univ. of Denmark, Bldg. of Math. Modeling, Bldg. 321, Lyngby, 2800, Denmark, jla@imm.dtu.dk http://www.imm.dtu.dk/~jla/

In a paper of Gelinas et al. from 1987 branching on resource-constraints is introduced. We investigate new selection and branching criterias where we use structural information as size of time window, geographical position of customer etc. Computational results are presented for the Vehicle Routing Problem with Time Windows (VRPTW).

3) Solving the Capacitated VRP with Column Generation, ***Ann E. Bixby***, Northwestern Univ., IEMS Dept., 2225 N Campus Dr., Evanston, IL 60208, abixby@iems.nwu.edu, ***Collette R. Coullard***, ***David Simchi-Levi***

We present a column generation algorithm for the capacitated VRP, using a polyhedral approach for the column generation subproblem.

4) Tourist Paths in Artistic Towns, ***Nicoletta Ricciardi***, Universita La Sapienza, Dip. Stats. Probability, Piazzale Aldo Moro 5, Roma, 00185, Italy, ricciard@pow2.stat.uniroma1.it, ***Giovanni Storchi***

We define "tourist path" as a homogeneous path which maximizes the interest of the visit of tourist sites within a given time. For each site, some parameters have been defined, such as place capacity, average visiting time and index of "esirability." Routing heuristics have been implemented and applied in real cases.

TD03 Fleet Assignment

Sponsor: RASIG
Sponsored Session
Chair: Guy Desaulniers, Ecole Polytech. & GERARD, 3000 Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, guyd@crt.umontreal.ca

1) RAIL-WAYS: A Fleet Assignment System for Passenger Railway Companies, ***Guy Desaulniers***, Ecole Polytech. & GERARD, 3000 Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, guyd@crt.umontreal.ca, ***Jean-Francois Cordeau***, ***Jacques Desrosiers***, ***Norbert Lingaya***, ***Francois Soumis***

We describe a fleet (locomotives and cars) assignment system for passenger transportation, RAIL-WAYS. It can be used to study what-if scenarios, to compute the equipment cycles, and to update these cycles in order to respond to short-term car demand charges. RAIL-WAYS is based on a column generation approach. Computational results will be presented.

2) A Benders Decomposition Approach for a Rail Equipment Assignment Problem, ***Jean-Francois Cordeau***, Ecole Polytech. & GERAD, 3000 Cote-Ste. Catherine, Montreal, Quebec, H3T 2A7, Canada, ***Jacques Desrosiers***, ***Francois Soumis***

We propose a formulation and an exact algorithm, based on Benders decomposition, for an equipment assignment problem arising in the context of railway passenger transportation. Adaptions to different scenarios are discussed, together with implementation considerations. Computational experiments carried out on real-life instances indicate that the algorithm is highly efficient.

3) Dynamic Locomotive Scheduling, ***Warren B. Powell***, Princeton Univ., Program in Stats & OR, CASTLE Lab., Princeton, NJ 08544, powell@princeton.edu, ***Arun G. Marar***, ***Ajith B. Wijeratne***

We present a dynamic programming approximation for dynamic management of locomotives. Our method is able to handle a variety of complex operating strategies and the characteristics of major locomotive types. The method explicitly handles uncertainities in forecasted toonages, and can optimize over extended horizons with fast response times.

4) Locomotive Scheduling System, ***Koorush Ziarati***, Ecole des HEC & GERAD, Montreal, Quebec, H3C 3J7, Canada, koorush@crt.umontreal.ca, ***Jacques Desrosiers***, ***Francois Lessard***, ***Marius M. Solomon***, ***Francois Soumis***, ***Beyime Tachefine***

The locomotive scheduling system provides at minimum cost sufficient motive power to pull all the trains scheduled by the railway company while satisfying the available locomotive fleet power and the locomotive maintenance planning. The numerical results are provided for an acyclic problem over a one week horizon, using data obtained from the company CN North America. This problem involves 2000 trains and 1300 locomotives.

TD04 Manufacturing I

Contributed Session
Chair: Abhijit Deshmukh, FL State Univ., Dept. of IE, Coll. of Eng., 2525 Dammer St., Tallahassee, FL 32310-6046, deshmukh@eng.fsu.edu

Co-Chair: Jin Wang

1) On Stable Schedules, ***Abhijit Deshmukh***, FL State Univ., Dept. of IE, Coll. of Eng., 2525 Dammer St., Tallahassee, FL 32310-6046, deshmukh@eng.fsu.edu, ***Jin Wang***

We present methods for developing stable schedules in the presence of operating variabilities for a large production facility. A specific example of a major auto-manufacturer is discussed. We model the costs of stabilizing schedules and show the benefits to the production facility and the downstream suppliers.

2) Product Line & Process Design for Mass Customization, ***Ursula Kraus***, Univ. of CA, Dept. of IE/OR, 1890 Arch St., # 209, Berkeley, CA 94709, ukraus@ieor.berkeley.edu, ***Candace A. Yano***

We present a model to support production and design decisions that incorporates the effect of lead time and degree of customization on overall demand. Implications for modular design, posponement and flexible production systems will be discussed.

3) A Production System that Leaves Product Variety up to the Assembly Line Workers, ***Thomas R. Nitsch***, Univ. of CA, 4135 Etcheverry Hall, Berkeley, CA 94720, tnitsch@ieor.berkeley.ca

TSS, the Toyota Sewn Products Management, results in a self balancing production line if workers are sequenced from slowest to fastest. We examine the performance of TSS applied to discrete workstations and product variety to examine if the stability and optimality is maintained and compare performance to traditional line layouts.

4) Toyota Production System: Some Experience in Brazil, ***Roberto R. Alvarez***, Brazilian Inst. for Quality & Productivity, Rua Dr. Correa Coelho 741, Bairro Jardim Botanico, Curitiba, Parana, 80010-050, Brazil, alvarez@ibqppr.org.br, ***Jose Antonio V. Antunes, Jr.***

Toyota production system is the reference for what has become known as lean manufacturing. In the west, the first of 2 pillars, autonomation and JIT, is commonly neglected. In Brazil, some research and practice in the area have been done, giving the same emphasis to both pillars.

TD05 Managing the Demand/Supply Interface

Sponsor: MSOM
Sponsored Session
Chair: M. Eric Johnson, Vanderbilt Univ., Owen Grad. Sch. of Mgmt., Nashville, TN 37203, johnsoem@ctrvax.vanderbilt.edu

1) Optimal Commonality in Component Design, ***Ulrich W. Thonemann***, McKinsey & Co., Im Mediapark 11, Cologne, 50670, Germany, ulrich_thonemann@mckinsey.com

We consider a manufacturing process where products are built to order and components are built to stock. The problem is to determine how many unique variants of a component to produce. We model the problem and solve a design problem that we encountered at a major automobile manufacturer.

2) Using Advance Demand Information in a Project-Based Supply Chain, ***Laura Rock Kopczak***, Stanford Univ., IE/EM Dept., Terman 351, Stanford, CA 94305-4024, kopczak@leland.stanford.edu

Demand information about materials required for a project emerges through a sequence of design decisions. A manufacturer meanwhile makes a sequence of decisions which allocate resources. We present a framework for characterizing demand and supply milestones and evaluating opportunities to share demand information. An example from a yearlong study of the construction industry is presented.

3) Managing Spare Parts Supply Chains for Products with Volatile Demand, ***M. Eric Johnson***, Vanderbilt Univ., Owen Grad. Sch. of Mgmt., Nashville, TN 37203, johnsoem@ctrvax.vanderbilt.edu

We consider the problem of managing a global spare parts supply chain for an equipment manufacturer in the semiconductor industry. Firms in this industry face wide changes in demand along with high service requirements and varying customer buying patterns. We examine supply chain initiatives including leadtime management and customer segmentation.

TD06 Policy Issues in Manufacturing

Sponsor: MSOM
Sponsored Session
Chair: Rachel Q. Zhang, Univ. of MI, Dept. of IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, rzhang@engin.umich.edu

1) U-Shaped Lines with Switchover Time & Cost, ***John A. Buzacott***, York Univ., Schulich Sch. of Business, North York, Ontario, M3J 1P3, Canada, jbuzacot@bus.yorku.ca, ***Seyed M. R. Iravani, Morton J. M. Posner***

The paper begins with a general definition and a general framework for classification of U-shaped lines. It then explores the effect of the switching costs and switchover times incurred when workers change stations by viewing the line as a sequence of tandem queues, each attended by a moving server.

2) Effects of Demand Uncertainty on Product Offering & Pricing Decisions, ***Candace A. Yano***, Univ. of CA, 4135 Etcheverry Hall, Berkeley, CA 94720-1777, yano@ieor.berkeley.edu www.ieor.berkeley.edu/~yano, ***Panupol Lerssrisuriya***

We address the problem of selecting a set of products to offer and their prices when the products share a finite-capacity manufacturing system. The demands are random, and the mean demand of each product declines as the price increases. We present structural results, a solution procedure, and managerial insights.

3) Optimal Material Release Times Using Simulation-Based Optimization, ***Mark L. Spearman***, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332, mark.spearman@isye.gatech.edu, ***Alexander Shapiro, Tito Homem-de-Mello***

We present a method for setting release times for jobs with due dates in a stochastic production flow line. Our methodology is based on Monte Carlo simulation and consequent optimization by a method known as "stochastic counterpart" method. We discuss how the cost parameters of this objective function can be obtained and conclude with a numerical example.

4) A Simple (s, z, S) Inventory Policy for Inventory Systems with Priority Demand Classes, ***Katia C. Frank***, Univ. of MI, Dept. of IOE, Ann Arbor, MI 48109-2117, kfrank@engin.umich.edu, ***Rachel Q. Zhang, Izak Duenyas***

We consider a periodic review inventory system with two priority classes, one deterministic and the other stochastic. The deterministic demand must be met without delay while the stochastic demand can be backordered. We propose a simple (s,z,S) policy and a heruistic that determines the ordering policy (s,S) and issuing policy z separately.

TD07 Technology & Market Dynamics

Contributed Session
Chair: Il-Horn Hann, Univ. of PA, The Wharton Sch., 3620 Locust Walk, #1300, Philadelphia, PA 19104-6366, hann36@wharton.upenn.edu

1) The Nature of Competition in Electronic Markets: An Empirical Investigation of the Electronic Travel Agent Market, ***Il-Horn Hann***, Univ. of PA, The Wharton Sch., 3620 Locust Walk, #1300, Philadelphia, PA 19104-6366, hann36@wharton.upenn.edu, ***Eric K. Clemons, Lorin Hitt***

It has been argued that due to reduction of consumer's search costs, e-markets exhibit intense price competition, hence, reducing incentives for vendors to participate. We verify this prediction empirically for the market of electronic travel agents (ETA). The main result suggests that competition among ETAs doesn't resemble undifferentiated Bertrand competition.

2) Information Asymmetry in Product Markets: A Contingency Approach, ***Subodh P. Kulkarni***, Howard Univ., Dept. of Mgmt., Sch. of Bus., 2600 Sixth St. NW, Washington, DC 20059, subodhk@erols.com

This paper argues that a firm's informational advantage over its customers in product markets may generally diminish in the long run, given the recent advances in information technology. Further, the information asymmetry may be contingent on product and organizational life cycles. Finally, it discusses a firm's strategies under these contingencies.

3) Diffusion Policy of Advanced Manufacturing Technology, ***Hyung-Sik Oh***, Seoul Ntl. Univ., Dept. of IE, Coll. of Eng., Seoul, 151-742, Korea, ohs@cybernet.snu.ac.kr

We forecast the diffusion rate of AMT such as NC, industrial robot in Korea industry. We derive diffusion policy of the AMT according to the price policy and industry structure of the supply sector.

4) Patent Data as an Indictor of Internationalization of Technology Generation & Formation of Alliance, ***Yender Lee***, McGill Univ., 1100 Dr. Penfield, # 704, Montreal, Quebec, H3A 1A8, Canada, leeyen@management.mcgill.ca, ***Hamid Etemad***

Patent data can provide consistent information over a long period of time on inventions with a great deal of details on location and other technical aspects. Using a research method, based-on advanced Boolean logic, this paper offers a new approach to identify groups of patent-records with high potential to signal the globalization...

TD08 Strategic Mgmt. of Largescale Engineering Projects: Findings from Intl. Research Program on Mgmt. of Eng. & Construction

Sponsor: Technology Management Section
Sponsored Session

Chair: Serghei Floricel, Univ. of Quebec at Montreal, Pavillon Ste-Catherine Ouest, Local X-7330, CP 11008, Montreal, Quebec, H3C 4T9, Canada, d236721@er.uqam.ca

1) The Social Construction of Engineering Projects, ***Roger Miller***, Univ. of Quebec at Montreal, Pavillon Ste-Catherine Ouest, Local X-7305, CP 11008, Montreal, Quebec, H3C 4T9, Canada, miller.roger@er.uqam.ca, ***Xavier Olleros***

Before being built, engineering projects must be socially constructed to face risks, complexity and emergence. The social construction process depends up the nature and context of projects, and focuses on creating governance and financing structures that match specific risks. Projects with no match are doomed or require restructuring.

2) Networks & Metacapabilities: The Making of the Virtual Organization in the Engineering Construction Sector, ***Joseph Lampel***, St. Andrews Univ., Dept. of Mgmt., St. Katherine W, The Scores, Fife Scotland, KY16 9AL, UK, jl10Wst-andrews.ac.uk

Rapid globalization in the engineering construction industry puts integrated firms at a disadvantage. A complex ecology is emerging of firms with multiple capabilities that are combined and recombined by networks for specific projects. Strategic advantage of firms in the sector therefore resides in metacapabilities of linking and organizing these networks.

3) Selection of Infrastructure Projects & Institutional Frameworks: A Dual Relation, ***Pascale Michaud***, IMEC, EDI World Inst., 380 St. Antoine St W Ste. 3280, Montreal, Quebec, H2Y 3X7, Canada, pimec@login.net

We show how institutions and regulations influence models of project delivery and affect project performance. It looks at the various institutional and regulatory frameworks to deliver large-scale projects and seeks to explain their evolution in the current context of transition towards a new model of infrastructure provision.

4) A Multilevel Perspective on the Management of Risks in Engineering Projects, ***Serghei Floricel***, Univ. of Quebec at Montreal, Pavillon Ste-Catherine Ouest, Local X-7330, CP 11008, Montreal, Quebec, H3C 4T9, Canada, d236721@er.uqam.ca

The categories of risks that managers heed and try to control differentiate good and bad project outcomes. These categories originate in three levels of context: the skills and practices of different managerial groups, the perceived structural positions with respect to other organizations, and the models conveyed by the institutional environment.

TD09 Learning & Transforming the Organization

Sponsor: Technology Management Section
Sponsored Session

Chair: Louis Lefebvre, Ecole Polytech. of Montreal, Dept. of IE, PO Box 6079, Sta. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, lefebvrl@cirano.umontral.ca

1) Benchmarking for Best Practices in R&D: A Cross-Industry Study Comparison of Innovative Companies, ***S. W. F. Omta***, Univ. of Groningen, Fac. of Mgmt. & Org., Landleven 5, PO Box 800, Groningen, 9700 AV, The Netherlands, s.w.f.omta@bdk.rug.nl bdk.rug.nl, ***Frances Fortuin***

We are conducting an international benchmarking survey, supported by SKF, to assess reference values for best R&D practices. Companies like Siemans, Ericsson, Aerospatiale and Samsung participate in it. The study focuses on issues such as the structure and organization of R&D, as well as the R&D processes and performance.

2) Learning by Managing Projects: The Case of R&D Projects, ***Mario Bourgault***, Ecole Polytech. of Montreal, Dept. of IE, PO Box 6079, Sta. Centreville, Montreal, Quebec, H3C 3A7, Canada, mario.bourgault@mail.polymtl.ca, ***Helene Sicotte***

Development projects can act as catalysts on the way firms learn and accumulate know-how. This is particularly revelant where many organizations are involved. However, the process by which knowledge is accrued and incorporated into the firms' practices remains unclear. The study investigates this issue, analyzing several R&D projects.

3) The Process of Organizational Transformation: A Case Study in the Banking Sector, ***Albert Lejeune***, Univ. of Quebec at Montreal, PO Box 6192, Sta. Centreville, Montreal, Quebec, H3C 2R2, Canada, lejeune.albert@uqam.ca, ***Line Ricard***, ***Lise Prefontaine***

Using the conceptual framework of Bartlett and Ghoshal, we developed indicators to assess levels of transformation performed by organizations on three axes: purpose, people and processes. A case study in the banking sector shows that using specific measures helps management evaluate their strengths and weaknesses and realign their actions.

4) Technology Transfer & Organizational Learning, ***Dan A. Seni***, Univ. of Montreal at Quebec, PO Box 6192, Sta. Centreville, Montreal, Quebec, H3C 2R2, Canada

TD10 New Developments in Scheduling II

Cluster: Scheduling
Invited Session

Chair: Lei Lei, Rutgers Univ., Fac. of Mgmt. & RUTCOR, 180 University Ave., Newark, NJ 07102, llei@andromeda.rutgers.edu

1) Some Discussion on the Influence of Information Over Scheduling Policy in Supply Chain, ***Linguo Gong***, LA State Univ., Coll. of Bus. Admin., Dept. of IS&DS, Baton Rouge, LA 70803-6316

We study the impact of customer ordering information on delivery schedule of manufacturer, warehouse and retailers in a supply chain environment. By using analytical model and computer simulation, we investigate system performances under different levels of information availability and different delivery scheduling policies.

2) On the Large-Scale Aircraft Scheduling Problem with Time-Windows & Capacity Constraints, ***Lei Lei***, Rutgers Univ., Fac. of Mgmt. & RUTCOR, 180 University Ave., Newark, NJ 07102, llei@andromeda.rutgers.edu, ***Carla P. Gomes***, ***Jun Du***, ***Lijie Shi***, ***Ronald Armstrong***, ***Anna Olecka***

We propose an AI and OR local optimization algorithm for solving large-scale aircraft scheduling problems with various practical constraints. An AI search procedure is developed to find an initial feasible schedule and an iterative OR procedure, then identifies a local optimal solution.

3) A Multicriteria Simulation Study on Dynamic Scheduling, ***Philip Y. Huang***, VA Polytech. Inst. & State Univ., Dept. of MS & UT, Blacksburg, VA 24061-0235, phhuang@vt.edu, ***Jack Leu***

One of the major difficulties in job shop scheduling is to find a sequencing rule that dominates others in all performance measures. In this research a dynamic sheduling is to find a sequencing rule that dominates others in all perforance measures. In this research a dynamic scheduling rule employed one of the following rules, depending on the shop condition, to assign priority: shortest processing time, critical ratio, or COVERT.

TD11 Factors in Planning, Scheduling & Supply Chain Management III

Cluster: Flexible Manufacturing Systems
Invited Session

Chair: Bart L. MacCarthy, Univ. of Nottingham, Dept. of Mfg. Eng. & Ops., University Pari, Nottingham, NG7 2RD, UK, bart.maccarthy@nottingham.ac.uk

1) withdrawn - author request of 2/26, ***Nobuto Nakamara***, Hiroshima Univ., Dept. of ISE, 4-1 Kagamiyama 1 chome, Higashi-Hiroshima, 739, Japan, nakamura@pel.sys.hiroshima-u.ac.jp

2) Predictable Scheduling on a Single Machine with Sensitive Jobs, ***Reha Uzsoy***, Purdue Univ., Sch. of IE, 1287 Grissom Hall, W Lafayette, IN 47907-1287, uzsoy@ecn.purdue.edu, ***Ronan O'Donovan***, ***Kenneth N. McKay***

We examine the problem of optimizing total tardiness and predictability on a single machine in the face of stochastic breakdowns. The schedulers' knowledge of the effects of disruptions on job processing times is used to develop improved schedules. Computational experiments show that using this information significantly improves performance.

3) Implementation of Human Learning & Problem Solving to Highly Unsimulatable Combinatorial Optimization Problems, ***Jinhwa Kim***, Univ. of WI, Sch. of Bus., 1238 Grainger, 975 University Ave., Madison, WI 53706, jikim@bus.wisc.edu, ***Scott T. Webster***

With the information and inspiration from cognitive sciences, we suggest an approach called simulated learning, which simulates human learning and problem solving processes for combinatorial optimization problems. Its advantage lies in the application to highly unsimulatable problems, where only a set of past solution examples is available.

4) Playing Games with Supplier Relationships: The Use of n-Person Games in an Analysis of Case Studies from the Automotive Industry, ***Stefan Bungart***, Univ. of Warwick, Warwick Mgmt. Group, Coventry, CV4 7AL, UK, s.bungart@warwick.ac.uk

We use contemporary game theory to analyse the actions of players and outcomes of such actions in customer - supplier relationships. A number of case studies will be used to illustrate the concepts and demonstrate the analytical and explanatory power of game theory in its application in supply chain management.

TD12 Analyzing Telemedicine Networking

Cluster: Health Applications
Invited Session

Chair: Claude Sicotte, Univ. de Montreal, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, sicottec@ere.umontreal.ca

1) Evaluation of Technological Innovation: The Case of Telemedicine in Remote Areas, ***Claude Banville***, Univ. Laval, Fac. des sci. de l'Admin., Dept. of SIO, Ste. Foy, Quebec, G1K 7P4, Canada, claude.banville@sio.ulaval.ca, ***Jean-Paul Fortin***, ***Luc Provost***, ***Josee Morisset***, ***Sylvie Kirouac***

We discuss the evaluation of a telemedicine project that aims to provide and organize specialized care to remote areas of the province of Quebec in radiology and pediatric cardiology. We focus on an overview of the project, on the (qualitative) methodology and on preliminary results of an evaluation that was conducted along a perspective of technological innovation.

2) Comparison of Two Pilot Projects in Telediagnostic, ***Jean-Paul Fortin***, Univ. Laval, Dept. de Medicine, Ste.-Foy, Quebec, G1K 7P4, Canada, jean-aul.fortin@msp.ulaval.ca, ***Claude Banville***, ***Luc Provost***, ***Josee Morisset***, ***Sylvie Kirouac***, ***Francois Hubert***

This presentation gives a comparison of 2 pilot projects in telediagnostic which are compared to allow identification of acceptability and diffusion conditions. The outcome leads to a better understanding of implementation strategies used to deal with issues related to professional practices, health care services changing structures, ethical and legal frameworks, economical preoccupations and technological challenges.

3) Cognitive Analysis of Collaborative Problem-Solving Processes in Telemedicine, ***Lambert Farand***, Univ. of Montreal, Dept. of Health Admin., PO Box 6128, Sta. Downtown, Montreal, Quebec, H3C 3JC, Canada, farandl@mdas.umontreal.ca, ***Jose Arocha***, ***Jean-Philippe Lafrance***

We studied clinical problem-solving processes in the context of real telemedical consultations. A case-study design and qualitative methods originating from cognitive psychology were used. The negotiation that takes place between collaborating clinicians in this context provides a rich source of data for the analysis of medical reasoning.

4) Dual Reality of Telemedicine: Communication Network or Professional Network, ***Claude Sicotte***, Univ. de Montreal, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, sicottec@ere.umontreal.ca, ***Louise Rousseau***, ***Marcellin Aye***, ***Francois Champagne***, ***Andre Lacroix***

The potential benefits of telemedecine are mainly based on telecommunications and computer technology that permits the interaction and the exchange of information between geographically remote interactants. Such emphasis leaves in the dark a crucial dimension of telemedecine: the ability of networking experts. We describe this duality observed within a four hospital network study.

TD13 Innovations & Applications of Integer Programming

Cluster: Discrete Optimization
Invited Session

Chair: Arthur L. Fenaroli, IBM, 522 South Rd., Poughkeepsie, NY 12601, artf@us.ibm.com

Co-Chair: Fanny Soohoo

1) Evaluating the Trade-offs Between Idling & Shutting Down Production Lines, ***Renato de Matta***, Univ. of IA, Coll. of Bus. Admin., 108 Pappajohn BAB, Iowa City, IA 52241, redmatta@blue.weeg.uiowa.edu, ***Tan Miller***

When a plant's capacity exceeds its forecast demand, a manufacturer must either plan line shutdowns or plan to temporarily idle lines without shutting down lines. The trade-offs between these 2 strategies can be complex. We propose a scheduling model which evaluates the impact of both strategies on plant production costs.

2) Improving OSL-MIP Performance Via Priorities for Branching Utilizing Appropriate OSL-USER Exits, ***Kurt Spielberg***, IBM, 2005 Market St., Philadelphia, PA 19103, kurtspie@vnet.ibm.com

We have obtained excellent results for certain classes of problems with setting branching priorities from double - contraction a basic concept of logical processing. Implementations with OSL-USER exits promise additional flexibility in combining double contraction with other strategies. OSL-USER exits will be discussed and numerical results will be given. The improvements in performance can be striking.

3) Production Planning, Scheduling & ATP Available to Promise in the Food Processing Industry, ***Scott Zhu***, IBM Global Services, 580 E Swedesford Rd., Wayne, PA 19087, zhus@us.ibm.com, ***Dimitris Alevras***

We address issues in the modeling of supply chain management problems in the food processing industry. At each plant raw materials have to be disassembled each day and packaged into boxes for delivery. All order items have freshness requirements on delivery. The proposed framework optimizes order to plant assignment, production planning and scheduling over a one year horizon with respect to factors such as value of products, freight and inventory costs.

TD14 Global Optimization I

Contributed Session

Chair: Tim Van Voorhis, IA State Univ., IMSE Dept., 205 Engineering Annex, Ames, IA 50011, tvanvoor@iastate.edu www.imse.iastate.edu

1) A Branch & Bound Algorithm Using Lagrangian Underestimates, ***Tim Van Voorhis***, IA State Univ., IMSE Dept., 205 Engineering Annex, Ames, IA 50011, tvanvoor@iastate.edu www.imse.iastate.edu

This talk will present a branch and bound algorithm for global optimization. At each branch, lower bounds are quickly found by estimating the Lagrange Multipliers and then minimizing a convex underestimate of the resulting Lagrangian function. The partitioning process improves the multiplier estimates and tightens the convex underestimates.

2) Global Optimization of a Mixed-Integer Bilinear Program, ***Dmitry V. Golovashkin***, Carnegie Mellon Univ., Dept. of Chemical Eng., Pittsburgh, PA 15213-3890, dmitry@andrew.cmu.edu, ***Ignacio E. Grossmann***

We describe a B&B method for the global optimization of problems that exhibit bilinear terms in the continuous variables and linear terms for 0-1 variables in the objective function and constraints. Novel underestimating functions and bounding strategies are also described. Numerical results are presented.

3) Hybrid Algorithm, ***Birna P. Kristinsdottir***, Univ. of WA, Dept. of IE, Box 352650, Seattle, WA 98195, bpkice@u.washington.edu, ***Zelda B. Zabinsky***

A new global optimization algorithm, called the Hybrid Algorithm, is set forth and tested on several global optimization test problems. The hybrid algorithm is motivated by complexity results derived for random search algorithms, and combines sequential random search algorithms with interval methods in a single algorithm with promising results.

TD15 Variational Inequalities & Projected Dynamical Systems with Applications

Cluster: Nonlinear Programming
Invited Session

Chair: Anna B. Nagurney, Univ. of MA, Sch. of Mgmt., Dept. of Finance & OM, Amherst, MA 01003, nagurney@gbfin.umass.edu

1) Noncompliant Oligopolistic Firms & Marketable Pollution Permits: Statics & Dynamics, ***Anna B. Nagurney***, Univ. of MA, Sch. of Mgmt., Dept. of Finance & OM, Amherst, MA 01003, nagurney@gbfin.umass.edu, ***Kanwalroop K. Dhanda***

We consider the modeling, analysis, and computation of solutions to both static and dynamic models of multiproduct, multipollutant noncompliant oligopolistic firms engaged in markets for pollution permits. We utilize variational inequality theory for the static model and the theory of projected dynamical systems for the dynamic model. An algorithm is proposed and applied to several numerical examples.

2) On the Stationary Link Flow Pattern, ***Ding Zhang***, SUNY, Sch. of Bus., Oswego, NY 13126-2529

We propose to study the stationary link flow pattern in a transportation network. We show that under reasonable assumptions on the commuters' route choice behavior, the stationary link flow pattern is the necessary and sufficient condition for the (Wardrop) traffic equilibrium in both static and dynamic versions.

3) A Multiobjective Financial Equilibrium Model, ***June Dong***, SUNY, Sch. of Bus., Oswego, NY 13126

A multiobjective financial equilibrium model will be presented. The model allows financial sectors to have their individual objectives and criterias in investment decision making. Qualitative properties of the model will be discussed.

4) Modeling International Financial Equilibria with Benchmark Tracking, ***Stavros Siokos***, Univ. of MA, Dept. of Mech. & IE, Amherst, MA 01003, siokos@ecs.umass.edu, ***Anna B. Nagurney***

We extend existing international financial equilibrium models with benchmark tracking. The models are based on variational inequality theory for the analysis of the statics and projected dynamical systems theory for the study of the dynamics and disequilibrium behavior.

TD16 Semidefinite Programming & Applications

Cluster: **Linear Programming**
Invited Session

Chair: Henry Wolkowicz, Univ. of Waterloo, Waterloo, Ontario, N2L 3G1, Canada, hwolkowi@orion.math.uwaterloo.ca

1) A Spectral Bundle Method for Semidefinite Programming, ***Christoph Helmberg***, ZIB-Berlin, Konrad-Zuse-Zentrium, Takustrasse 7, Berlin, 14195, Germany, helmberg@zib.de, ***Franz Rendl***

We present a bundle method for solving eigenvalue optimization problems that arise from semidefinite programs. The traditional cutting plane model built from subgradient information is replaced by a semidefinite model covering the subspace spanned by import eigenvectors. The approach allows to exploit problem structure. This is illustrated for Combinatorial applications.

2) An Interior-Point Method for the Euclidean Distance Matrix Completion Problem, ***Henry Wolkowicz***, Univ. of Waterloo, Waterloo, Ontario, N2L 3G1, Canada, hwolkowi@orion.math.uwaterloo.ca, ***Abdo Y. Alfakih, Amir Khandani***

Given a partial symmetric matrix with only certain elements specified, the EDMCP consists in finding the unspecified elements in order to construct an EDM. We solve the EDMCP by generalizing the completion problem to allow for approximate completions. In particular, we introduce a primal-dual interior-point algorithm for both approximate and exact completion problems. In addition, the algorithm uses a new search direction for semidefinite programming.

3) CUTSDP: A Toolkit for a Cutting Plane Approach Based on Semidefinite Programming, ***Stefan E. Karisch***, Tech. Univ. of Denmark, Dept. of Math. Modeling, DTU Bldg. 321, Copenhagen, DK-2100, Denmark, sk@imm.dtu.dk

CUTSDP is a package of C programs containing an implementation of a cutting plane approach based on semidefinite programming. We describe the main features of the toolkit and present applications in quadratic integer programming e.g. for max-cut and graph partition problems.

TD17 Current Issues in Operations Management

Cluster: **Optimization Days**
Invited Session

Chair: Kevin Z. Weng, School of Bus., Univ. of Wisconsin-Madison, Madison, WI 53706-1323, kweng@bus.wisc.edu

1) Incentive Strategies Favor Non-Consolidating Queueing Service Systems: The Principal-Agent Perspective, ***Stephen M. Gilbert***, Case Western Reserve Univ., Weatherhead Sch. of Mgmt., 10900 Euclid Ave., Cleveland, OH 44016-7235, ***Kevin Z. Weng***

We study a service network in which an agency is responsible for meeting the expected waiting and service time required by customers. We model the facilities' self-interested capacity decisions as the solution to a game. Our analysis challenges the conventional wisdom on the value of risk-pooling by consolidating service queues.

2) What Do Managers Need to Know About Operations Management?, ***Suzanne de Treville***, American Sch. of Intl. Mgmt., Archamps Campus, Grand-Rue 57, Founex, 1297, Switzerland

Over the past couple of decades, a large number of improvement approaches have been developed for managing operations. Is there some core understanding of OM that is fundamental to most of the common OM approaches? We attempt to distill a simple and comprehensive framework of managing operations from a collection of popular techniques.

3) Integrating Production, Inventory & Transportation in Supply Chain Management, ***Ana Muriel***, Univ of MI, Grad. Sch. of Bus. Admin., Ann Arbor, MI 48109-1234, ***Lap Mui A. Chan***, ***David Simchi-Levi***

We review recent results on integrating production, inventory and transportation in large scale supply chains. Our focus is on the development of theory and algorithms to efficiently solve problems that involve the coordination of production decisions, inventory policies and transportation strategies in the presence of economies of scale.

TD18 Applications of Metaheuristics

Cluster: **Metaheuristics**
Invited Session

Chair: E.-G. Talbi, LIFL, Cite Scientifique Bat. M3, Villeneve d'Ascq, 59655, France, talbi@lifl.fr

1) Les meta-heuristiques d'optimisation combinatoire: une demarche empirique, mais efficace, aussi pour l'optimisation globale, ***Rachid Chelouah***, Ecole Centrale de Paris, Grand voie des vignes, Chatenay-Malabry, 92295, France, chelouah@u-cergy.fr, ***P. Siarry***

Depuis environ 15 ans, les "metaheuristiques" - principalement le recuit simule, la methode de recherche tabou, les algorithmes genetiques - se sont imposees comme des moyens precieux pour la resolution de problemes d'optimisation combinatoire "difficiles." La recherche reste active dans ce domaine, car le reglage de ces methodes relevent encore du specialiste et le temps de calcul demeure bien souvent la pierre d'achoppement...

2) Diversifying Tabu Search by Genetic Algorithms, ***V. Bachelet***, Ecole des Mines de Douai, bachelev@lifl.fr, ***E.-G. Talbi, P. Preux***

In order to show that the cooperation of different heuristic methods may lead to an efficient search strategy, we have hybridized a genetic algorithm and a tabu search method. While both metaheuristics cooperate via an adaptive memory which contains a history of the search already done, the tabu...

3) No Title Supplied, ***Luca-Maria Gambardella***, IDSIA, C. so Elvezia 36, Lugano CH, 6900, Switzerland, luca@idsia.ch, ***M. Dorigo, Eric Taillard***

We present HAS-SOP, an hybrid ant colony algorithm coupled with a local optimizer applied to various instances of the sequential order problem (SOP). We compare HAS-SOP with some of the best heuristics available for the SOP. Experimental results show that HAS-SOP is the best performing method for SOP problems and is able to...

TD19 Tutorial: An Introduction to Stochastic Programming

Invited Session

Chair: Gilbert Laporte, Ecole des HEC, Univ. of Montreal, CRT, CP 6128, Station A, Montreal, Quebec, H3C 3J7, Canada, gilbert@crt.umontreal.ca

1) Tutorial: An Introduction to Stochastic Programming, ***Francois V. Louveaux***, FUNDP, 1 Rempart de la Vierge, Namur, B-5000, Belgium, francois.louveaux@fundp.ac.be

The aim of stochastic programming is to model and solve problems involving uncertain data. This tutorial will provide an introduction for newcomers to the field. The first part will discuss examples of applications and modeling issues related to undertainty. Basic properties of stochastic programs and commonly used methods of solutions will then be presented. Finally, an introduction to current areas of research will be provided.

TD21 Advances in Microscopic Traffic Simulation I

Cluster: **Advances in Microscopic Traffic Simulation**
Invited Session

Chair: Jaime Barcelo, Polytech. Univ. of Catalunya, Dept. of Stats & OR, Pau Gargallo 5, Barcelona, E-08028, Spain, barcelo@eio.upc.es

1) Microscopic Modeling of Traffic Management Measures for Public Transport in DRACULA, ***Ronghui Liu***, Univ. of Leeds, Inst. for Trans. Studies, Leeds, LS2 9JT, UK, rliu@its.leeds.ac.uk

We will describe the developments made to adapt the traffic microsimulation model DRACULA in order to model public transport (bus and guided bus) and associated traffic management schemes. The new features include reserved lane, bus stop, bus layby, selective vehicle detection, journey time prediction and responsive signal controls.

2) Modeling Permissive Movements at Intersections with Gap Acceptance, ***Shane Velan***, Center of Research on Trans., Univ. of Montreal, CP 6128 succursale Cetre-Ville, Montreal, Quebec, H3C 3J7, Canada, velans@civil.queensu.ca, ***Michel Van Aerde***

We describe and evaluate the structure of an implementation of the probabilstic

direct approach to modeling permissive movements. The gap-acceptance logic, which was implemented within a microscopic simulation model, can be applied deterministically or stochastically to isolated intersections with signalized or unsignalized traffic contgrol, and to networks with a mixture of intersection control strategies.

3) Travel Time Savings from Actuated, Sychronized Signal Systems, *Richard A. Glassco*, MITREtek Systems, 600 Maryland Ave. SW, Ste. 755, Washington, DC 20024, rglassco@mitretek.org

The THOREAU traffic simulation models a network representing downtown Detroit. The Plan for Intelligent Control of Actuated Synchronized Signal Operation algorithm combines dynamic resynchronization of congested corridors with advanced signal actuation. Controllers operate in actuated mode within cycle lengths and offsets optimized for corridor progression. The study quantifies travel time savings and delay reduction.

4) HUTSIM: A New Way to Simulate Traffic Light Operations, *Matti Kokkinen*, HUTSIM, Lansiportti 4, Lansiportti, FIN-02210, Finland, matti.kokkinen@traficon.fi, ***Iisakki Kosonen***

HUTSIM is a traffic simulation program packet. It consists of an editor to build models and a simulation program to see what happens. The software development team have members from Helsinki University of Technology (HUT), the city of Helsinki and from a private engineering office Traficon. The main object is to make a simulation software that simulates traffic in an ordinary crossing.

TD22 Frameworks for Group Decision & Negotiation: Group Support Systems

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: Floyd L. Lewis, Western WA Univ., Decision Science Dept., Coll. of Bus. & Econ., Bellingham, WA 98225-9077, lewis@cbe.wwu.edu

1) Do Some Things Change Faster than Others? The Dynamics of Behavioral Change in Computer-Supported Groups, *Kelly Burke*, ID Univ., CIS Dept., Coll. of Bus., Pocatello, ID 83209, burkkell@isu.edu, ***Laku Chidambaram***

This study focuses on change over time in computer-supported groups, reflecting increasing familiarity with technology, team members, and task. A longitudinal study suggests that rates of change for different dimensions of group behavior are not uniform. Practical and theoretical implications of differential rates of change in computer-supported groups as discussed.

2) Initial Experiences Teaching Management Support Systems via Distance Learning, *Floyd L. Lewis*, Western WA Univ., Decision Science Dept., Coll. of Bus. & Econ., Bellingham, WA 98225-9077, lewis@cbe.wwu.edu

New technologies allow students in different places at different times to interact with course materials, the instructor, and each other. Distributed versions of GSSs are now available. This paper describes a Management Support Systems class, including GSS, that was utilized the internet for lectures, assignments, discussions, and quizzes.

3) Panel: Important Issues in Distributed Approaches to Group Decisions & Negotiation, *Laku Chidambaram*, University of Hawaii, College of Business Admin, 2404 Maile Way, Honolulu, HI 96822-2223, laku@busadm.cba.hawaii.edu, ***Melvin F. Shakun***, ***Gregory E. Kersten***

TD23 Innovative Applications

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Jeffrey S. Stonebraker, Applied Decision Analysis, Inc., 2710 Sand Hill Rd., Menlo Park, CA 94025, jeff@adainc.com

1) Web-Based Financial Decision Analysis, *Terry Bresnick*, Innovative Decision Analysis, Inc., 3011 Weber Pl., Oakton, VA 22124, ***Dennis M. Buede***

Over the past 2 years we have designed web-based applications for Quicken Financial Network and InsureMarket. The applications include personal check-ups, rule-based decision aides and DA-based decision aides. We summarize the applications, demonstrate the applications if a web connection is available and provide an update on the usage and success of the applications.

2) Environmental Risk Management, *Daniel G. Brooks*, AZ State Univ., Dept. of Mgmt., Tempe, AZ 85287, daniel.brooks@asu.edu

Petro-chemical companies have been transporting their products over aging, risk-prone pipeline systems for years. We present how we developed a consistent system-wide process for assessing and managing risk for Chevron Pipeline (CPL) Company that has been institutionalized throughout CPL.

3) Manufacturing Risk Management, *Jeffrey S. Stonebraker*, Applied Decision Analysis, Inc., 2710 Sand Hill Rd., Menlo Park, CA 94025, jeff@adainc.com

We discuss our 1st application of risk management in manufacturing. The schedule of this pilot study was very tight having been compressed from months to weeks. We also discuss the organizational impacts of this study along with our lessons learned.

4) withdrawn - author request of 2/26, *James C. Felli*, Naval Postgrad. Sch., DRMI (64FL), Monterey, CA 93943-5201, jcfelli@nps.navy.mil

TD24 Analytical Hierarchy Process

Contributed Session

Chair: Saul I. Gass, Univ. of MD, Coll. of Bus. & Mgmt., College Park, MD 20740, sgass@mbs.umd.edu

1) Tournaments, Transitivity & Pairwise Comparison Matrices, *Saul I. Gass*, Univ. of MD, Coll. of Bus. & Mgmt., College Park, MD 20740, sgass@mbs.umd.edu

We show, using results from tournaments and graph theory, how one can readily determine the number of 3-way intransitive cycles (A preferred to B, B preferred to C and C preferred to A) that exist within a pairwise comparison matrix, and, using standard LP procedures, how to find them.

2) Multipartner Organization Selection Modeling Using ANP, *Joseph Sarkis*, Clark Univ., Grad. Sch. of Mgmt., 950 Main St., Worcester, MA 01610-1477, jsarkis@clarku.edu, ***Laura Meade***

This presentation will present an ANP model that helps decision makers form multi partner alliances.

3) The Analytic Hierarchy Process - An Effective Tool for a Strategic Decision of a Research Centre, *J. M. Hummel*, Univ. of Groningen, Fac. of Mgmt. & Organ., Landleven 5, PO Box 800, Groningen, 9700 AV, The Netherlands, j.m.hummel@bdk.rug.nl http://www.bdk.rug.nl, ***S. W. F. Omta***, ***G. Rakhorst***, ***W. Van Rossum***

We deal with the application of AHP to strategic organizational decision problems. Empirical data are derived from a case study performed at an academic research centre collaborating with industry. They indicate that AHP evoked group discussions that resolved disagreements and resulted in consistent collective judgments.

4) A Hierarchical Production Plan for a Make-to-Order Steel Fabrication Plant, *Brian D. Neureuther*, TX Tech. Univ., COBA/ Area of ISQS, Lubbock, TX 79409-2101, otbri@coba2.ttu.edu, ***George G. Polak***, ***Nadia Sanders***

A hierarchical production plan is developed utilizing actual production data from a make-to-order steel fabrication plant. An aggregate linear model, disaggregate non-linear model, and master production schedule comprise the three respective tiers. A production plan and master production schedule are reported and recommendations are offered for plant improvements.

TD25 Linear & Nonlinear Approaches to Reliability Analysis

Sponsor: Applied Probability Section
Sponsored Session

Chair: Sudha Jain, Univ. of Toronto, Dept. of Stats., 100 St. George St., Toronto, Ontario, M5S 1A1, Canada, jainsu@utstat.utoronto.ca

1) withdrawn - author request of 2/27, *Dinesh S. Shah*, Xerox Corp., 200 Crosskeys Park, Bldg. 0815-000, Fairport, NY 14450, dinesh_s_shah@mc.xerox.com

2) Performance Analysis of Assembly Systems with Underliable Machines, *Xue-Ming Yuan*, HKUST, Dept. of IE/EM, Clear Water Bay, Kowloon, Hong Kong, ***Liming Liu***

This paper discusses an unreliable assembly sysstem where different types of components are processed by two separate work centers before merging to an assembly station. Analytical results on its performance measures such as inventory level, availability, throughput, blocking times, first failure times, and response times are obtained.

3) withdrawn - author request of 2/24, *David W. Jacobson*, IBM Corp., Reliability Eng. Dept. HQZ, Bldg. 040-3, 3605 Hwy. 52 N,

Rochester, MN 55901-7829, jake@rchvmx.vnet.ibm.com

4) Reliability Allocation with Discrete Cost-Reliability Data for Components, ***Jayant Rajgopal***, Univ. of Pittsburgh, Dept. of Indust. Eng., Pittsburgh, PA 15261, rajgopal@engrng.pitt.edu, ***Subba Rao V. Majety***

We address the optimal allocation of reliability among components in a system to guarantee specified system reliability. Unlike most prior work, we describe component cost-reliability relationships via discrete data sets. Nonlinear integer programming formulations along with solutions procedures are provided for the design optimization problem.

TD26 Multidimensional Queueing Systems

Sponsor: Applied Probability Section
Sponsored Session
Chair: Winfried K. Grassmann, Univ. of Saskatchewan, Dept. of Comp. Sci., 1C144 Engineering, Saskatoon, SK, S7N 0W0, Canada

1) Generating Functions of Probability Measures of Infinite Markov Chains with Block Structures, ***Yiqiang Q. Zhao***, Univ. of Winnipeg, Dept. of Math & Stats., 515 Portage Ave., Winnipeg, Manitoba, R3B 2E9, Canada, zhao@uwinnipeg.ca, ***Wei Li***

Generating functions of various probability measures of infinite Markov chains with block structure are studied. Some decomposition theorems hold, which have applications in both finding closed form expressions and computing these measures. Some of the theorems hold in non-ergodic as well as in ergodic case.

2) Analysis of Markovian Polling Systems with Single Buffers & Correlated Input Process, ***Thomas Lee***, Univ. of IL, 601 S Morgan St., MC 294, Chicago, IL 60607

We introduce a simple approach for modeling and analyzing Markovian polling systems with single buffers and correlated input process. Our method allows transient and steady state analysis. To obtain exact solution our analysis requires the solution of $2*m-1$ linear equations, where m is the number of stations. Furthermore, we obtain bounds and develop efficient procedure for computing throughput, loss probability, and the expected delay observed by a customer.

3) Asymptotic Analysis for an M/M/1 Queue in a Random Environment with a Fast Server, ***William A. Massey***, Bell Labs., 700 Mountain Ave., Rm. 2C-12, Murray Hill, NJ 07974-0636, ***Raj Srinivasan***

We establish asymptoltic expansions and error bounds for an M/M/1 queue in a random environment with a constant service rate. We exploit the underlying matrix geometric structure and provide approximate formulae for the average queue length and mean waiting time.

4) The Solutions of Sequential Queues with Blocking by Using Difference Equations, ***Winfried K. Grassmann***, Univ. of Saskatchewan, Dept. of Comp. Sci., 1C144 Engineering, Saskatoon, SK, S7N 0W0, Canada

Sequential queues with blocking are analysed by using characteristic roots. Equations these roots are obtained, and solution methods for solving these equations are discussed. The efficiency of this method will be compared with matrix-geometric methods.

TD27 Electricity System Design Issues

Sponsor: ENRE
Sponsored Session
Chair: Yves Smeers, Univ. Catholique de Louvain, 34 voie du Roman Pays, Louvain La Neuve, B-1348, Belgium, smeers@core.ucl.ac.be

1) Modeling Electricity Restructuring in the National Energy Modeling System, ***Peter Whitman***, Energy Information Admin., 1000 Independence Ave. SW, Washington, DC 20585, pwhitman@eia.doe.gov

NEMS is the primary tool for mid-term projections of energy supply and demand for the Energy Information Administration. The movement towards deregulation of the electricity generation sector has required extensive modification to the dispatch, capacity planning and electricity pricing portions of NEMS. This talk focuses on the implementation of marginal cost pricing representative of a deregulated generation market for electricity in the model.

2) Coordinating Fuel Inventory & Electric-Power Generation Under Uncertainty, ***Chonawee Supatgiat***, Univ. of MI, Dept. of IOE, Ann Arbor, MI 48109-2117, chonawee@engin.umich.edu, ***Samer Takriti, Lilian S. Wu***

We consider an energy marketer who purchases natural gas from the open market and sells it to contracted customers. A storage may be used on days with high spot prices to supply customers with natural gas and to sell it back to the market at a profit. The marketer has another option: using the gas to generate electricity and sell it in the open market...

3) The economic impact of Transmission pricing schemes, ***Richard Green***, Univ. of Cambridge, Dept. of Applied Econ., Sidgwick Ave., Cambrodge, CB3 9DE, UK, rjg10@econ.cam.ac.uk

This paper combines a small transmission model with a model of generators' investment and operational decisions, to consider the effects of different transmission pricing schemes. These include spot pricing, postage stamps rates, and intermediate schemes, as in England and Wales. The cost of inappropriate price signals is estimated.

4) Value at Risk in Capacity Planning Models for Electricity Generators, ***Olivier Daxhelet***, Univ. Catholique de Louvain, 34 Voie du Roman Pays, Louvain-La-Neuve, 1348, Belgium, dax@core.ucl.ac.be, ***Emmanuel Canon, Jacqueline Boucher***

We consider a standard capacity expansion model with selling and fuel price risks. We introduce different types of long term contracts with hedging properties. The company has to select both its capacity investments and the accompanying contracts in order to protect itself from a possible loss of value. The problem is modelled as a chance constraint capacity expansion model. The probabilistic constraint expresses the accepted value at risk.

TD28 Panel: Integrating OR/MS into the MBA Program

Sponsor: Forum on Education
Sponsored Session
Chair: Janet M. Wagner, Univ. of MA, Dept. of MS/IS, 100 Morrissey Blvd., Boston, MA 02125, wagner@umbsky.cc.umb.edu

1) Panel: Integrating OR/MS into the MBA Program, ***Kenneth R. Baker***, Dartmouth Coll., Tuck Sch., Hanover, NH 03755-9000, kenneth.r.baker@dartmouth.edu, ***Vicki Milledge, Rakesh Vinay Vohra, Janet M. Wagner***

Whether driven by an altruistic drive to provide MBA students with useful tools, or a Machiavellian ploy to ensure the Professors' survival, one successful strategy to ensure the continuation of OR/MS in management education is by finding ways to integrate it into other areas of the MBA curriculum. Panel members will report on integration initiatives at their schools and discuss the advantages and disadvantages of these approaches.

TD29 Aviation Modeling & Simulation

Sponsor: Aviation Applications Section
Sponsored Session
Chair: Michael White, MITRE Corp., 1820 Dolly Madison Blvd., MS W-281, Mc Lean, VA 22102-3481, mwhite@mitre.org.com

1) Assessing National Airspace System Growth Limits Implied by Delay Metrics, ***Frederick Wieland***, The MITRE Corp., 1820 Dolley Madison Blvd., MS W282, McLean, VA 22102, fwieland@mitre.org

Flight delays are one of the metrics used to measure NAS performance. As air traffic volume continues to increase both domestically and internationally, airports and en route airspace will be stretched to their capacity limits. We shall assess what those limits night be by using flight delays as the fundamental indicator...

2) The Traffic Flow Modeling & Analysis Capability Model, ***James S. DeArmon***, MITRE Corp., 1820 Dolley Madison Blvd., McLean, VA 22102

TMAC is a family of tools that can be configured flexibly to conduct experiments related to air traffic management. The system models airports, airspace and aircraft at the most detailed level and contains application layers that support flow management and human interaction. The system has been used to model a number of features and questions related to free flight...

3) The Utility of Highly Approximate Analyses of the National Airspace System, ***Michael White***, MITRE Corp., 1820 Dolly Madison Blvd., MS W-281, Mc Lean, VA 22102-3481, mwhite@mitre.org.com

Conventional analyses of the NAS are typically highly detailed and complex, taking months or years to complete. In many cases, the time required to complete the analysis greatly exceeds the time available before a decision will be made or a policy formulated; this renders these analysis results useless, regardless of their accuracy or precision...

TD30 Military Operations I

Cluster: Military Applications
Invited Session

Chair: P. Desmier, Ntl. Canada Defense Hq., Dept. of Ntl. Defense, 101 Colonel By Dr., Ottawa, Ontario, K1A 0K2, Canada, desmier@ora.dnd.ca

1) Getting There is Half the Fun: The Impact of Lift & Logistics on 21st Century Force Effectiveness, *W Peter Cherry*, Vector Research Incorporated, P O Box 1506, Ann Arbor, MI 48106-1506

The latter half of the 20th century was characterized by forward stationed forces, equipment and supplies, reliance on host nation support and massive mobilization and movement to theatre. Modernization decisions were made in this context. We examine changes that have taken place as emphasis has shifted to force projection, austere theatres of operation and the use of active component forces.

2) Impact of New Technologies on Military Mission Effectiveness, *R. Mitchell*, HQ NORAD/USSPACECOM ANA, Bldg. 1470, Ste. 116, 250 S Peterson Blvd., Peterson AFB, CO 80914-3180

The feasibility of employing military platform signature reduction technologies is a problem facing military planners. Detection range reduction can be demonstrated to be an inaccurate measure on which to base decisions. Enhancement of the platforms ability to carry out or survive its mission is a much better, though more complex, measure of effectiveness...

3) Locating Search & Rescue Bases, *Kevin Y. K. Ng*, Univ. of Ottawa, Faculty of Admin., 101 Colonel By Dr, Ottawa, Ontario, K1N 6N5, Canada, kevinng@ora.dnd.ca, ***B. U. Nguyen***

According to the 1994 Defence White Paper, the Canadian Forces are to maintain and operate 3 SAR coordination centers. Their function is to respond to thoughsands of distress signals every year. We describe a mathematical approach to locate the SAR bases, taking into account, objectively and subjectively, the incidents coverage, response time, availability of SAR helicopters' maintenance facilities and political considerations.

4) Downsizing Canada's Air Force, *P. Desmier*, Ntl. Canada Defense Hq., Dept. of Ntl. Defense, 101 Colonel By Dr., Ottawa, Ontario, K1A 0K2, Canada, desmier@ora.dnd.ca

TD31 Tutorial: Supply Contracts - Analysis & Mechanism Design

Sponsor: Section on Logistics
Sponsored Session

Chair: Yehuda Bassok, Univ. of WA, Sch. of Bus., Seattle, WA 98105, yehuda@washington.edu

1) Tutorial: Supply Contracts - Analysis & Mechanism Design, *Ravi Anupindi*, Northwestern Univ., KGSM, 2001 Sheridan Rd., Evanston, IL 60208, r-anupindi@nwu.edu, ***Yehuda Bassok***

Proper management of the link between a buyer and a supplier is crucial in achieving superior performance of the entire supply chain. Key issues are cooperation to share the risk associated with the uncertainty in the demand process and the nature of information shared. Several types of supply contracts have been used in practice.

TD32 Public Programs

Contributed Session

Chair: Jordan H. Leiter, US Dept. of Justice, Ntl. Inst. of Justice, 810 7th St. NW, Washington, DC 20531, leiterj@ojp.usdoj.gov

1) Commentary on the OR/WWW Interface, *Moshe Sniedovich*, Univ. of Melbourne, Dept. of Math. & Stats., Parkville Vic, 3052, Australia, moshe@ms.unimelb.edu.au

We examine the WWW from the view point of OR. We describe the facilities that this technology provides for teaching, learning and practicing OR and the resources required. We shall also speculate on how this technology will affect OR in the future.

2) HumanServicesNet: A Web-Based Geographic Information System for Non-Profit Organizations, *Michael P. Johnson*, Carnegie Mellon Univ., Heinz Sch. of PP&M, Pittsburgh, PA 15218-3890, johnson2@andrew.cmu.edu heinz.cmu.edu/heinz/faculty/MiJohnson.html, ***Wilpen L. Gorr, Ramayya Krishnan, Stephen Roehrig, Piysha Singh***

HumanServicesNet is a prototype service delivery system for the non-profit sector that integrates GISs, Internet access and optimization-based decision support. We will review the design of HSNet and highlight its innovations in system architecture, interactive design of service catchment areas and comprehensive service planning via set covering models.

3) A Legal Impact Study on the Sentencing of Drug Offenders in New York City: Estimating Specific Deterrence with Cox Regression, *Jordan H. Leiter*, US Dept. of Justice, Ntl. Inst. of Justice, 810 7th St. NW, Washington, DC 20531, leiterj@ojp.usdoj.gov

A Cox survival model tests the hypothesis that incarceration specifically deters 23000 drug and non-drug offenders convicted in New York City, by estimating the relationship between length of sentence and likelihood of rearrest, controlling for prior record, crime severity, age, ethnicity, gender, casetime, and period. Results question the hypothesis.

TD33 From Chaos to Innovation

Contributed Session

Chair: A. D. Amar, Seton Hall Univ., Sch. of Bus., South Orange, NJ 07079, amaramar@lanmail.shu.edu

1) Managing the Organizational Context in a Loosely Coupled Organization, *Davide Ravasi*, Universita Luigi Bocconi, Inst. di Econ. Aziendale, Viale Isonzo 23, Milano, Italy, davide.ravasi@uni-bocconi.it, ***Gianmario Verona***

Management scholars have suggested the introduction of a certain degree of chaos in the organization, in order to increase the innovative ability. The experience of a Danish hearing-aid producer is analyzed to further our understanding of the process leading from chaos to innovation, through the transformation of the organizational context.

2) Workflow Systems Exhibiting Chaos, *Susan J. Chinn*, PA State Univ., Behrand Coll., Erie, PA 16563, sjc6@psu.edu, ***Charlene G. Riggle, Greg Madey***

The analysis of certain workflow systems reveals conditions under which deterministic chaos may occur. This research identifies the characteristics of systems that can exhibit such tendencies and problems that may cause the analyst to suspect that the system is indeed chaotic.

3) Symbiotic Decision Making: A Model for Contemporary, Innovative Organizations, *A. D. Amar*, Seton Hall Univ., Sch. of Bus., South Orange, NJ 07079, amaramar@lanmail.shu.edu

We present a decision making process suitable to replace 20th century techniques designed around optimization of quantifiable objectives of hierarchical organizations. The symbiotic process suggested is for the emerging, post-industrial work groups where the need to unleash the human mind for enhancing innovation supercedes lucid economic optimization.

TD34 Software Demonstrations

Chair: To be announced

1) Software Demonstration: The AMPL Plus Mathematical Modeling Environment, *Sanjay Saigal*, Compass Modeling Solutions Inc., 1005 Terminal Way, Ste. 100, Reno, NV 89502, info@modeling.com

When released in 1995, AMPL Plus represented a major step up in ease of use over the text-based (command-line) interface of AMPL. The recently released 32-bit version of AMPL Plus allows AMPL users to solve even larger "industrial-strength" models, faster. We present an overview of modeling with AMPL Plus, together with a discussion of its data-interface, project management and application-building capabilities.

2) Software Demonstration: LINDO, LINGO & What's Best! - Flexible Mathematical Modeling Tools for Windows, *Mark Wiley*, LINDO Systems, Inc., 1415 N Dayton St., Chicago, IL 60622

We will demonstrate LINDO Systems family of popular mathematical modeling packages for Windows. This includes LINDO, our linear and integer programming engine; a new release of LINGO, our integrated modeling language with linear/nonlinear solvers; and What's Best!, our large-scale linear/nonlinear spreadsheet solver.

TD35 Network Training & Applications

Cluster: Networks
Invited Session

Chair: Edoardo Amaldi, Cornell Univ., Sch. of OR & Theory Ctr., 237 Rhodes Hall, Ithaca, NY 14853, amaldi@cs.cornell.edu

1) A Large-Scale Optimization Method for Neural Decision Trees, *Kristin Bennett*, RPI, Math. Sci. Dept., Troy, NY 12180, bennek@rpi.edu, ***Donghui Wu, Ayhan Demirez***

Linear programming was used to successfully solve a very large classification problem in banking with over 24,000 points with 7000 attributes. The LP formulation based on computational learning theory produced compact neural decision trees with few attrributes. Sampling techniques were used to make the almost fully dense LPs tractable.

2) An Incremental Nonlinear Primal-Dual Algorithm for Neural Networks Training & Applications to Financial Forecasting, ***Theodore Trafalis***, Univ. of OK, Sch. of IE, 202 W. Boyd, Ste. 124, Norman, OK 73019, trafalis@mailhost.ecn.ou.edu, ***Nicolas P. Couellan***

We develop a new incremental nonlinear primal-dual algorithm for supervised Neural Network training. The technique performs successive primal-dual increments for each decomposition term of the error function. The method is particularly beneficial for online applications and problems that have a large amount of data. We provide preliminary experimental results for financial forecasting.

3) Recognition of Meterological Situations with Neural Networks, ***Frederic Aviolat***, Swiss Fed. Inst. of Tech., Dept. of Math., Lausanne, CH-1015, Switzerland, aviolat@dma.epfl.ch, ***Daniel Cattani***, ***Thierry Cornu***

The Swiss Meteorological Institute aims at automatizing the estimation of the amount of clouds above airports. A neural network model has been developed based on heterogeneous measurements from original instruments, to give a global estimate of cloudiness. A heuristic procedure is then applied to find the heights of the cloud layers and their cloud amounts.

4) Training Support Vector Networks Using a Reflective Newton Method, ***Edoardo Amaldi***, Cornell Univ., Sch. of OR & Theory Ctr., 237 Rhodes Hall, Ithaca, NY 14853, amaldi@cs.cornell.edu, ***Yuying Li***

The actual bottleneck to tackle large classification and regression problems using support vector networks is to solve large-scale and dense quadratic programs subject to bounds on the variables and to a single equality constraint. We descibe an adaption of a recent reflective Newton method and present some experimental results.

TD36 The K Shortest Paths Problem

Cluster: Networks
Invited Session
Chair: Ernesto Q. Martins, Univ. of Coimbra, Dept. of Math., Largo de Dinis Apt. 3008, Coimbra, 3000, Portugal, eqvm@mat.uc.pt

1) An Algorithm for Ranking Loopless Paths, ***Marta Margarida Pascoal***, Univ. of Coimbra, Dept. of Math., Largo de D. Dinis-Apart. 3008, Coimbra, 3000, Portugal, marta@mat.uc.pt, ***Jose Luis E. Santos***, ***Ernesto Q. Martins***

A new algorithm is proposed for ranking paths as so as its adaption for loopless paths. Comparative computational experiments are also presented. This allows the ranking of more than half a million of loopless paths in 10000 nodes, 100000 arcs euclidean networks in less than half second.

2) Simulation of Network Performance Based Connection Admission Control, ***M'hamed Nour***, Montreal Univ., DIRO, CP 6128 Succ. Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, nour@iro.unmontreal.ca, ***Ernesto Q. Martins***, ***J. William Atwood***, ***Michel Gendreau***, ***Marta Margarida Pascoal***, ***Jose Luis E. Santos***

ATM provides various classes and requires Connection Admission Control procedures for deciding whether a new request from a user can be accepted. The Objective of this presentation is to show how k-shortest path algorithms may be used in the context of ATM Networks to provide decisions for Connection Admission Control.

3) A k-Shortest Path Column Generator for the Pairing Problem, ***Curt A. Hjorring***, Carmen Systems, Odinsgatan 9, Gothenburg, S-41103, Sweden, curt.hjorring.@carmen.se

The rules that define pairings are complex and were previously hard coded into column generators. A more general solution is a rule system that returns a simple yes/no for a partial/complete pairing. We present results from a rule system-based column generator that uses a k-shortest path algorithm.

4) Ranking Paths in the Multiobjective Shortest Path Problem, ***Marta Margarida Pascoal***, Univ. of Coimbra, Dept. of Math., Largo de D. Dinis-Apart. 3008, Coimbra, 3000, Portugal, marta@mat.uc.pt

A new algorithm is proposed for the biobjective shortest path problem, which is based on the ranking of shortest paths. The inportance of the ojective function in the ranking problem is shown and comparative computational experiments are presented.

TD37 Automatic Graph Drawing

Sponsor: CSTS
Sponsored Session
Chair: Petra Mutzel, Max-Planck-Institut f Informatik, Im Stadtwald, Saarbrucken, 66123, Germany, mutzel@mpi-sb.mpg.de

1) Three-Dimensional Orthogonal Drawings, ***Therese C. Biedl***, McGill Univ., 3480 University Ave., Montreal, Quebec, H3A 2A7, Canada, therese@cgm.cs.mcgill.ca, ***Tom Shermer***, ***Susan Whitesides***, ***Stephen Wismath***

We discuss orthogonal drawings in 3 dimensions for graphs with arbitrarily high degree. In the so-called "unrestricted model," we prove matching upper and lower bounds. Then we present other algorithms that deal with constraints on the size and the relative positions of nodes.

2) Crossing-Minimization for Multi-Layer Graphs, ***Thomas Odenthal***, Columbia Univ., Dept. of IE/OR, SW Mudd Bldg., 500 W 120th St., New York, NY 10027-6699, to37@columbia.edu, ***Michael Junger***, ***Eva K. Lee***, ***Petra Mutzel***

The multi-layer crossing number problem is to find the minimum number of edge-crossings in a multi-layer graph. First, we present an integer programming formulation of the problem. Polyhedral theory is then conducted on the polytope associated with our formulation for the 2-layer crossing number problem and several classes of facets are derived. We present first computational results.

3) Restricted Crossing Minimization for General Graphs, ***Petra Mutzel***, Max-Planck-Institut f Informatik, Im Stadtwald, Saarbrucken, 66123, Germany, mutzel@mpi-sb.mpg.de, ***Thomas Ziegler***

The planarization method has been suggested in order to get almost "crossing-minimal" drawings for general graphs. In a first step, a maximum planar subgraph H is determined, and in a second step, the removed edges are inserted in a fixed embedding of H such that the number of crossings is minimized. We report on our first approach to attach the restricted crossing minimization problem via integer programming techniques.

TD38 ATM Networks

Sponsor: TST
Sponsored Session
Chair: Hussein T. Mouftah, Queen's Univ., Dept. of Elect. & Comp. Eng., Kingston, Ontario, K7L 3N6, Canada, mouftah@eleceng.ee.queensu.ca

1) Design Considerations for Link-State Routing Protocols for Connection-Oriented Networks, ***M. Sivabalan***, Queen's Univ., Dept. of Elec & Comp. Eng., Kingston, Ontario, K7L 3N6, Canada, siva@eleceng.ee.queensu.ca, ***Hussein T. Mouftah***

Various alternatives of link-stage update mechanisms and routing algorithms leading to different scenarios for routing protocol are investigated using call-by-call simulations. The main objective is to reduce the call blocking ratio without significantly increasing routing related overhead. Furthermore, a new "learning" scheme that can be used in conjunction with link-state protocols is presented.

2) Fast Bandwidth Reservation Algorithm for Broadband Wireless Networks, ***Osama Kubbar***, Queen's Univ., Dept. of Elect. & Comp. Eng., Kingston, Ontario, K7L 3N6, Canada, osama@eleceng.ee.queensu.ca, ***Hussein T. Mouftah***

A medium access control (MAC) protocol for broadband and wireless networks is described. The proposed MAC protocol is designed to reduce the effect of the channel access delay and improve the radio channel throughput. It is based on a fast bandwidth reservation algorithm that provided to be very efficient.

3) Mobility-Based Call Admission for Wireless Networks, ***Eman Fituri***, Queen's Univ., Dept. of Elect. & Comp. Eng., Kingston, Ontario, K7L 3N6, Canada, eman@eleceng.ee.queensu.ca, ***Hussein T. Mouftah***

An adaptive call admission control mechanism for wireless ATM networks is proposed. The approach is based on the theory of optimal estimation where both, source parameter declaration and measurement of the state of network resources are considered in the call admission process. The state of the network is defined in terms of mobility related parameters, and traffic related parameters.

4) Maximal Profit Dimensioning and Tariffing in a Retrial Network, ***Glen Takahara***, Queen's Univ., Dept. of Math. & Stats., Jeffrey Hall, Kingston, Ontario, K7L 3N6, Canada, takahara@glen.mast.queensu.ca

An optimization problem is formulated with objective function the expected profit of a network, manimizing over route tariffing and link dimensioning. The

problem is solved through a reformulation involving blocking probabilities as free variabled. It is shown that the reformulation is able to deal with caller retrials incorporated into the dynamics of the system.

Tuesday 17:00-18:30

TE01 Dynamic Traffic Assignment II: Operational Issues

Sponsor: TSS & IFORS
Sponsored Session
Chair: Athanasios Ziliaskopoulos, Northwestern Univ., Civil Eng., 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, a-z@nwu.edu

1) Experimental Analysis of an On-Line Consistency Model for Traffic Networks with ATIS/ATMS, ***Srinivas Peeta***, Purdue Univ., Sch. of Civil Eng., W. Lafayette, IN 47907, peeta@ecn.purdue.edu

Key on-line concerns for the deployment of a DTA system are computational efficiency and network state consistency over time. Motivated by these operational issues for networks with ATIM/ATMS, we propose a mathematical programming technique that seeks to minimize the error between actual (field measurements) and predicted network states on a real time basis, and respond to on-line disturbances. Experimental results using a rolling orizon framework are discussed.

2) A System Consistency Maintenance Framework for the Real-Time Operation of Dynamic Traffic Systems, ***Ying Kang***, Univ. of TX, Dept. of Civil Eng., ECJ 6.2, Austin, TX 78712, yingkang@mail.utexas.edu, ***Hani S. Mahmassani***, ***Yaser Hawas***, ***Athanasios Ziliaskopoulos***

The proposed framework consists of a core diagnostic algorithm and a set of updating algorithms intended to keep a real-time dynamic traffic assignment system consistent with actual measurements relayed from sensors. Numerical results are presented.

3) A Distributed Common Object Request Brokerage Architecture Framework for a Large-Scale Real-Time Dynamic Traffic Assignment Model, ***Steven T. Waller***, Northwestern Univ., Dept. of ISE, 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, travis@trans.civil.nwu.edu, ***Athanasios Ziliaskopoulos***

We introduce a framework for implementing a Common Object Request Brokerage Architecture (CORBA) distributed real-time dynamic traffic assignment system. It includes various modules to read real-world data, estimate OD demand, predict paths, simulate traffic and interact with the user. Many of these modules can run independently of each other for certain operations,...

TE02 Dynamic Models in Logistics

Sponsor: TSS
Sponsored Session
Chair: Warren B. Powell, Princeton Univ., Program in Stats & OR, CASTLE Lab., Princeton, NJ 08544, powell@princeton.edu

1) Dynamic Locomotive Scheduling, ***Warren B. Powell***, Princeton Univ., Program in Stats & OR, CASTLE Lab., Princeton, NJ 08544, powell@princeton.edu, ***Arun G. Marar***, ***Ajith B. Wijeratne***

We present a dynamic programming approximation for dynamic management of locomotives. Our method is able to handle a variety of complex operating strategies and the characteristics of major locomotive types. The method explicitly handles uncertainities in forecasted toonages, and can optimize over extended horizons with fast response times.

2) Design & Implementation of Intermodal Optimum Path Algorithm for Multimodal Networks w/Time-Dependent Arc Travel Times, Switching Dela, ***Athanasios Ziliaskopoulos***, Northwestern Univ., Civil Eng., 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, a-z@nwu.edu, ***Whitney Wardell***

We present a time-dependent intermodal optimum path algorithm for multimodal transportation networks that accounts for delays at mode and arc switching points. The correctness and computational complexity of the algorithm are proved. A simple representation of the mode-to-mode switching options is introduced that results in a substantially improved design...

3) A Variable Aggregation Model for Dynamic Fleet Management, ***Warren B. Powell***, Princeton Univ., Program in Stats & OR, CASTLE Lab., Princeton, NJ 08544, powell@princeton.edu, ***Gregory A. Godfrey***, ***Arun G. Marar***

The dynamic management of resources often requires a high level of detail for decisions being made now, and lower levels of detail as we make plans in the future. We present a variable aggregation method for resource allocation problems, and show how it can be used to assign individual drivers now, and manage capacity in the future.

4) Dynamic Service Network Design, ***Warren B. Powell***, Princeton Univ., Program in Stats & OR, CASTLE Lab., Princeton, NJ 08544, powell@princeton.edu, ***Hugo P. Simao***, ***Katerina Papadaki***, ***Raymond K. Cheung***, ***Teodor Gabriel Crainic***

We show how a new dynamic programming approximation can be used to solve large-scale service network design problems that arise in less-than-truckload and rail operations. The technique handles forecasting uncertainities, and a variety of other complex operational issues.

TE03 Models for Network & Terminal Planning

Sponsor: RASIG
Sponsored Session
Chair: Michael Beeby, Canadian National Railway, 935 de LaGauchetiere Ouest, Montréal, Québec, H3B 2M9, Canada, beeby@cn.ca

1) Strategic & Tactical Simulation Models for Network Planning, ***Kerim Tumay***, CACI Products Co., 3333 N Torrey Pines Ct., La Jolla, CA 92037, kerim@cacisl.com, ***William Mauer***

We describe a network simulation library specifically developed for modeling railroad operations. The purpose of the modeling tool is to evaluate the impact of strategic and tactical network planning decisions on key performance measures such as delay and utilization. The library objects representing trains, yards, tracks, crews and locomotives minimize the time it takes to model a reailroad network...

2) Route Capacity Model, ***Harald Krueger***

We offer a summary of a practitioners review of capacity and service reliability on a 750 mile corridor, including effects of changing priority, P/W ratios, plant enhancement, track maintenance, line stoppages, through historic review, and desecrate event simulation. RCM is used to analyze the traffic capacity of rail line segments...

3) Line Capacity Model, ***Harald Krueger***

We present a parametric approach to identifying line capacity by focusing on key plant, traffic and operating factors that drive train delay.

4) Yard Capacity Model, ***Harald Krueger***

Assessment of yard capacity with respect to traffic volumes, in and out bound process and throughput and an assessment of the significance of each.

TE04 Manufacturing II

Contributed Session
Chair: David W. Glenn, Univ. of MI, 1205 Beal Ave., Ann Arbor, MI 48109-2117, dwglenn@umich.edu

1) withdrawn - author request of 2/24, ***Alex Orman***, Southampton Univ., Math. Dept., Southampton Hants, SO17 1BJ, UK, ajo@soton.ac.uk

2) Integrating Modeling Techniques to Support the Development & Analysis of Manufacturing Control Systems, ***Robert W. Brennan***, Univ. of Calgary, Div. of Mfg. Eng., 2500 University Dr. NW, Calgary, Alberta, T2N 1N4, Canada, brennan@enme.ucalgary.ca enme.ucalgary.ca, ***Behzad Foroughi***

We are concerned with the use of appropriate modeling techniques to support the development and analysis of manufacturing control systems. Investigations into using fuzzy logic to integrate sensitivity information obtained from perturbation analysis will be discussed. The approach is evaluated using a discrete-event simulation testbed developed for this study.

3) Optimal Control of a Manufacturing System with Random Product Yield, ***Izak Duenyas***, Univ. of MI, Dept. of IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, duenyas@umich.edu, ***Chi-Yang Tsai***

We consider a manufacturing system which produces multiple product types with random yield. We formulate this problem with 2 types of products as a Markov decision process and characterize the structure of the optimal policy. We also propose an effective heuristic.

4) Optimal Stamping Die Rework During Tryout, ***David W. Glenn***, Univ. of MI, 1205 Beal Ave., Ann Arbor, MI 48109-2117, dwglenn@umich.edu, ***Stephen M. Pollock***

Prior to their acceptance (buy-off), dies for stamping sheet metal panels are reworked based on panel dimensions. This iterative and costly trial and error process is currently used to achieve dimensional conformance. We present a sequential decision model based on assembled (rather than component) part

dimension, to minimize total buy-off cost. Appreciable savings can be realized, particularly when panels are non-rigid.

TE05 Stochastic Inventory Models

Sponsor: MSOM
Sponsored Session
Chair: Yigal Gerchak, Univ. of Waterloo, Dept. of MS, 200 University Ave. W, Waterloo, Ontario, N2L 3G1, Canada, ygerchak@mansci.watstar.uwaterloo.ca

1) Incorporating the Information of Retailer's Inventory Position in Supplier's Production Policy in Continuous Review Distribution System, ***Kamran Moinzadeh***, Univ. of WA, Sch. of Bus., Seattle, WA 98105, kamran@u.washington.edu, ***Yehuda Bassok***

We study the role of information utilization in managing the variation observed by supplier due to retailer's random ordering patterns in continuous review distribution systems. Assuming retailer's demand is random, we propose a policy for the supplier. We compare the effectiveness of our policy to the traditional one via a numerical experiment.

2) Demand Forecast Updating: An Exercise in Futility?, ***Kyle D. Cattani***, Univ. of NC, Sch. of Bus., Chapel Hill, NC 27599-3490, kyle_cattani@unc.edu, ***Warren H. Hausman***

We study demand forecasts that do not consistently become more accurate as they are updated. We present multiple examples demonstrating this counter-intuitive phenomenon and some theoretical results to explain its occurrence. Potential causes include demand randomness, inappropriate forecasting models and demand information distortion.

3) Dynamic Lot Sizing with Returning Items & Disposals, ***Dmitri Krass***, Univ. of Toronto, Fac. of Mgmt., 105 St. George St, Toronto, Ontario, M5S 1A1, Canada, krass@fmgmt.mgmt.utoronto.ca, ***Jose Beltran***

We analyze a DLS model where some of the previously sold items are returned to the point of sale and re-enter the inventory stream. Such problems tend to arise frequently in retail of style goods and in other retailing situations. By analyzing the structure of optimal policies, several useful properties are derived, leading to an efficient DP algorithm.

4) Allocation of Uncertainty-Reduction Effort to Miniminize Total Variability, ***Yigal Gerchak***, Univ. of Waterloo, Dept. of MS, 200 University Ave. W, Waterloo, Ontario, N2L 3G1, Canada, ygerchak@mansci.watstar.uwaterloo.ca

A manufacturing process consists of a series of activities with uncertain durations. The uncertainty of the duration of individual activities can be reduced at cost. We wish to minimize the variability of the sum of these durations. Using mean-preserving transformations, we derive the optimal allocation of investment.

TE06 Project Management

Contributed Session
Chair: Graham K. Rand, Lancaster Univ., Dept. of MS, The Mgmt. School, Lancaster, LA1 4YX, UK, g.rand@lancaster.ac.uk

1) Project Scheduling with Discrete & Continuous Resources, ***Jan Weglarz***, Poznan Univ. of Tech., ul.Piotrowo 3a, Poznan, 60-965, Poland, weglarz@put.poznan.pl, ***Joanna Jozefowska***

We consider project scheduling problems in which activities simultaneously require (constrained) discreted and continuous, i.e. continuously divisible resources. Activity models are given as functions: processing speed vs. resource amount. Exact and heuristic procedures for minimization of project duration are presented.

2) High-Intensity Heuristics for Resource-Constrained Multiple Dependent Project Scheduling, ***Tamminh Tran Kapuscinska***, Carnegie Mellon Univ., Schenley Park, Pittsburgh, PA 15213, tran+@cmu.edu /gsia.cmu.edu/andrew/ttran/home.html, ***Thomas E. Morton***, ***Prasad Ramnath***

A study of extended dispatch methods (X-Dispatch) for resource-constrained multiple dependent projects with the objective of minimizing the sum of weighed tardiness. X-Dispatch are versions of dispatch heuristics with modifications that allow for inserted idleness. They have the potential of greatly enhancing the performance of dispatch methods at moderate extra cost.

3) Resource Planning & Coordination in Multi-Project Programs, ***Richard F. Deckro***, AFIT, AFIT/ENS, 2950 P St., WPAFB, OH 45433, rdeckro@afit.af.mil, ***Michael L. Fredley***, ***Victor D. Wiley***

The allocation of resources within a program to projects is a key consideration. Project managers must perform their tasks within budgets and resource allocations they establish with the program manager. We look at a mathematical programming-based approach to coordinate resources among program projects to improve overall program performance.

4) Critical Chain: The Theory of Constraints Applied to Project Management, ***Graham K. Rand***, Lancaster Univ., Dept. of MS, The Mgmt. School, Lancaster, LA1 4YX, UK, g.rand@lancaster.ac.uk

In his recently published third novel, Critical Chain, Eli Goldratt applied his Theory of Constraints to Project Management. This paper will explore the relationshiop between the ideas developed in the novel and the CPM/PERT approach.

TE07 Information Systems Management Issues

Contributed Session
Chair: Charlene G. Riggle, Univ. of Tampa, 401 W Kennedy Blvd., Box 142F, Tampa, FL 33606, rigglec@sprynet.com

1) A Framework for Information Systems Quality Management, ***Antonis C. Stylianou***, Univ. of NC, Dept. of IOM, Charlotte, NC 28223, astylian@uncc.edu http://www.uncc.edu/~astylian

Recent articles point out that the issue of systems quality, is ranked very highly by IS executives. Other evidence, however, suggests that a large number of IS managers does not understand or apply the principles of quality management. The objective of our paper is to investigate, integrate, and present quality...

2) Implications of Some of the Recent Improvement Philosophies for the Management of the Information Systems Organization, ***Adel M. Aladwani***, Kuwait Univ., PO Box 34927, Edailiyah, 73251, Kuwait, adwani@kuc01.kuniv.edu.kw

In an uncertain and competitive environment, organizations are forced to search for philosophies to guide performance improvement efforts. Considerable attention has been paid by the current literature to 2 particular philosphies: BPR and TQM. These movements emphasize a reconfiguration of an organization's processes to increase performance which ultimately should facilitate the recuperation of the competitive posture of the organization...

3) The Development of the Extended Burnout Index for Information Systems Professionals, ***Vikram Sethi***, Southwest MO State Univ., 368 Glass Hall, COBA, Springfield, MO 65804, mikran@world.std.com, ***Vijay Sethi***, ***David Meinert***

Burnout among IS professionals has been examined to a limited extent in the IS literature. However, practical evidence suggests that burnout is one of the key problems among IS professionals. We examine several dimensions of burnout. In addition, we review some of the most common measurement instruments available for use in organizations and IS groups.

4) Developing A Web Site in a Small Organization, ***Charlene G. Riggle***, Univ. of Tampa, 401 W Kennedy Blvd., Box 142F, Tampa, FL 33606, rigglec@sprynet.com

Developers of Web sites at small organizations encounter problems whose degree is unique to the environment, such as a scarcity of resources, developers who must multi-task with other obligations, and conflicting goals. This research examines one such case, and details solutions that may be beneficial to other small organizations.

TE08 University Programs in Technological Entrepreneurship & Commercialization: US, Canadian & Mexican Showcases

Sponsor: Technology Management Section
Sponsored Session
Chair: Sarfraz A. Mian, SUNY, Sch. of Bus., Oswego, NY 13126, mian@oswego.edu

1) Technology Commercialization Degree Program at the University of Texas-Austin: US, Canadian & Mexican Showcases, ***David L. Gibson***, Univ. of TX, iC2 Inst., 2815 San Gabriel, Austin, TX 78705, davidg@icc.utexas.edu

The IC2 Institute at UT-Austin has been offering an innovative one-year master's degree program in technology commercialization since 1995. This paper will highlight the salient features of this program such as the use of teams, its global dimention, and the distance learning aspects. The author will draw conclusions from the experiential learning provided by this pioneering program in the nations.

2) Canadian Programs in Hi-Tech Entrepreneurship & Spinoffs: Review of Univ. of Ottawa's & Canadian Ntl. Research Council Emerging Programs, ***Jerome Doutriaux***, Univ. of Ottawa,

Faculty of Admin., PO Box 450, Ottawa, Ontario, K1N 6N5, Canada, doutriaux@admin.uottawa.ca

This paper will focus on 2 Canadian cases - one, University of Ottawa's effort to establish a high-technology entrepreneurship program in the engineering managment area; two, the National Research Council's (NRC) recently launched technology spin-off program which is quite unique in the nation. The author will discuss the challenges faced by these two emerging examples of teaching technological entrepreneurship in Canada.

3) Technological Entrepreneurship Training in Mexico: An Overview of the Selected University, ***Leonel Corona***, Sch. of Economics, Economics of Tech., University City, 04510, Mexico, leonel@servidor.dgsca.unam.mx

Programs Based on the author's research on developing innovative spin-off companies from Mexican universities and research institutes, this presentation will highlight the entrepreneurial training dimention. The technologically oriented entrepreneurship training programs at the nation's premier institutions of higher education such as UNAM and ITESM will be discussed in the light of their emerging nature and international collaborations.

4) New Trends in Technological Entrepreneurship Training: A Survey of the Innovative University Programs in the US, ***Sarfraz A. Mian***, SUNY, Sch. of Bus., Oswego, NY 13126, mian@oswego.edu

A recent national survey of several innovative university technology commercialization mechanisms reveals some new trends in entrepreneurial training and education in the U.S. Based on the authors research, this presentation will describe some of the salient features of the selected university programs in technological entrepreneurship training. The paper concludes with recommendations on establishing new university programs in this emerging field of instruction in business as well as engineering disciplines.

TE09 Profiting from the Natural Environment: Perspectives on Technology

Sponsor: Technology Management Section
Sponsored Session
Chair: Frances Westley, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, westley@management.mcgill.ca

1) Proactive Environmental Responsiveness Strategies & the Development of Competitively Valuable Organizational Capabilities, ***Sanjay Sharma***, St. Mary's Univ., Fac. of Commerce, 923 Robie St., Halifax, Nova Scotia, B3H 3C3, Canada, sanja.sharma@stmarys.ca, ***Harrie Vredenburg***

Using case comparisons, we grounded the resource-based view of the firm within the domain of environmental responsiveness, and then tested observed relationships through a mail survey. Proactive responsiveness to uncertainties inherent at the interface between business and ecological issues was associated with unique organizational capabilities which also affect firm competitiveness.

2) Constructing the Whale: Technologies of Surveillance in Marine Eco-Tourism, ***Nelson Phillips***, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke W, Montreal, Quebec, H3A 1G5, Canada, phillips@management.mcgill.ca, ***Thomas Lawrence***

We explore the relationship between the technologies of surveillance used in whale-watching and the social construction of the whale. Using actor-network theory, we argue that this dynamic is central to the organization and commercialization of whale watching as an eco-tourism product.

3) Technology & Resilience: A Historical Look at Wet-Rice Agriculture in Indonesia, ***Ann Kinzig***, Princeton Univ., Environ. Inst. Dept. of Ecol., Guyot Hall, Rm. 25, Princeton, NJ 08544-1003

Traditional wet-rice farming (sawah) required considerable social and technological coordination from the family field to the watershed containing many communities. I describe two revolutions in sawah: "colonial," primarily economic and social, and "modern" (Green Revolution), primarily technological, and their consequences for rice systems' scales and local and regional ecological dynamics.

4) The Human, Social & Environmental Costs of Oil Extraction: The Columbian Case, ***Titus Moser***, Univ. of Cambridge, Judge Inst. of MS, Trumpington St., Cambridge, CB2 1AL, UK, tjm20@hermes.cam.ac.uk, ***Frances Westley***

Based on field work, interviews and questionnaires administered to oil companies operating in Columbia, this study compares the strategies of multinationals, international and local companies for oil extraction, the impact of their extraction technologies on human, social and environmental costs, and their impact on the sustainability of these operations.

TE10 Production Scheduling in the Supply Chain Environments

Cluster: Scheduling
Invited Session
Chair: David Wu, Lehigh Univ., Dept. of IMSE, Mfg. Logistics Inst., Bethlehem, PA 18015, sdw1@lehigh.edu

1) Optimizing the Design of a Plant-Level Supply Chain in the Semiconductor Industry, ***Karen L. Donohue***, Univ. of PA, The Wharton Sch., OPIM, 1300 SH-DH, Philadelphia, PA 19104-6366, donohue@opim.wharton.upenn.edu, ***Chun-Hung Chen***

We introduce a solution methodology for optimizing the design of a semiconductor fabrication facility that combines the flexibility of simulation with the efficiency of dynamic programming. The routine captures the full impact of reentrant material flows, resource-dependent yield loss, and a hybrid of process environments. We share results from a recent industry study.

2) Generalized Models & Algorithms for Capacitated Lot Sizing, ***Charles R Sox***, Auburn University, Department of ISE, 207 Dunstan Hall, Auburn, AL 36849, crsox@eng.auburn.edu, ***Yubo Gao***

We present general models for capacitated lot sizing problems that unify previous research and provide the basis for more general algorithms. Both efficient MILP formulations and heuristics are described. These models and algorithms offer a foundation for capacitated lot sizing that can be extended to multi-echelon, supply chain planning.

3) Modeling Demand Behaviors in Manufacturing Supply Chains, ***Mary J. Meixell***, Lehigh Univ., Mfg. Logistics Inst., 200 W. Packer Ave., Bethlehem, PA 18015, mjm2@lehigh.edu, ***David Wu***

We propose a multi-level, multi period production model that captures the tier-to-tier MRP logic of automotive and electronic manufacturing supply chains. The model makes use of information such as product supply structures, production capacity and manufacturing lead-times. We demonstrate the use of this model for demand analysis in manufacturing supply chains.

4) A Multicommodity Planning Model for Inter-Supply Chain Integration, ***David Wu***, Lehigh Univ., Dept. of IMSE, Mfg. Logistics Inst., Bethlehem, PA 18015, sdw1@lehigh.edu, ***Hakan Golbasi***

We develop a multicommodity flow production model for manufacturing facilities where a diverse set of products from different supply channels is produced. Each commodity captures a product-specific subproblem while the network captures the multi-facility manufacturing structures. We present an efficient Lagrangian Decomposition solution algorithm and results from intensive computational testing.

TE11 Quality Management

Cluster: Quality & Services Management
Invited Session
Chair: Mohan Gopalakrishnan, Concordia Univ., Dept. of DS/MIS, 1455 de Maisonneuve Blvd. W, Montreal, Quebec, H3G 1M8, Canada, mogopal@vax2.concordia.ca

1) Integration of Statistical Tools for Process Control & Improvement, ***Michael Adams***, Univ. of Alabama, Mngmt. Science & Stats Dept., ***Chad Bray***, ***David M. Miller***

Bridging the gap between statistical methodology and statistical systems is an area of concern for statisticians both in industry and academia. We focus on the systematic use of statistical methods such as the design of experiments, regression, time series, control charts and capability ratios in quality management and improvement environments...

2) POST ISO 9000 & the Canada Award for Excellence: Case Study Results, ***Kevin Laframboise***, Concordia Univ., Dept. of DS & MIS, 1455 de Maisonneuve Blvd. W, Montreal, Quebec, H3G 1M8, Canada, lafrak@vax2.concordia.ca, ***Mohan Gopalakrishnan***

We report the direct and indirect movement of some firms toward the status of excellence following initial quality initiatives that include ISO 9000 specifically. The criteria that serve to award the Canada Awards of Excellence are used to help determine the state of business excellence.

3) The Quality Paradox, ***Michael D. Johnson***, Univ. of MI, Bus. Sch., Ann Arbor, MI 48109-1234, ***John E. Ettlie***

The "quality revolution" continues in North America, seemingly by fits and starts, perhaps because of a paradox in quality theory: the latent conflict between meeting internal specifications and satisfying customer needs. We argue and demonstrate empirically that the technology life-cycle exerts powerful influences on the relationship between conformance and customer quality.

TE12 Health Applications

Cluster: Health Applications
Invited Session
Chair: Luce Brotcorne, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada

1) An Application of Decision Analysis to the Choice of a Prophylactic Antibiotic Regimen for Clean Surgical Procedures, ***Amy R. Wilson***, Univ. of CA, 4175 Etcheverry Hall, Berkeley, CA 94709, amy@ieor.berkeley.edu, ***Robert M. Oliver***

We propose a decision model to choose the best prophylactic antibiotic regimen for surgical patients. The decision should be based on hospital-and patient-related risk factors. The model describes the escalation from inoculation and/or colonization with an organism to infection. Outcomes of interest include patient outcome, cost, and antibiotic spectrum.

2) Using Mathematical Programming to Minimize the Overall Costs of Immunization Programs, ***Edward C. Sewell***, Southern IL Univ., Dept. of Math. & Stats., Edwardsville, IL 62026-1653, esewell@siu.edu, ***Sheldon H. Jacobson***, ***Bruce G. Weniger***, ***Robert Deuson***, ***Robert T. Chen***

To reduce the total number of shots that a child must receive and the overall cost of the vaccines, pharmaceutical companies are combined several vaccines in a single shot. Since different companies offer different combinations, purchasing decisions have increased in complexity. We present a pilot mathematical program to optimize purchasing decisions.

3) Blood Inventory Management, ***Erhan Kozan***, Queensland Univ. of Tech., Sch. of Math. Sci., GPO Box 2434, Brisbane Qld, 4001, Australia, e.kozan@fsc.qut.edu.au

The present study attempts to formulate a more comprehensive analytical framework for examining the relative merits of alternative blood bank policies. The model that has been developed as an integer linear program to find the optimal despatching plan, while minimising the number of outdated units and satisfying no shortage policies.

4) Fast Heuristics for the Screening of Cytological Samples, ***Luce Brotcorne***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, ***Gilbert Laporte***, ***Frederick Semet***

In the screening of cytological samples, a slide is examined using a microscope. Since the area of the specimen is very large compared with the area of a microscope field of view (FOV), a large number of FOVs is needed to cover the entire specimen area. Heuristics reducing the number of FOVs have been developed to aid in screening these specimens on an automated microscopy workstation.

TE13 Integer Programming, Modeling & Applications

Cluster: Discrete Optimization
Invited Session
Chair: Monique Guignard-Spielberg, Univ. of PA, Dept. of OPIM, The Wharton Sch., Philadelphia, PA 19104-6366, guignard@wharton.upenn.edu

1) A Lagrangean Relaxation & Constraint Generation Approach for 2-Stage Capacitated Facility Location Problems, ***Andreas Klose***, Univ. of St. Gallen, Inst. for OR, Bodanstrasse 6, St. Gallen, CH-9000, Switzerland, andreas.klose@ifu.unisg.ch, ***Paul Staehly***

To solve 2-stage capacitated facility location problems, a Lagrangean heuristic, based on relaxing capacity constraints, is proposed. The Lagrangean dual is solved using "weighted" Dantzig-Wolfe decomposition, feasible solutions are obtained from reassignment procedures, and valid inequalities are added to improve the lower bound. Computational results are presented.

2) Exact & Tabu Search Approaches for Solving 0-1 Min-Max Problems, ***Arnaud Freville***, Univ. de Valenciennes, LIMAV, Le Mont Houy, BP 311, Valenciennes Cedex, 59236, France, arnaud.freville@univ-valenciennes.fr, ***Faiza Amrani***

We consider a special case of 0-1 integer programming problems where one h as to minimize the maximum of several linear functions (one wants to equilibrate many objectives). We present a Branch and Bound/tabu search approach specialized for this type of objective. Computational experiments indicate that these approaches are quite promising.

3) Integer Programming Using Simulation & Ordinal Optimization & Its Application to a Jobshop Scheduling Problem, ***Chun-Hung Chen***, Univ. of PA, Dept. of Systems Eng., Philadelphia, PA 19104-6315, chchen@seas.upenn.edu, ***Monique Guignard-Spielberg***, ***Yuh-Chyun Luo***

Combining ordinal optimization and simulation can produce a very effective tool for solving general combinatorial optimization problems. We apply the approach to a jobshop scheduling problem for chemical industries. The method can determine good schedules with high confidence probabilities in a small fraction of the time required by conventional methods.

TE14 Global Optimization II

Contributed Session
Chair: Alexander Strekalovsky, Irkutsk State Univ., Math. Dept., K Marx str. 1, Irkutsk, 664003, Russia, strekal@math.isu.runnet.ru

1) DC Programming: Theory & Algorithms, ***Alexander Strekalovsky***, Irkutsk State Univ., Math. Dept., K Marx str. 1, Irkutsk, 664003, Russia, strekal@math.isu.runnet.ru, ***Ider Tsevendorj***

The paper is partially devoted to Global Optimality Conditions for the nonconvex optimization problems, where the objective function or some constraints are given by the functions, that can be presented as a difference of two convex functions (d.c. functions). A variant of global search method based on the theory has...

2) A Global Optimization Method for Integer Programming, ***Ider Tsevendorj***, Irkutsk State Univ., Math. Dept., K. Marx str 1, Irkutsk, 664003, Russia, ider@math.isu.runnet.ru, ***Alexander Strekalovsky***, ***Antonina Kuznetsova***

We consider the knapsack problem with several constraints which can be converted into a reverse convex contiuous problem. Using the necessary and sufficient global optimality conditions a global search method has been developed. The latter algorithm was tested for the problems up to hign dimensions.

TE15 Advances in Nonlinear Programming

Cluster: Nonlinear Programming
Invited Session
Chair: Paul Tseng, Univ. of WA, Dept. of Math., Box 354350, Seattle, WA 98195, tseng@math.washington.edu

1) Incremental Gradient & Subgradient Methods, ***Dimitri P. Bertsekas***, MIT, Dept. of Elect. Eng. & CS, Cambridge, MA 02139, dimitrib@mit.edu

We consider a new class of subgradient methods for minimizing a convex function that consists of the sum of a large number of component functions. The subgradient iteration is performed incrementally, by sequentially taking steps along the subgradients of the component functions.

2) Recent Progress in Solving Large Bound-Constrained Problems, ***Jorge J. More***, Argonne Ntl. Lab., Math. & Comp. Sci. Div., 9700 S Cass Ave., Argonne, IL 60439, more@mcs.anl.gov, ***Chih-Jen Lin***

We review and compare algorithms for the solution of large-scale (at least 10,000 variables) problems. We emphasize algorithms with strong convergence properties, and subproblems that can be solved with fixed memory requirements and a finite (but small) number of iterations. Numerical experiments will be used to illustrate important issues.

3) Primal-Dual Methods for Nonlinear Programming, ***Margaret Wright***, Bell Labs., 600 Mountain Ave., Rm. 2C-462, Murray Hill, NJ 07974, mhw@bell-labs.com

Primal-dual methods for constrained optimization have recently been the object of substantial attention. Although these methods have a common motivation, they differ substantially in its interpretation, formulation, and implementation. We will discuss and compare the major approaches taken in primal-dual methods for nonlinear programming, especially for the nonconvex case.

TE16 Large-Scale Nonlinear Optimization

Cluster: Linear Programming
Invited Session
Chair: Robert J. Vanderbei, Princeton Univ., Civ. Eng. & OR, Princeton, NJ 08544, rvdb@princeton.edu

1) Modified Barrier Methods for Nonlinear Programming Revisited, ***David F. Shanno***, Rutgers Univ., RUTCOR, PO Box 5062, New Brunswick, NJ 08903-5062, shanno@tucker.rutgers.edu

The talk is concerned with very large scale nonlinear programming,k where it is assumed only first order information is available. The methods studied will be a variety of modified barrier and penalty-barrier methods. Topics considered will include choice of penalty-barrier function, estimation of Lagrange multipliers, and handling of simple bounds. Numerical experience will be documented.

2) Interior Point Algorithms & Software for Nonlinear Optimization, ***Jorge Nocedal***, Northwestern Univ., ECE Dept., Evanston, IL 60208

A new interior point algorithm for solving general nonlinear problems is presented. Rather than trying to mimic interior point methods for linear programming, we have taken the approach of including in an SQP approach the key features of primal-dual iterations. The robustness an efficienty of the new algorithm is tested on a set of large-scale problems from the CUTE collection. The software package (NITRO) implementing this algorithm will also be described in some detail.

3) Solving Nonlinear Programming Problems Using AMPL/ LOQO, ***Robert J. Vanderbei***, Princeton Univ., Civ. Eng. & OR, Princeton, NJ 08544, rvdb@princeton.edu

Recently the AMPL modeling language was enhanced so that it provides solvers with sparse Hessians in addition to values and gradients. This enhancement has made it possible to use interior-point methods, such as implemented in LOQO, in conjunction with AMPL. We shall describe the AMPL/LOQO solver and give computational results on a number of large real-world nonlinear programming problems. Comparisons against state-of-the-art solvers such as MINOS and LANCELOT will be presented.

TE17 Supply Chain Planning: A Software Perspective

Cluster: Optimization Days
Invited Session
Chair: Anand Iyer, i2 Tech. inc., 909 E. Las Colinas Blvd., Irving, TX 75039, iyer@i2.com

1) Tactical Material Planning, ***Scott A. Moses***, i2 Tech., Inc., 909 E. Las Colinas Blvd., Irving, TX 75039, scott_moses@i2.com

Although material is the dominant constraint in some modern industries, scheduling research traditionally has focused on machines and labor. Tactical material planning problems have received little attention. We present approaches for modeling and algorithms for solving these problems including techniques that work well for industrial sized systems.

2) Allocated Available to Promise for High-Tech Industries, ***Rajesh Gangadharan***, i2 Tech., Inc., 909 E. Las Colinas Blvd., Irving, TX 75039, rajesh_gangadharan@i2.com

We describe the available to promise problem and the implementation of its solution in software form.

3) The Generalized Multi-Dimensional Knapsack Problem & Its Applications to Supply Chain Planning, ***Anand V. Srinivasa***, i2 Tech., Inc., 909 E. Las Colinas Blvd., Irving, TX 75039, srinivasa@i2.com

We investigate the problem of deploying degradable resources over multiple-time periods. We formulate the problem as a GMKP and investigate its properties. We also explore its applications to supply chain planning situations.

TE18 Tutorial: Parallel Metaheuristics

Cluster: Metaheuristics
Invited Session
Chair: Michel Toulouse, Univ. of OK, Sch. of Comp. Sci., 200 Felgar St., Rm. 114, Norman, OK 73019, toulouse@cs.ou.edu

1) Tutorial: Parallel Metaheuristics, ***Teodor Gabriel Crainic***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, theo@crt.unmontreal.ca, ***Michel Toulouse***

We review metaheuristic parallel search methods, mainly TS, SA and GAs, according to the point of view of the level of parallelism of each strategy. It is hoped that by examining the commonalities among parallel implementations across the field of metaheuristics, insights may be gained, trends may be discovered and research challenges may be identified.

TE19 Machine Scheduling Problems

Invited Session
Chair: Chelliah Sriskandarajah, Univ. of Toronto, Dept. of MIE, 5 King's College Rd., Toronto, Ontario, M5S 3G8, Canada, chellia@mie.utoronto.ca

1) Tutorial: Machine Scheduling Problems, ***Jacek Blazewicz***, Instytut Automatyki, Politechnika Poznanska, ul Piotrowo 3A, Poznan, 60-695, Poland

This study is concerned with deterministic problems of scheduling tasks on machines (processors), one of the most rapidly expanding areas of combinatorial optimization. In general terms, a given set of tasks is processed on a set of available processors, so that all processing conditions are satisfied and a certain objective function is minimized (or maximized). It is assumed, in contrast to stochastic scheduling problems, that all task parameters are known a priori in a deterministic way...

TE21 Advances in Microscopic Traffic Advances II

Cluster: Advances in Microscopic Traffic Simulation
Invited Session
Chair: Michel Van Aerde, Center for Trans. Research, VA Polytech.Inst., Blackburg, VA 24060, vanaerde@ctr.vt.edu

1) A Simulation Laboratory for Evaluating Dynamic Traffic Management Systems, ***Moshe E. Ben-Akiva***, MIT, Dept. of Civil & Env. Eng., 77 Massachusetts Ave. Rm 1-181, Cambridge, MA 02139, mba@mit.edu, ***Haris N. Koutsopoulis***, ***Qi Yang***

A traffic simulation laboratory, capable of evaluating traffic management systems in integrated traffic networks, is presented. The laboratory consists of a microscopic traffic simulator (MITSIM), which represents the "real world" and a traffic management simulator, which represents the system under evaluation. It is implemented in a distributed environment and its applicability is demonstrated through a case study.

2) The Application of Microscopic Simulation in Solving Real Transportation Problems, ***J.K. Littlejohn***, Paramics, Paramics Traffic Simulation, 16 Chester St., Edinburgh, EH37RA, UK, jkl@paramics.com, ***G. Millar***, ***G. Kyle***

Transportation engineers are finding that, due to increasing congestion and the introduction of new technologies, many network problems they are required to solve cannot be tackled with traditional transportation modelling tools. This paper describes why and how microscopic simulation was applied to several real projects and the excellent results achieved.

3) Microscopic Simulation with SITRA-B+, ***Jean-Francois Gabard***, ONERA/CERT SODIT SA, 2 Ave. Edouard Belin, BP 4025, Toulouse Cedex, 31055, France, gabard@cert.fr, ***Laurent Breheret***

The SITRA-B+ microscopic urban traffic simulation model was developed in order to provide the user with a calibration and validation tool for the design and test of UTC and dynamic route guidance strategies; scenarios which can be modelled with SITRA-B+ include various types of vehicles (guided and non-guided cars, buses) and complex intersection layouts.

4) Advanced Modeling Features in AIMSUN2 Microsimulator, ***Jaime Barcelo***, Polytech. Univ. of Catalunya, Dept. of Stats & OR, Pau Gargallo 5, Barcelona, E-08028, Spain, barcelo@eio.upc.es, ***Jordi Casas***, ***Jose Ferrer***, ***David Garcia***

AIMSUN2 is a microscopic traffic simulator designed and developed to account specifically for Advanced Road Transport Telematic applications. Special care has been taken in accurately model applications concerning route information to the motorists (Guidance, Variable Message Panels) and their dynamic reactions changing or not the used route. The architecture of the simulator also...

TE22 Frameworks for Group Decision & Negotiation: Negotiating Prices for Internet Services

Sponsor: Group Decision & Negotiation Section
Sponsored Session
Chair: Aleksandr Kogan, Rutgers Univ., 180 University Ave., Fac. of Mgmt., Newark, NJ 07012

Co-Chair: Fred Sudit

1) Pricing Strategy for Internet Service, ***Banani Nandi***, AT&T Labs, Rm. 7f-505, 600 Mountain Ave., Murray Hill, NJ 07974-0636, ban@ulysses.att.com, ***Miklos Antal Vasarhelyi***

The aim of this study is to develop a proper pricing strategy for Internet service so as to maximize social and economic benefit for users. The analysis will take into consideration the possibility that the optimum pricing scheme depends upon whether network ownership is vertically integrated or vertically disintegrated.

2) Economic Incentives in Multi-Owner Intergrated Services Networks, ***Alok Gupta***, Univ. of CT., 368 Fairfield Rd., U-41 IM, Dept. of OPIM, Storrs, CT 06269, alok@boss.opim.uconn.edu, ***Dale O. Stahl***, ***Andrew B Whinston***

Economic incentives of the owners of different parts of public data communication networks are crucial to the design of the future network interconnection agreements that will provide the infrastructure for Electronic Commerce. This paper explores these incentives and their roles in sustaining Quality of Service requirements for EC applications.

3) The Technology & Accounting of Pricing Internet Services, ***Aleksandr Kogan***, Rutgers Univ., 180 University Ave., Fac. of

Mgmt., Newark, NJ 07012, *Ephraim F Sudit, Miklos Antal Vasarhelyi*

The growth in commercial use of the Internet will require changes in the pricing of its services. This paper focuses on the technological and accounting requirements of alternative pricing systems for Internet services. Congestion-activated pricing and usage-based (e.g. priority) pricing are discussed in terms of their technical and economic feasibilities.

TE23 Strategy Modeling & Analysis

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Samuel E. Bodily, Darden Grad Sch of Business, Univ of Virginia, Box 6550, Charlottesville, VA 22906, BodilyS@virginia.edu

1) Portfolio Management in an Upstream Oil & Gas Organization, *Mazen A Skaf*, SDG, 2440 Sand Hill Rd, Menlo Park, CA 94025, mskaf@sdg.com

We describe a portfolio management process and system we have developed and successfully implemented in the oil & gas industry. We discuss our approach to portfolio management, the process, the system architecture and benefits of applying the process to multi-billion dollar asset portfolios in the deepwater Gulf of Mexico.

2) Analysis of Indirect Investment Effects, *Thomas R. Varner*, PO Box 1261, Lafayette, CA 94549, tvarner@earthlink.net

An analytical framework is presented to analyze the effects that current investment decisions have on future prospects. Existing strategic models typically consider these "indirect effects" only on a qualitative or intuitive basis. Specific issues addressed with this analytical framework include financing, learning, project spawning and market effects.

3) Models & Strategy: An Arranged Marriage, *Patrick S. Noonan*, Emory Univ., Goizueta Bus. Sch., Atlanta, GA 30322, patrick_noonan@bus.emory.edu

Despite their many surface incompatibilities, what OR/MS professionals consider "modeling" and what planning professionals consider "strategy" can be combined effectively. Numerous case examples illustrate - and scholarly research on individual and organizational cognition and decision explains - the critical prescriptive issues in approaching strategic decision processes with OR tools.

4) A Decision Analysis Approach for Strategic Capital Allocation in Health Care, *Don N. Kleinmuntz*, Univ. of IL, 1206 S 6th St., Rm. 360, Dept. of Bus. Admin., Champaign, IL 61820, dnk@uiuc.edu, *Catherine E. Kleinmuntz*

We develop a methodology for allocating capital across organizational units, service lines and facilities. It balances critical financial, strategic and quality goals, and is particularly well suited to complex integrated healthcare organizations. We describe implementation at a large urban hospital with a capital budget in excess of $10 million.

TE24 DEA I

Contributed Session

Chair: Barbara J. Hoopes, VA Tech. Univ., 7054 Haycock Rd., Falls Church, VA 22043, bhoopes@vt.edu

1) Data Envelopment Analysis, Control Charts & Process Improvement: Is There a Connection?, *Barbara J. Hoopes*, VA Tech. Univ., 7054 Haycock Rd., Falls Church, VA 22043, bhoopes@vt.edu, *Kostas Triantis*

DEA looks at the efficiency performance of production processes, taking into account critical process and product characteristics. Process control charts track the variability and central tendency of production processes by studying the stochastic behavior of a single product characteristic. Neither approach explicitly identifies root causes or drivers of process performance...

2) Data Envelopment Analysis as a Tool for Managerial Decision Making, *Jati K. Sengupta*, Univ. of CA, Dept. of Economics, Santa Barbara, CA 93106-9210, sengupta@econ.ucsb.edu

Using Data Envelopment Analysis (DEA) as a policy tool for improving managerial efficiency is explored here. Learning efficiency goals and adopting appropriate strategies and reward/incentive mechanisms are modelled here through dynamic and stochastic DEA models.

3) A DEA-Based Framework for Strategic Group Analysis: Empirical Investigation in the Hospital Industry, *Lily M. Adu*, Univ. of IA, 92 Bluebird Dr., Somerville, NJ 08876, lily-adu@uiowa.edu, *Dennis L. Bricker, Thomas S. Gruca*

A cross-efficiency modification of DEA is offered as the core of an objective and viable framework for the systematic operationalization of the strategic group construct. Other important components of the framework are statistical analyses to ascertain differences between strategic groups on strategic variables as well as performance measures.

TE25 Stochastic Modeling in Water Resources

Sponsor: Applied Probability Section
Sponsored Session

Chair: Bernard F. Lamond, Univ. Laval School of Bus., Dept. Op. & Dec. Systems, Fac. of Admin. Sci., Quebec, Quebec, G1K 7P4, Canada, bernard.lamond@fsa.ulaval.ca

1) Determining the Maximum Daily Storage of Several Reservoirs in Series Subject to Annual Flood, *Andre Turgeon*, Hydro-Quebec, IREQ, 1800 Montee Ste-Julie, Varennes, Quebec, J3X 1S1, Canada, andre@ireq.ca, *Maarouf Saad, Joseph Ribeiro, Laura Fagherazzi*

We present a method for determining the daily storage of several reservoirs in series which must not be exceeded so that the probability of a flood at a downstream site over a one-year period remains below a predetermined value. The storage values are obtained by solving a Linear Programming problem for each day in which the constraints place upper limits on the content of the reservoirs and on the combined contents of two or more reservoirs.

2) Stochastic Long Term Hydro Generation Planning: A Combined Dynamic Programing & Parametric Linear Programming Approach, *Louis Lafond*, Hydro-Quebec, IREQ, 1800 Montee Ste.-Julie, Varennes, Quebec, J3X 1S1, Canada, louis@ireq.ca

A combination of traditional backward dynamic programming and of parametric linear programming within each stage of the recursion will be described for stochastic long term generation planning at Hydro-Quebec, including the handling of water head variations.

3) Computing Optimal Policies for a Reservoir Using Piecewise Polynomial Approximations, *Bernard F. Lamond*, Univ. Laval School of Bus., Dept. Op. & Dec. Systems, Fac. of Admin. Sci., Quebec, Quebec, G1K 7P4, Canada, bernard.lamond@fsa.ulaval.ca

We propose a method for optimizing a single hydro-electric reservoir using a piecewise polynomial approximation of the future value functions. Unlike previous methods based on splines, we avoid discretizing the inflow distribution. Instead, we carry out the expectation step of dynamic programming using an exact integration for a piecewise polynomial function.

TE26 Stochastic Models: Analysis & Approximation

Sponsor: Applied Probability Section
Sponsored Session

Chair: Hong Chen, HKUST & Univ. of British Columbia, Fac. of Comm., BRAMSS, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, honchen@uxmail.ust.hk

1) Asymptotics for Polling Models with Increasing Setups, *Tava Lennon Olsen*, Univ. of MI, Dept. of IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, tlennon@engin.umich.edu

This talk considers asymptotics for polling models with increasing setup times. It is shown that as setup time increases to infinity the coefficient of variation of the intervisit time for each queue converges to zero. This, in turn, is shown to imply that the waiting time distribution coverges to the uniform distribution as setups increase to infinity...

2) Higher Order Approximations for Queueing Networks, *Muckai K. Girish*, Cascades Com. Corp., 5000 Executive Pkwy., Ste 333, San Ramon, CA 94583, *Jian-Qiang Hu*

Most approximations for queueing networks are lower order approximations in the sense that only a few parameters, usually the first two moments, of arrival and service distributions are used. These approximations are not very accurate in many cases. Higher order approximations developed recently will be presented.

3) A Queue with Elastic Demand as a Model for an Internet Service Provider, *Shaler Stidham Jr.*, Univ. of NC, Dept. of OR, CB#3180, Smith Bldg., Chapel Hill, NC 27599-3180, sandy@or.unc.edu

We model an ISP as a processor-sharing queue with Poisson arrivals. Self-optimizing customers contgrol the work processed by maximizing net benefit: utility (concave in work processed) minus a tariff proportional to connect time. We examine stability and other properties of equilibrium behavior and implications for ISP fee structures.

4) Markov-Modulated Queueing Networks: Diffusion Limits & Their Applications, ***Hong Chen***, HKUST & Univ. of British Columbia, Fac. of Comm., BRAMSS, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, honchen@uxmail.ust.hk, ***Jian-Qiang Hu***, ***Muckai K. Girish***

The diffusion limit theorem is developed for queueing systems with Markov-modulated arrival and service processes. For the Markov-modulated single-server queue, two approximations are proposed based on the diffusion limit theorem: one is the diffusion approximation and the other is the interpolation approximation in which the heavy traffic limit and the light traffic derivatives are combined using Pade approximation.

TE27 Electricity Generator Competition Issues

Sponsor: ENRE
Sponsored Session
Chair: J. Scott Rogers, Univ. of Toronto, Dept. of MIE, 5 Kings College Rd., Toronto, Ontario, M5S 3G8, Canada, rogers@mie.utoronto.ca

1) Generation Supply Bidding in Perfectly Competitive Electricity Markets, ***George Gross***, Univ. of IL, Dept. of Elect & Comp. Eng., Urbana, IL 61801, gross@staff.uiuc.edu, ***D. J. Finlay***

A general framework of a CEM, embodying the salient attributes of the Poolco concept, is formulated. This framework serves to solve the selection by the CEM operator of the winners in a sealed bit auction of the right to serve load in each period of the auction horizon...

2) Using Agent-Based Simulation to Understand Strategic Bidding in Electric Power Pools, ***Christopher Day***, London Business Sch., Sussex Place, Regents Park, London, NW1 4SA, UK, cday@lbs.ac.uk, ***Derek W. Bunn***

The price-setting mechanism of the electricity pool of England and Wales has been investigated in a stylised way using agent-based simulation to explore the evolution of strategic bidding behavior. Specification issues of anticipatory learning, asymmetric market structure and the objectives of the agents, i.e., generators, are considered, leading to behavioral insights which go beyond those of supply-function equilibria in imperfect markets.

3) GENCOMP 2.0: Model of Competition Among Electric Generators, ***J. Scott Rogers***, Univ. of Toronto, Dept. of MIE, 5 Kings College Rd., Toronto, Ontario, M5S 3G8, Canada, rogers@mie.utoronto.ca, ***K. Wong***

We describe a model (GENCOMP 2.0) of generator competition under the influence of an independent market operator. The generators are profit mazimizers and each has an endowment of units and an anticipation of the others' behavior. Considering demand elasticity and seasonality in supply and demand, we compute Nash solutions.

4) The Value of Improved Short-Term Load Forecasts, ***Benjamin F. Hobbs***, JHU, Dept. of Geog. & Environ. Eng., 313 Ames Hall, 3400 N Charles, Baltimore, MD 21218, bhobbs@jhu.edu, ***Suradet Jitprapaikulsarn***, ***Sreenivas R. Konda***, ***Vira Chankong***

The value of reduced errors in short-term electric load forecasts is quantified considering improvements in generator unit commitment. Commitment decisions are simulated for forecasts with differing accuracies, then real-time dispatch decisions are simulated using actual loads.

TE28 Enhancing Research & Teaching with Visual Basic for Applications

Sponsor: Forum on Education
Sponsored Session
Chair: Kenneth J. Klassen, Univ. of Calgary, Fac. of Mgmt., Op. Mgmt., 2500 Univ. Dr., NW, Calgary, Alberta, T2N 1N4, Canada, kklassen@acs.ucalgary.ca

1) Rapid Prototype Development with VBA, ***Robert F. Easley***, Univ. of Notre Dame, Coll. of Bus. Admin., PO Box 399, Notre Dame, IN 46556-0399, reasley@darwin.helios.nd.edu

A brief introduction to VBA programming will be given, including the basics of macro recording and editing, and creating wizards using dialog sheets for controls. Also, I will discuss the differences between the Excel 5 and Office97 implementations of VBA and VB, and will provide some general suggestions for incorporating VBA in the classroom.

2) Research Using Visual Basic for Excel: Lessons Learned & Questions Opened, ***Kevin L Stamber***, Purdue University, 1293 Potter Cntr. Rm. 334, W. Lafayette, West Lafayette, IN 47907-1293, stamber@ecn.purdue.edu

VBA, specifically in Excel, provides a widely available platform for conducting research experiments in areas such as simulation. Examples of the use of VBA in economic decision making and electricity forecasting will be discussed, with emphasis on randomness, run time, and appropriate scale of problems for examination.

3) How to Solve 4000 Integer Linear Programs in a User-Friendly Environment, ***Kenneth J. Klassen***, Univ. of Calgary, Fac. of Mgmt., Op. Mgmt., 2500 Univ. Dr., NW, Calgary, Alberta, T2N 1N4, Canada, kklassen@acs.ucalgary.ca

Using Excel's VBA, it is possible to quickly develop a model where multiple optimization problems are solved in sequence. An example of this will be given, along with a discussion of hints for success, problems to look out for, and related applications.

TE29 Airline Operations

Sponsor: Aviation Applications Section
Sponsored Session
Chair: Michael Irrgang, Lan Chile Airlines, mirrgang@lanchile.cl

1) Integration of Scheduling Systems & Databases Within an Airline: The Opportunity, ***Michael Irrgang***, Lan Chile Airlines, mirrgang@lanchile.cl

Today, many systems within the typical airline could provide a much higher level of integrated decision support from common databases than is currently found today. We present one possible vision of such an integration.

2) Operationally Significant Predictions for Use in Air Traffic Control Ground Dely Programs & Collaborative Decision Making, ***Roger Beatty***, American Airlines, 1821 Dunn St., Grapevine, TX 76051, 70541.1002@compuserve.com

There is a complex integration between the airlines in attempting to schedule and operate their flights and the FAA in controlling the use of air space. This integration evolves through the marketplace into something that works well in good weather, but has serious problems for all airlines in bad weather because the FAA views an airline as a collection of aircraft...

3) Collaborative Air Traffic Management, ***Mike Wambsganss***, Metron Inc., 11911 Freedom Dr., Ste. 800, Reston, VA 22090-5602, wambsganss@metsci.com

The application of OR to collaborative air traffic management.

4) A Profitablity Model for an Airline Flight Scheduling System, ***Dirk John***, Lufthansa Systems, Am Weiher 24, Kelsterbach, D-65451, Germany

We present a profitability model which has been successfully used to optimize airline schedules.

5) Managing Aircraft During Irregular Operations, ***Michael F. Arguello***, Univ. of TX, Ctr. for Mngmt. Ops./Logistics, Grad. Sch. of Bus., Austin, TX 78712-1175, arguello@mail.utexas.edu, ***Jonathan F. Bard***, ***Gang Yu***

We present methods for rerouting aircraft whenever groundings and/or delays and station closures lead to insufficient resources for executing a flight schedule as planned. Local search techniques are employed to construct feasible solutions and a mathematical model is used for deriving a lower bound. Multiple fleets and sub-fleet constraints are considered.

TE30 Operations Other than War & Information Warfare

Cluster: Military Applications
Invited Session
Chair: N. Gass, Ntl. Defense HQ, OR & Analysis, 101 Colonel Dr., Ottawa, Ontario, K1A 0K2, Canada, gass@ora.dnd.ca

1) Operations Other Than War Tool Requirement in Relation to the Joint Warfare Simulation, ***Dean Hartley***, Oak Ridge Ntl. Lab., 1099 Commerce Park, Oak Ridge, TN 37830, dhx@ornl.gov

During the past 3 years, the US DoD has been examining how to support analysis of OOTW. Previous reports have covered the research leading to definition of the analysis requirements. We describe which analysis requirements will be satisfied by the new analytical combat model, the JWARS and how the remainder of the requirements can be satisfied.

2) An Anglo-French View of Information Operations & the Requirements of Early Entry Forces in Multi-National Operations, ***S. A. J. Young***, UK Ministry of Defense, Development & Doctrine, SO1(LW3), DG(D&D), Upavon, Wiltshire, UK SN9 6BE, UK, ***A. Brignall***, ***F. Faucon***

Information operations aim at assuring the coherence and efficiency of

operations, both physical and perspective. The ultimate aim is to render unnecessary physical combat through deterrence and the destruction of the cohesion and willpower of the opponent. The use of early entry forces as part of the deterrence process requires an understanding of the factors governing force composition...

3) The Application of Cognitive Mapping to Characterize Information Operation Capabilities, ***Robert Garigue***, Ntl. Defense HQ, Dept. of Ntl Defense, 101 Colonel By Dr, Ottawa, Ontario, K1A 0K2, Canada

No abstract supplied.

4) The Threat of Information Operations to the Infrastructure of a Country, ***N. Gass***, Ntl. Defense HQ, OR & Analysis, 101 Colonel Dr., Ottawa, Ontario, K1A 0K2, Canada, gass@ora.dnd.ca, ***T. Romet***

The model is based on an entropy formulaton and fuzzy arithmetic which takes into account the inconsistencies in the technological capabilities of an actor. The final result yields the vulnerability of individual infrastructure components under consideration of protection measures and collateral damage effects together with a measure of the overall state of the infrastructure after attack.

TE31 SABRE Group Activities in Logistics

Sponsor: Section on Logistics
Sponsored Session
Chair: Scott B. Smith, SABRE Group, 22 Third Ave., Burlington, MA 01803, scott_smith@sdt-boston.com

1) Truckload Procurement Practices: An Industry Survey, ***Chris Caplice***, SABRE Group, 3200 Patterson Ave., Richmond, VA 23221, chris_caplice@sdt-boston.com

The Defense Logistics Agency has recently surveyed shippers to better understand truckload and less than truckload procurement practices. The survey covered strategic issues such as carrier selection and more day-to-day issues such as load tendering, including several in-depth interviews with leading shippers. We present the results.

2) Implementing a Yield Management Model in the Truckload Industry, ***Noha Tohamy***, Sabre Group, 22 Third Ave., Burlington, MA 01803, noha_tohamy%ptcg@ptcg.com

Yield management has proven itself in diverse industries. The truckload industry has yet to take advantage of this model. Currently, truckload carriers do not base their allocation, real-time proving or load accept/reject decisions on any global vision of their network. We introduce a model that maximizes a carrier's yield on a real-time basis.

3) Multi-Vehicle Routing Through a Cross-Dock, ***Rina R. Schneur***, SABRE Group, 22 Third Ave., Burlington, MA 01803, rina_schneur@sdt-boston.com, ***Susan W. O'Dell***

We present the problem of routing and scheduling freight from origins to destinations, with the option of consolidating through a cross-dock. We consider different types of available resources, time-windows, and other operational constraints. We discuss the context of the problem and the challenges involved in solving it.

4) Optimization-Based Bidding: A New Methodology for Truckload Procurement, ***Scott B. Smith***, SABRE Group, 22 Third Ave., Burlington, MA 01803, scott_smith@sdt-boston.com

Shippers can obtain better rates and improved service on truckload freight by using optimization based bidding methods rather than simply choosing the low bidder on each lane. This is because optimization-based methods can make for a more efficient transportation network. We describe our experience with the use of an optimization based bidding process at several shippers.

TE32 Forecasting

Contributed Session
Chair: Sara E. Benson, Lafayette Coll., Dept. of Civil & Environ. Eng., Easton, PA 18042, bensons@lafayette.edu

1) withdrawn - author request of 1/22, ***David A. Nembhard***, Auburn Univ., 415 Coll. of Bus., Auburn, AL 36849-5346, nembhard@business.auburn.edu auburn.edu/~nembhda, ***Harriet Black-Nembhard***

2) Forecasting Freight Flows Over New Jersey Highways, ***Sara E. Benson***, Lafayette Coll., Dept. of Civil & Environ. Eng., Easton, PA 18042, bensons@lafayette.edu, ***Jakub P. Rowinski***, ***Maria P. Boile***

We present a methodology to forecast freight flows over truck route networks. The methodology is used to build a model of commodity flows over New Jersey highways.

3) withdrawn - author request of 3/23, ***James Taylor***, London Business Sch., Sussex Place, Regents Park, London, NW1 4SA, UK, jtaylor@lbs.ac.uk

Day-ahead forecasts are required for operational planning and for calculating the daily electricity pool price. One approach predicts the turning-points on the demand curve, and then produces half-hourly forecasts by a smoothing procedure based on a historical demand curve. This research aims to improve this method and considers alternative approaches.

4) An Exploration of Network Modeling: The Case of NEPOOL, ***Thanh H. Luong***, US Dept. of Energy, Energy Info. Admin., 1000 Independence Ave. SW, Washington, DC 20585, tluong@eia.doe.gov, ***Douglas Hale***

The economic reason to deregulate the electric power industry is to achieve efficiency where the net social benefit is maximized consistent with numerous physical constraints. The work reported here was undertaken to assess the sensitivity of price and generation to location caused by incremental line losses and line congestion.

TE33 Marketing I

Contributed Session
Chair: George E. Monahan, Univ. of IL, Dept. of Bus. Admin., 1206 S Sixth St., Champaign, IL 61820, gmonahan@uiuc.edu

1) Implicit Cooperation in a Market Share Attraction Advertising Game, ***George E. Monahan***, Univ. of IL, Dept. of Bus. Admin., 1206 S Sixth St., Champaign, IL 61820, gmonahan@uiuc.edu

A competitive model of product and brand advertising is formulated as a variable-sum two-person game. The model embodies elements of both competition and cooperation. Conditions on the parameters of the model are established that identify when both firms find it in their best interest to implicity cooperate through product advertising.

2) Competitive Price Equilibrium When Consumers Have a Category Reservation Utility, ***Nakagawa Keiichiro***, NTT Data Corp., 3-7-1 Nishi-Shinjuku, Shinjuku-ku Tokyo, 163-10, Japan, nakagawa@riss.nttdata.co.jp, ***Kijima Masaaki***, ***Namatame Takashi***

We study a competitive price equilibrium in the market of a category where consumers are homogeneous with a reservation utility below which consumers will not purchase in the category. Some comparative statics of the prices and market shares with respect to the reservation utility in the Nash equilibrium are investigated.

3) withdrawn - author request of 3/7, ***David C. Croson***, Univ. of PA, The Wharton Sch., 36230 Locust Walk # 1300, Philadelphia, PA 19104-6366, crosond@wharton.upenn.edu, ***Il-Horn Hann***

4) Modeling Pricing Decisions, ***Rahul Bhaskar***, DFI Aeronomics, 650 Castro St., Ste. 300, Mountain View, CA 94041, rbhaskar@dfi.com, ***Bhavit Desai***

Pricing represents the most important "P" in the marketing mix. We will present our formulation of the problem of pricing faced by different service industries. Pricing DSSs and their potential uses in industry will be discussed.

TE34 Software Demonstrations

Chair: To be announced

1) Software Demonstration: Integrating Mathematical Programming Tools, ***Gautam Mitra***, Brunel Univ., Surrey, Wentworth, GU25 4RX, UK

Tools such as MPL provide a rich interactive environment for developing mathematical programming models. We illustrate a production application which uses MPL as an embedded component of a distributed programming/modeling system. We also show software extensions which integrate client/server capability into MPL. The scope of extending this approach to the Internet/Intranet computer paradigm is also discussed.

2) Software Demonstration: Extend Tutorial, ***David Krahl***, Imagine That, Inc., 6830 Via Del Oro, Ste. 230, San Jose, CA 95119, extend@imaginethatinc.com

Extend from Imagine That, Inc., is a multidomain, hierarchical simulation modeling tool. It is based on a modern GUI and is extensible into many different areas of application including all discrete event and continuous systems. With over 10,000 copies sold, it is the most popular discrete event simulation software ever created.

TE35 Network Design Problems

Cluster: Networks
Invited Session
Chair: Oktay Gunluk, AT&T Labs., OR Dept., 101 Crawfords Corner Rd., Holmdel, NJ 07733, og85@qpc2.ho.att.com oktay@att.com

1) Polyhedral Inequalities for Survivable Flow Problems, ***Daniel Bienstock***, Columbia Unv., Dept. of IEOR, New York, NY 10027, dano@ieor.columbia.edu, ***Gabriella Muratore***

We describe several classes of strong cuts for solving network design problems with flow-survivability constraints. These constraints specify that in the event of a node or edge deletion, at least a certain fraction of each demand can be routed.

2) Accounting for Non-Convex Barriers in Network Topology Designs, ***Mohan Gawande***, AT&T Bell Labs., Rm. 3J321, Crawfords Corner Rd., Holmdel, NJ 07733-1988, gawande@att.com

We extend a known algorithm for the computation of the shortest paths between points in a plane that avoid convex polygons to the case of non-convex polygonal barriers. A computationally efficient real-time algorithm is developed. This can be incorporated into network design algorithms to design effective network topologies that take into account penalties due to presence of impenetrable non-convex barriers.

3) Minimizing a Spanning Tree with Niche Search, ***Joao Pedro Pedroso***, Riken Institute, Saitama, Japan, jpp@brain.riken.go.jpw

We discuss the problem of finding a spanning tree with the following characteristics: one exogenously determined root node has degree D, D nodes have degree one, and all other nodes have degree two. The length of this spanning tree is defined as the length of the longest of its paths starting from the root node. Spanning trees with these properties can be seen as solutions of a particular VRP..

4) Network Resilience & Restoration Strategies, ***Bruce Shepherd***, Lucent Research, Murrey Hill, NJ 07733, bsheo@research.bell-labs.com

We discuss the problem of allocating capacities in a network so as to be resilient against certain network failures. Normally, we speak about single edge or node failures but we also discuss the multiple failure problem. What is meant by resilience is closely linked to how a network manager performs restoration after a failure occurs. We discuss several models which apply to a number of scenarios.

TE36 Spanning & Steiner Tree Models

Cluster: Networks
Invited Session
Chair: Luis Gouveia, Univ. of Lisbon, DEIO-CIO Fac. of Sci., Bloco C/2-Campo Grande, Lisbon, 1700, Portugal, lgouveia@fc.ul.pt

1) Branching Strategies for the Steiner Problem in Graphs, ***Stefan Voss***, Tech Univ. of Braunschweig, Inst. for Bus. Sci., Abt-Jerusalem-Str. 7, Braunschweig, D-38106, Germany, stefan.voss@tu-bs.de

The Steiner problem in graphs requires a subgraph of minimum total weight spanning a set of given vertices. Usually branching strategies in branch and bound or branch and cut approaches focus primarily on branching along edges. We show that branching along vertices can improve the algorithmic performence considerably.

2) Min-Cost Flow Based Lower Bounds for the Constrained Minimum Spanning Tree Problem, ***Daniele Pretolani***, Univ. di Camerino, Dpt. di Matematica e Fisica, Via Madonna delle Carceri, Camerino, 62032, Italy, deleone@camserv.unicam.it, ***Antonio Frangioni***, ***Maria Grazia Scutella***

We consider a well-known single-commodity flow formulation of the Constrained Minimum Spanning Tree problem. We study several different relaxations, with the aim of rapidly obtaining good lower bounds. We discuss the application of the above bounding procedures to heuristic and/or enumerative approaches to the problem. Preliminary computational results are presented.

3) Valid Inequalities for Non-Unit Demand Capacitated Tree Problems, ***Luis Gouveia***, Univ. of Lisbon, DEIO-CIO Fac. of Sci., Bloco C/2-Campo Grande, Lisbon, 1700, Portugal, lgouveia@fc.ul.pt, ***Maria Joao Lopes***

We show how to strenghten the upper bounding constraints of a well known flow model for the CMST problem. The new constraints are derived from the optimal solution of an adequate subset sum problem. In oreder to assess the quality of the new constraints we present computational results for several variations of the CMST: with variable arc capacities and with flow costs.

TE37 Tutorial: The Integration of Constraint Programming & LP-Based Mathematical Programming

Sponsor: CSTS
Sponsored Session
Chair: Robert E. Bixby, Rice Univ., Dept. of Comp. & Applied Math., Houston, TX 77005

Co-Chair: Jean-Francois Puget

1) Tutorial: The Integration of Constraint Programming & LP-Based Mathematical Programming, ***Robert E. Bixby***, Rice Univ., Dept. of Comp. & Applied Math., Houston, TX 77005, ***Jean-Francois Puget***

We discuss the process of integrating 2 optimization software libraries: the CPLEX Callable Library and the ILOG Solver C++ library so they can work together in the solution of problems in OR. This process leads to challenges and insights in combinatorial optimization at both the algorithmic and modeling levels.

TE38 Issues & Methodology in Network Planning

Sponsor: TST
Sponsored Session
Chair: Jennifer S. Huang, MCI Communications, 2400 N Glenville Dr., Richardson, TX 75082

1) The Optimal Design of Physical & Logical Layers for ATM Networks, ***Soumyo D. Moitra***, Indian Inst. of Mgmt., Dept. of Op. Mgmt., Diamond Harbour Rd., Joka, Calcutta, 700027, India, sdmoitra@hotmail.com

We discuss some of the issues involved in optimally designing ATM networks. The problems involved in otimally designing both the physical and logical layers in ATM are analyzed. Approaches based on single-, 2-stage and multiple objective functions are described and compared. Some heuristics for solving the models are reviewed.

2) Modeling the Supply Chain for Advanced Intelligent Network Services

The Advanced Intelligent Network is a new architecture for provisioning services in the voice network using databases and software. We present a model of complementary roles of the provider of equipment and software and the provider of the services. Results are presented on the optimal strategies for each.

3) Application of Decision-Ordering Techniques for Capacity Planning in Telecommunication Transport Networks, ***Jonathan Weston-Dawks***, Nortel

Although heuristic techniques have been effective in capacity planning problems, the order with which capacity assignment or routing decisions are made is unspecified. The issues associated with the lack of a good decision-ordering procedure are described. A discussion follows on some of the techniques used to compensate for this, and how this issue relates to decision-ordering techniques in constraint programming. The problem of spare capacity assignment is used as an example.

Wednesday 08:00-09:30

WA01 Network Traffic Control

Sponsor: TSS & IFORS
Sponsored Session
Chair: K. Larry Head, Univ. of AZ, Dept. of SIE, Tucson, AZ 85721, larry@sie.arizona.edu

1) A New Paradigm for Developing Signalized Network Control Strategies, ***George F. List***, RPI, Dept. of Civil Eng., Troy, NY 12180, listg@rpi.edu, ***Frank DiCesare***

We present a new approach to the development of signalized network control strategies. A Petri-net based approach capitalizing on the that environment's many benefits is described. Stressed are the cease of logic development, the powerful QA/AC environment, automatic computer code creation, and the fact that the actual signal control software can be tested through simulation...

2) Performance & Experience of the RHODES Real-Time Traffic-Adaptive Signal Control Logic, ***K. Larry Head***, Univ. of AZ, Dept. of SIE, Tucson, AZ 85721, larry@sie.arizona.edu, ***Pitu B. Mirchandani***

Over the past couple of years we have gained considerable experience with

RHODES including simulation evaluation on several different networks and are nearing completion of field tests in two locations. We discuss some of the performance issues and results, and discuss our experiences with RHODES.

3) Evaluation of Ramp Control Algorithms Using Microscopic Traffic Simulator, ***Mithilesh Jha***, MIT, Intelligent Trans. Sys. Prog., Cambridge, MA 02139, mkj@mit.edu, ***Masroor Hasan***, ***Markos Papageorgiou***, ***Moshe E. Ben-Akiva***

We evaluate the effectiveness of various ramp control algorithms using a MIcroscopic Traffic SIMulator (MITSIM). Results demonstrate the importance of explicit modeling of merging behavior for evaluating ramp control alogorithms. Based on insights gained form simulation results, we propose and evaluate enhancements in existing algorithms.

WA02 Intermodal Military Logistics

Sponsor: TSS
Sponsored Session
Chair: Yupo Chan, AFIT, Dept. of OS, ENS, Rm. 179, Bane Hall(Bldg.640), 2950 P St, WPAFB, OH 45433, ychan@afit.af.mil

1) A Framework for Analysis & Support of Intermodal Military Logistics, ***Stephan E. Kolitz***, Draper Labs., 555 Technology Sq., MS 4E, Cambridge, MA 02139, kolitz@draper.com, ***Cynthia Barnhart***

The importance of efficient logistics operations in military applications was made clear by the lessons of Operations Desert Shield and Desert Storm. This research explores a framework for analysis and dynamic decision support within US Army intermodal logistics operations, specifically the management of containerized munitions transportation.

2) A Simulation for Intermodal Military Logistics, ***Andrew E. Coop***, Draper Labs., 555 Technology Square, Cambridge, MA 02139, acoop@draper.com, ***Cynthia Barnhart***, ***Stephan E. Kolitz***

This research addresses issues in intermodal military logistics. A flexible, object-oriented simulation has been developed; it has uses in scenario analysis, as a testbed for optimization models, and eventual extension to operational use.

3) A Multiple-Depot, Multiple-Vehicle, Location-Routing Problem with Stochastically-Processed Demands, ***Yupo Chan***, AFIT, Dept. of OS, ENS, Rm. 179, Bane Hall(Bldg.640), 2950 P St, WPAFB, OH 45433, ychan@afit.af.mil, ***W. Brand Carter***, ***Michael D. Burnes***

We formulate a multiple-depot, multiple-vehicle, location-routing problem with stochastically-processed demands, which are defined as demands that are generated upon completing site-specific service on their preecessors. A special separable case of the problem was solved, wherein probably demands are estimated by stochastic processes at the demand nodes prior to the vehicle location-routing decisions.

WA03 Transportation I

Contributed Session
Chair: Ann Van Ackere, London Business School, Sussex Place, Regent's Park, London, NW1 4SA, UK, a.vanackere@lbs.ac.uk

1) Choice of Road: Locally Rational Choice & Global Cycles, ***Ann Van Ackere***, London Business School, Sussex Place, Regent's Park, London, NW1 4SA, UK, a.vanackere@lbs.ac.uk, ***Erik Larsen***

We present a spatial traffic model where rational individuals select a road each period, based on local information and previous experience. For many parameter combinations average travel time outperforms the Nash equilibrium. Increased information available about the traffic situation in the previous period results in longer average travel times.

2) Network Equilibrium with Nested Logit Demand Function, ***Maria P. Boile***, Lafayette Coll., Dept. of Civil & Environ. Eng., AHE 315, Easton, PA 18042-1775, boilem@lafayette.edu, ***Annette Ellis***

We present a demand-supply network equilibrium model with nested logit demand function. The mathematical model has non-linear objective function and linear constraints, and is shown to satisfy well-defined equilibrium conditions.

3) Multimodal Shortest Hyperpath on Transportation Networks, ***Giovanni Storchi***, Universita' di Roma, Dip Stats. Probabilita' e SA, Piazzale Aldo Moro 5, Roma, 00185, Italy, storchi@pow2.sta.uniromal.it, ***Massimiliano Caramia***

The Multimodal Shortest Hyperpath problem is considered using "viable" paths in a real transportation network. The multimodal network considers different modes such as: car, subway, bus and pedestrian. An application on the network of the city of Rome is presented with particular attention to the bus terminal parking problem.

4) Toll Policies in Transportation Networks: Uniqueness Properties for Fixed & Elastic Demands, ***Claude M. Penchina***, Univ. of MA, Dept. of Physics & Astron., 411 Hasbrouck Lab., Amherst, MA 01003, penchina@phast.umass.edu

Congestion pricing can optimize flow on large transportation networks. With fixed demand, path-tolls at optimum flow are widely adjustable, allowing designers to achieve additional economic/political goals, but link-toll policies are more restrictive. Elastic demand reverses the roles: link-tolls retain some flexibility but path-tolls become unique.

WA04 Material Management

Contributed Session
Chair: Prafulla Joglekar, LaSalle Univ., 1900 W Olney Ave., Philadelphia, PA 19141, joglekar@lasalle.edu

1) withdrawn - author request of 3/6, ***Yan Dong***, Univ. of MD, Coll. of Bus., College Park, MD 20742, ydong@mbs.umd.edu, ***Kefeng Xu***

2) Modeling Project Procurement with Post-Project Disposal Opportunities, ***Keith A. Willoughby***, Univ. of Saskatchewan, Coll. of Commerce, Saskatoon, SK, S7J 5A7, Canada, willoughby@commerce.usask.ca

The procurement of an item in a large-scale project, when faced with quantity uncertainities, is a critical materials management issue. On-hand inventory after completion of project construction may be disposed for revenue or retained to satisfy on-going operational usage. We develop models to analyze these procurement and disposal decisions.

3) A Dynamic Procurement Policy to Exploit Changing Price & Leadtime Quotes, ***Gregory A. DeCroix***, Univ. of WA, Sch. of Bus. Admin., Box 353200, Seattle, WA 98195-3200, decroix@u.washington.edu

We study an inventory sytem in which suppliers provide cost and leadtime quotes once per period. We propose and analyze a dynamic procurement policy that allows the customer to take advantage of this information by adjusting the ordering decision in response to the specific quote observed.

4) Responding to a One-Time-Only Sale of a Product Subject to Sudden Obsolescence, ***Prafulla Joglekar***, LaSalle Univ., 1900 W Olney Ave., Philadelphia, PA 19141, joglekar@lasalle.edu, ***Patrick Lee***

We model a retailer's optimal inventory and pricing decisions in response to a manufacturer's 1-time-only sale of a product subject to sudden obsolescence. A numerical example, an extensive sensitivity analysis and directions for future work are provided.

WA05 Practical Issues in Supply Chain Management

Sponsor: MSOM
Sponsored Session
Chair: Paul O. Iyogun, Wilfrid Laurier Univ., Sch. of Bus. & Econ., 75 University Ave. W, Waterloo, Ontario, N2L 3C5, Canada, piyogun@mach1.wlu.ca

1) Location-Distribution Decisions Under NAFTA, ***Anne G. Robinson***, Univ. of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, agrobins@mansci.watstar.uwaterloo.ca, ***James H. Bookbinder***

The North American Free Trade Agreement offers additional opportunities for Canadian manufacturers. Based on total-cost minimization, we aim to determine locations of transshipment points and a twin plant/DC, when product components originate in Canada, undergo maquiladora-type processing operations in Mexico and are completed at a US twin plant.

2) Retail Logistics Benchmarking Tool, ***Wendy Qu***, Industry Canada, 235 Wueen St., 7E, Ottawa, Ontario, Canada, qu.wendy@ic.gc.ca

No abstract supplied.

3) Managing a Logistics Third Party Provider, ***Martin Dresner***, Univ. of MD, Coll. of Bus. & Mgmt., College Park, MD 20742, mdresner@mbs.umd.edu

As increasing numbers of logistics activities are contracted to third party providers, managing the outsourcing partnership becomes more critical to the profitability of firms. Results are reported from a mail survey of 500 firms with outsourcing experience on how best to choose, manage and control third party logistics providers.

4) A Study of Supply Management Practices in Canada, ***Paul O. Iyogun***, Wilfrid Laurier Univ., Sch. of Bus. & Econ., 75 University Ave. W, Waterloo, Ontario, N2L 3C5, Canada, piyogun@mach1.wlu.ca

We report on a recent survey sponsored by the Purchasing Management Association of Canada on purchasing trends in Canada. The focus will be on 7 main issues in supply management and how some of the large Canadian companies have recently organized to deal with the issues.

WA06 Energy

Contributed Session

Chair: Paulo B. Correia, UNICAMP, DE/FEM.UNICAMP, C Postal 6122, Campinas - SP, 13083-970, Brazil, correia@fem.unicamp.br

1) A Multicriteria Optimization Model for Energy Conservation on Water Distribution Networks, ***Paulo B. Correia***, UNICAMP, DE/FEM.UNICAMP, C Postal 6122, Campinas - SP, 13083-970, Brazil, correia@fem.unicamp.br, ***Cynthia S. Andrade***

A network represents the water distribution system. Water is produced as the captation nodes and transported through pipes, by gravity or pumping, to the consumer nodes. Pumping answers for an expressive parcel of the distribution costs. Generally, distribution systems have several water reservoirs. Then, the pumping costs can be minimized by optimization programs...

2) Mathematical Models for the Marketing of Natural Gas Pipeline Networks, ***Roger Z. Rios-Mercado***, TX A&M Univ., 1000 Country Place Dr., Apt. 69, Houston, TX 77079-4712, roger@hpc.uh.edu www.hpc.ub.edu/~roger/, ***Rudy Elizondo***, ***E. Andrew Boyd***

We will present and discuss some mathematical models from problems arising in the marketing of natural gas pipeline networks.

3) Optimization for Operations Planning at the Bonneville Power Administration, ***Tom S. Halliburton***, NSR Information, 2905 Santos Ln, # 2313, Walnut Creek, CA 94596, tsh8@pge.com, ***Terry P. Thompson***

Non-linear optimization models are required for Columbia River Treaty calculations. Experience with conjugate gradients and quasi-Newton algorithms are outlined. Trials were performed using stochastic DP for operations planning. It was unsuitable due to the nature of some constraints, complex operating requirements and uncertainty in the electric industry.

4) "Bad News" in Offshore Platform Construction: A Case Study, ***L. M. Lakats***, Technical Partners, 443 Quebec Ave., Toronto, Ontario, M6P 2V5, Canada, lakats@interlog.com, ***O. T. Gudmestad***, ***H. Skjaeveland***, ***W. K. Rettedal***, ***E. Gausel***

In the case of a particular offshore platform construction project, new information suggested a significant increase in risk. Our mathematical model evaluates communication of the warning and risk impact of alternative management structures. Important factors in critical warning communication across multiple organizations in large projects are identified.

WA07 Quality Management & Benchmarking

Contributed Session

Chair: James R. Evans, Univ. of Cincinnati, PO Box 210130, Cincinnati, OH 45221-0130, evansjr@email.uc.edu

1) Modeling the Malcolm Baldrige National Quality Award Criteria, ***James R. Evans***, Univ. of Cincinnati, PO Box 210130, Cincinnati, OH 45221-0130, evansjr@email.uc.edu

We propose a causal model of the linkages among management practices and between management practices and business results in the Baldrige criteria based upon an analysis of inputs and outputs suggested by specific criteria requirements. The model provides a basis for further theoretical and empirical research.

2) Benchmarking Online Collaboration, ***Niels Agger-Gupta***, The Fielding Inst., PO Box 61122, Kensington RPO, Calgary, Alberta, T2N 4S6, Canada, agger@ibm.net http://www.dartt.com, ***Dottie J. Eastman***

Organizations need to assess the effectiveness of online collaboration in ways that reflect their unique goals and objectives. This research is developing assessment tools and procedures to produce customized organizational benchmarks, supported by systematic evaluation.

3) Evaluation of Production Integrated Environmental Protection Investments Within the Business Chance Management, ***Carola B. Spiecker***, Univ. of Bremen, PO Box 33 04 40, Faculty 7, Bremen, 28334, Germany, cspiecke@uni-bremen.de, ***Hans-Dietrich Haasis***

PEIP are an appropriate way to reach business targets in environmental protection in the sense of an eco-benchmark and to meet competition. The realisation of PEIP will be efficient, if investors do not only consider technical aspects but evaluate them by intergrating cost and risk analysis methods into their calculations.

WA08 Global Network Entrepreneurship for the 21st Century: Linking Talent, Technology, Capital & Know-How

Sponsor: Technology Management Section
Sponsored Session

Chair: David L. Gibson, Univ. of TX, iC2 Inst., 2815 San Gabriel, Austin, TX 78705, davidg@icc.utexas.edu

1) University/Industry Collaboration in Korea: Current Policies & Future Plans

2) Implementing a Globally Linked & Entrepreneurial MOT Program: The Case of the Instituto Superior Tecnico, ***Manuel V. Heitor***, Inst. Superior Tecnico, Av. Rovisco Pais, Lisboa, 1096, Portugal, ***Pedro T. Conceicao***

The Instituto Superior Tecnico (IST) has embarked on several innovative programs to re-engineer this technical university. These programs include a series of global conferences on science and technology policy and innovation, global training programs and educational initiatives, and interships for Portuguese executives in US technology-based companies.

3) Building a Business School & Incubator in China: The Case of the University of Science & Technology, China, ***Liang Liang***, Univ. of TX, iC2 Inst., 2815 San Gabriel Ave., Austin, TX 78705, ***Xiaoming Lu***

USTC is building a new business school with associated incubator facilities to better serve the needs of the Chinese Academy of Sciencies as well as China's industry and educational initiatives. This paper discuss the challenges and opportunities in fostering these initiatives.

4) Global Networked Entrepreneurship for the 21st Century: Linking Talent, Technology, Capital & Know-How, ***David L. Gibson***, Univ. of TX, iC2 Inst., 2815 San Gabriel, Austin, TX 78705, davidg@icc.utexas.edu, ***Chris Stiles***

We present early results of an IC2 Institute sponsored globally networked entrepreneurship tour to S.America, Europe, Russia, China, Japan and other areas. Date were collected on successful entrepreneurial role models, regional challenges, and global networking to technology venturing.

WA09 North-South Technology Alliances

Sponsor: Technology Management Section
Sponsored Session

Chair: Jorge Niosi, Univ. of Montrealat Quebec, Sch. of Bus., 315 St. Catherine E, Montreal, Quebec, H2X 3X2, Canada, niosi.jorge_e@uqam.ca

1) Canada-China Technology Alliances, ***Jorge Niosi***, Univ. of Montrealat Quebec, Sch. of Bus., 315 St. Catherine E, Montreal, Quebec, H2X 3X2, Canada, niosi.jorge_e@uqam.ca

2) French-North African Technology Alliances, ***Bertrand Bellon***, Univ. of Paris, Paris, France

3) Capacity Building for North-South Technology Transfer, ***Jan Jorgensen***, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, jorgense@mcgill.ca

WA10 Manufacturing Scheduling

Cluster: Scheduling
Invited Session

Chair: Bryan A. Norman, Univ. of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA 15261, banorman@engrng.pitt.edu

1) A Field Test of a Prototype Scheduling System, ***Scott Webster***, Syracuse Univ., Sch. of Mgmt., Syracuse, NY 13244-2130, stwebster@som.syr.edu

We summarize experience with a field test of a prototype sheduling system. The field test lasted approximately 1 year and took place at a manufacturer in the metal cutting industry.

2) Scheduling Complicated Flowshops, ***Venkat Narayanan***, Auburn Univ., Dept. of ISE, 207 Dunstin Hall, Auburn, AL 36849, venkat.narayanan@eng.auburn.edu bulfin@eng.auburn.edu, ***Robert***

L. Bulfin

We discuss modeling complicated flowershops with a series of simpler, aggregate models. Complications include setups, time windows, precedence, finite buffers, multiple machines and routes, lot sizing, batching, re-entrant flows and complex measures. The models retain the global flavor of the problem and help tradeoff model fidelity and solvability.

3) Integrated Scheduling of AGVs & Workcenters with the Consideration of Conflict Free Routing, ***Muhammad F. Anwar***, SUNY, Dept of IE, 342 Bell Hall, Buffalo, NY 14260, anwar@eng.buffalo.edu, ***Rakesh Nagi***

The problem of intergrated workcenter scheduling and conflict-free AGV routing for material handling in an assembly environment is considered. The problem is formulated as an MILP, with an objective of minimizing the production makespan of a complex assembly. To solve practical-sized problems a network based heuristic is developed.

4) Simultaneous Tool Assignment & Operation Sequencing for Multiple Spindle NCN Machines, ***Bryan A. Norman***, Univ. of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA 15261, banorman@engrng.pitt.edu, ***James C. Bean***

We introduce a unique scheduling and tool assignment problem that arises for multiple spindle machine tools. These problem contain constraints that are not found in the traditional scheduling literature. We present 3 solution methodologies for these problems and their effectiveness is demonstrated on test problems with comparisons to lower bounds.

WA11 Services Management

Cluster: Quality & Services Management
Invited Session

Chair: Kevin Laframboise, Concordia Univ., Dept. of DS & MIS, 1455 de Maisonneuve Blvd. W, Montreal, Quebec, H3G 1M8, Canada, lafrak@vax2.concordia.ca

1) Marrying Labor Staffing & Scheduling with Queueing Theory, ***Armann Ingolfsson***, Univ. of Alberta, Fac. of Bus., Edmonton, Alberta, T6G 2R6, Canada, armann.ingolfsson@ualberta.ca ualberta.ca/~aingolfs/

The intersection of research on optimal labor staffing and research on queues with time-varying arrival and service rates is very small, even though both domains are concerned with the same physical situation. We discuss possible approaches to optimizing labor staffing while taking dynamic congestion effects into account.

2) withdrawn - author request of 3/23, ***Richard A. Reid***, Univ. of NM, Anderson Sch. of Mgmt., Albuquerque, NM 87131, reid@anderson.unm.edu

3) Theory & Practice of Benchmarking in Cities & Towns, ***Jean Harvey***, Univ. du Quebec at Montreal, Dept. des science admin., Ecole des sci. de la gestion, Montreal, Quebec, R-2695, Canada, harvy.jean@uqam.ca, ***Claude Roy***

The public sector has borrowed benchmarking practices from the private sector without much adaption. Local governments, typically lagging behind on quality improvement initiatives, are following suit. We explore the soundness of such transfer of concept through a survey of literature and a structured analysis of published case studies.

4) A Survey of Research in Field Service, ***Donald Simmons***, Birghampton Univ., Lisle, NY 13797, br00513@binghampton.edu, ***Sal R. Agnihothri***

Service provided at a customer's site is called field service. Examples include the after-sale support of goods such as capital equipment and large home appliances, and the services such as emergency vehicles (fire and ambulance) and utilities. It is estimated that in the United States, firms engaged in field service...

WA12 Health Applications: Resource Allocation

Contributed Session

Chair: Janet M. Wagner, Univ. of MA, Dept. of MS/IS, 100 Morrissey Blvd., Boston, MA 02125, wagner@umbsky.cc.umb.edu

1) Resource Allocation for HIV/AIDS Control Programs: A Model-Based Policy Analysis, ***Marion S. Rauner***, Univ. of Vienna, Dept. Innovation & Tech. Mgmt., Bruenner Str. 72, Vienna, A-1210, Austria, marion.rauner@univie.ac.at bwl.univie.ac.at/bwl/inno/person.htm

We present a comprehensive multiperiod compartmental HIV/AIDS policy simulator applied to the population of Vienna, Austria. We first discuss the major model components such as infection mechanisms, interventions strategies and epidemiological and health economic impact measures. Finally, we analyze selected HIV/AIDS control technologies, e.g., testing policies, suppressor administration and vaccination strategies.

2) An Integer Goal Programming Model for Health-Care Strategic Resource Allocation Planning, ***N. K. Kwak***, St. Louis Univ., 3674 Lindell Blvd., St. Louis, MO 63108, kwakn@slu.edu, ***Changwon Lee***

We present the development of an inter-goal programming model as an aid to strategic resource allocation planning in a health-care system. Goals are identified and prioritized using the analytic hierarchy process method. The model results are examined and sensitivity analyses are performed to improve the model applicability.

3) Managing Pre-Registration Outpatient Services Using MedModel Simulation, ***Syi Su***, 1 Sec. 1, Jen-ai Rd., Taipei, Taiwan ROC, susyi@hsoa.mc.ntu.edu.tw, ***Chun-Chih Huang***, ***Nien-Tzu Chang***

This research taking an urology clinic as subject. Through MedModel simulation language with alternative solutions, it has been found that setting the appropriate services amount and heightening the pre-registration proportion) have the most profound contribution toward solving queuing problem in outpatient services.

4) Data Driven Physician Profiling: A Case Study, ***Janet M. Wagner***, Univ. of MA, Dept. of MS/IS, 100 Morrissey Blvd., Boston, MA 02125, wagner@umbsky.cc.umb.edu, ***Daniel G. Shimshak***

Using data for a sample of 27 physicians from a metropolitan managed care organization, an analysis was conducted to develop physician profiles. DEA and extensions were used to examine quality and resource indicators. The processes for reducing a large collection of variables to a manageable and meaningful set is also discussed.

WA13 The US Navy Affordability Initiative: Discreet Optimization Models & Methods

Cluster: Discrete Optimization
Invited Session

Chair: Matthew J. Saltzman, Clemson Univ., Dept. of Math. Sci., Martin Hall, Box 341907, Clemson, SC 29634-1907, mjs@clemson.edu math.clemson.edu/faculty/Saltzman

1) Affordable Naval Systems in a Time of Severely Constrained Budgets, ***Katherine Drew***, Office of Naval Research, drewk@onr.navy.mil

Navy officials are charged with making technological decisions at all stages of the development, procurement and fielding of complex Naval systems. These decisions must often be made under conditions of uncertainty and shifting priorities. This presentation will address hnow robust, high-confidence methodologies and tools for decision-making are critical to the development of affordable Naval systems.

2) Application of the Multiple Criteria Knapsack Model to Affordability Assessment, ***Kathrin Klamroth***, Clemson Univ., Dept. of Math. Sci., Clemson, SC 29634, klamroth@mathematik.uni-kl.de, ***Margaret M. Wiecek***

We study DP-based approaches to the multiple criteria knapsack problem. Extensions to the basic model such as multiple constraints, multiple decision periods and time-dependent coefficients are proposed and the algorithmic consequences are discussed. The models are examined in the context of affordability assessment.

3) Effective, Compact Linear Formulations of 0-1 Quadratic Programs, ***Warren Adams***, Clemson Univ., Dept. of Math. Sci., Clemson, SC 29634-1907, wadams@clemson.edu, ***Richard Forrester***, ***Fred W. Glover***

Various problems arising in capital budgeting can be formulated as 0-1 quadratic programs. We study the linerization strategy of Glover [1975] that produces compact linear reformulations of such quadratic programs, pose variations and refinements of this method, and perform computational tests to demonstrate the effectiveness within a branch-and-bound framework.

4) Cutting Planes from the Level-2 Adams/Sherali RLT, ***Matthew J. Saltzman***, Clemson Univ., Dept. of Math. Sci., Martin Hall, Box 341907, Clemson, SC 29634-1907, mjs@clemson.edu math.clemson.edu/faculty/Saltzman, ***Jill M. Forrester***

The Adams-Sherali reformulation-linerization technique produces a hierachy of high-dimensional, tight linear relaxations of linear mixed integer programs such as arise in capital budgeting. We examine cutting planes that are produced by

projecting constraints of the level-2 relaxation into the space of original variables, and the application of these cuts in MIP algorithms.

WA14 Integer Programming I

Contributed Session

Chair: Gerald L. Thompson, Carnegie Mellon Univ., GSIA, 5000 Forbes Ave., Pittsburgh, PA 15213-3890, gt04@andrew.cmu.edu

1) Statistical Properties of Estimated Optimal Coverage, ***James J. Cochran***, Drexel Univ., 1116 Beryl Trail, Dayton, OH 45459-2949, cochrajj@post.drexel.edu, ***Jeffrey D. Camm***, ***Martin S. Levy***

We consider coverage optimization when a complete census is impractical. Under such circumstances, a point estimate of the optimal coverage is generally found using sample data. We discuss the variance of the sampling distribution of this estimator and prove both the existance and direction of its bias.

2) Optimal Diagnosis of Series-Parallel Systems, ***Tonguc Unluyurt***, Rutgers Univ., 80-B Phelps Ave., New Brunswick, NJ 08901, tonguc@rutcor.rutgers.edu rutcor.rutgers.edu/~tonguc, ***Endre Boros***

We consider the problem of figuring out the correct value of the structure function of an SPS when it is costly to inspect individual components. We give polynomial time algorithms for finding the min-expected cost strategy for some 2-level systems with identical components and for 1-level general systems.

3) A Recursive Heuristic for the Totally Balanced Maximal Covering Problem, ***George G. Polak***, Wright State Univ., Dept. of MSIS, Rike Hall 271, Dayton, 45458, gpolak@desire.wright.edu

The Maximal Covering Problem (MCP) is a special case of the maximization of a submodular function subject to a cardinality constraint. Nemhauser, Wolsey and Fisher derived error bounds for the q-enumeration plus greedy heuristic for these problems. For the totally balanced case, we propose a recursive implementation and update of bounds.

4) New Applications for the Integral Simplex Method, ***Gerald L. Thompson***, Carnegie Mellon Univ., GSIA, 5000 Forbes Ave., Pittsburgh, PA 15213-3890, gt04@andrew.cmu.edu

The Integral Simplex Method (ISM) was shown by the author to be a psuedo polynomial time algorithm for solving set partitioning problems. Here it is extended to solve set packing, set covering and other combinatorial optimizations problems.

WA15 Mathematical Programming

Cluster: Nonlinear Programming
Invited Session

Chair: Jean-Pierre Dussault, Univ. of Sherbrooke, Dept. de Math. et d'Info., 2500 Blvd. Universite, Sherbrooke, Quebec, J1K 2R1, Canada, jean-pierre.dussault@dmi.usherb.ca

1) An Optimization Model for Flexible Objects, ***Nicolas Pfister***, Univ. de Sherbrooke, Dept. de Math. et d'Info., 2500 boul. Universitity, Sherbrooke, Quebec, J1K 2R1, Canada, ***Jean-Pierre Dussault***

A great majority of the models simulating the behavior of flexible objects, are developed using the forces acting on the body and constructing the equation of motion. We have followed a different approach and based our model on the minimization of a merit function representing the object's energey. However, one drawback of our method is the difficulty to integrate the effect of friction or any other dissipative forces into our model.

2) Self-Tuned Penalty Parameters for the Decomposition of Nonconvex Programs by Separable Augmented Lagrangians, ***Philippe Mahey***, Univ. Blaise Pascal, Lab. LIMOS, BP 125, Aubiere Cedex, 63173, France, mahey@flamengo.isima.br, ***Abdelouahad Hamdi***, ***Jean-Pierre Dussault***

A new versin of a separable augmented Lagrangian algorithm is given for the decomposition of non-convex structured programs. It is based on the implicit application of the multiplier method to the primal resource-directive subproblems associated with the decomposition and has nice connections with the proximal decomposition method for convex programming. Performance of that latter method is strongly dependent on the adjustment of the penalty parameter.

3) On the Augmented Exponential Penalty Algorithm, ***Jean-Pierre Dussault***, Univ. of Sherbrooke, Dept. de Math. et d'Info., 2500 Blvd. Universite, Sherbrooke, Quebec, J1K 2R1, Canada, jean-pierre.dussault@dmi.usherb.ca

We consider a multiplier method based on the exponential penalty function for inequality constrained nonlinear programming. However, in contrast to usual results, we analyze the asymptotic behavior of the algorithm while allowing the penalty parameter to converge to 0. Under usual assumptions of strict complementarity and linear independence of the active constraint's gradients, we obtain a superlinear convergence order with limited order 4/3.

4) Interior-Exterior Algorithm for Semidefinite Programming, ***Abdelhamid Benchakroun***, Univ. of Sherbrooke, Dept. of Math. & Info., 2500 blvd. Universite, Sherbrooke, Quebec, J1K 2R1, Canada, abdelhamid@benchakroun@dmi.usherb.ca, ***Jean-Pierre Dussault***, ***Abdelatif Elafia***, ***Khalid Elyassini***

We describe an interior-exterior algorithm for semidefinite programming. The algorithm is based on path following idea and uses the mixed penalty function with two parameters. The first leads to optimality and the second controls the feasibility. Each iteration updates a penalty parameters and finds a primal-dual search direction.

WA16 Advances in Linear Programming & Related Problems

Cluster: Linear Programming
Invited Session

Chair: Paul Tseng, Univ. of WA, Dept. of Math., Box 354350, Seattle, WA 98195, tseng@math.washington.edu

1) Convergence Analysis of a Primal-Dual Interior-Point Algorithm for Second-Order Cone Programming, ***Takashi Tsuchiya***, Inst. of Statistical Math., 4-6-7 Minami-Azabu, Minato-Ku, Tokyo, 106, Japan, tsuchiya@sun312.ism.ac.jp

We deal with primal-dual interior-point algorithms for second-order cone programming. We define neighborhoods of the central trajectory for this problem in terms of the Euclidean Jordan algebra and prove polynomiality of the path-following method using an analogue of the HRVW/KSH/M direction.

2) On the Existence of Short Admissible Pivot Sequences for LPs & LCPs, ***Tamas Terlaky***, Delft Univ. of Tech., Dept. of Tech. Math. & Info., Fac. of ITS, Mekelweg 4, Delft, 2600 GA, The Netherlands, t.terlaky@twi.tudelft.nl

We prove that short (at most n-steps) admissible pivot sequences exist from any basis to an optimal basis. This might indicate the existence of a polynomial criss-cross method. Observe the contrast with the challenging d-step conjecture (Hirsch conjecture). We still have no evidence of the existence of short feasible pivot sequences.

3) Developments in Interior-Point Software, ***Stephen J. Wright***, Argonne National Lab., Dept. of Math. & Comp. Sci., 9700 S Cass Ave., Bldg. 5, Argonne, IL 60439, wright@mcs.anl.gov, ***Michael Wagner***

Interior-point algorithms for linear programming have matured, but developments in the software are ongoing. We compare and contrast some of the very good codes not available. We also discuss developments in the areas of sparse linear algebra, parallel implementation, and network server implementations.

WA17 Metaheuristics I

Contributed Session

Chair: Alan W. Johnson, AFIT, 802 Golden Dr., Beavercreek, OH 45434, ajohnson@afit.af.mil

1) A General Convergence Result for Hill Climbing Algorithms, ***Alan W. Johnson***, AFIT, 802 Golden Dr., Beavercreek, OH 45434, ajohnson@afit.af.mil, ***Sheldon H. Jacobson***

GHC algorithms provide a general methodology to address intractable discrete optimization problems. A proof of convergence of GHC algorithms is presented that relaxes the sufficient conditions for the most general convergence proof for stochastic search algorithms in the literature. Examples are given and implications are discussed.

2) New Convergence Results for Generalized Hill Climbing Algorithms, ***Kelly A. Sullivan***, VA Polytech. Inst. & State Univ., ISE Dept., Blacksburg, VA 24060, sullivak@vt.edu, ***Sheldon H. Jacobson***

Generalized hill climbing algorithms provide a unifying framework for addressing difficult discrete optimization problems. New convergence results are presented using a unique iteration classification idea. The implications of these results are discussed.

3) A New Approach to the Non-Guillotine Cutting Problem, ***Victor M. Parada***, Univ. de Santiago de Chile, Av Ecuador #3659 Est. Central, Santiago RM, Chile, vparada@toqui.usach.cl, ***Lorena Pradenas***, ***Rodrigo Palma***

In this work the non guillotine cutting problem is considered. Such a problem has been modeled and solved by means of a new constructive and evolutive method. This method is based on informed methods and evolutionary algorithms. Numerical results are provided.

WA18 Metaheuristics I

Cluster: Metaheuristics
Invited Session
Chair: M. G. A. Verhoeven, BaaN Co., Zonneoordlaan 17, PO Box 250, BG Ede, 6710, The Netherlands, mverhoeven@baan.nl

1) AutoGraphiX: A System for Finding Extremal Graphs, ***Gilles Caporossi***, Ecole Polytech. of Montreal, GERAD, 3000 Cote Ste. Catherine, Montreal, Quebec, H3T 2A7, Canada, gillesc@crt.umontreal.ca, ***Pierre Hansen***

The variable neighborhood search metaheuristic is applied to the problem of finding external graphs for various graph invariants or formulae involving such invariants. This leads to automated or assisted refutation of conjectures, formulation of new ones and hints at proofs of such conjectures.

2) Solving the Maximum Clique Problem Through Evolutionary Search, ***Patrick Soriano***, Ecole Polytech., Univ. of Montreal, CP 6128 Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, patrick@crt.umontreal.ca, ***Michel Gendreau***

We present an evolutionary search procedure for the MCP. In this algorithm, offsprings are obtained by a two-step process. First, a "clique core" is extracted from two parent cliques by considering their vertex-set intersection along with a single vertex taken from their symmetric difference. This core is then expanded into...

3) Local Search for Resource-Constrained Scheduling, ***M. G. A. Verhoeven***, BaaN Co., Zonneoordlaan 17, PO Box 250, BG Ede, 6710, The Netherlands, mverhoeven@baan.nl

I present a local search algorithm for a resource constrained scheduling problem. In this problem machines are capable of processing several operations simultaneously, and operations may require multiple resources for processing with different processing times on each resource. Furthermore, operations may have several alternative resource sets by which they can be processed.

WA19 Locational Optimization with Imprecise Data

Sponsor: SOLA
Sponsored Session
Chair: Barbaros C. Tansel, Bilkent Univ., Dept. of IE, Bilkent, Ankara, 06533, Turkey, barbaros@bilkent.edu.tr

1) Minmax-Regret Solutions for Some Location Models Under Uncertainty, ***Igor Averbakh***, Western WA Univ., 516 High St., MS 9063, Math. Dept., Bellingham, WA 98225-9063, averbakh@cc.wwu.edu

We consider a number of location models on networks with uncertain lengths of edges and/or uncertain weights of nodes, where it is required to find the sol-called "minimax-regret" solution. Complexity issues and polynomial algorithms for tractable cases will be discussed.

2) Robustness Approach in 1-Median Location with Time Dependence & Data Uncertainty, ***Muhittin H. Demir***, Bilkent Univ., Dept. of IE, Bilkent, Ankara, 06533, Turkey, hdemir@bilkent.edu.tr

We study the 1-median problem on a network where the demands and edge lengths are either linear functions of time or are specified by a source set of discrete scenarios. We analyze the problem with respect to three different min-max criteria.

3) Robust Solutions to Single- & Multi-Period Machine Layout Problems with Interval Flows, ***Ozgur A. Tufekci***, Bilkent Univ., Dept. of IE, Bilkent, Ankara, 06533, Turkey, aozgur@bilkent.tr, ***Barbaros C. Tansel***

We consider the machine layout problem with unknown material flows that are assumed to lie in a priori specified intervals. We formulate the problem and give methods to compute robust (minimax regret) solutions for the single and multi-period problems.

4) Modeling & Analysis of Optimality Concepts in Multifacility Total Cost Location on a Tree with Interval Data, ***Muhittin H. Demir***, Bilkent Univ., Dept. of IE, Bilkent, Ankara, 06533, Turkey, hdemir@bilkent.edu.tr, ***Barbaros C. Tansel***

We consider the multifacility with mutual communication problem on a tree when demands and edge lengths are intervals rather than point values. We propose different concepts of optimality for the problem and give methods for the construction of the optimal sets. Extensions to robustness criterion are also given.

WA20 Continuous Location Problems

Sponsor: SOLA
Sponsored Session
Chair: Zvi Drezner, CA State Univ., Dept. of MS/IS, Fullerton, CA 92834, zdrezner@fullerton.edu

1) The Location of Protection Devices on an Electrical Tree Network: A Heuristic Approach, ***J. C. James***, Univ. of Birmingham, Dept. of Math. & Stats., Birmingham, B15 2TT, UK, ***Said Salhi***

An electrical tree network consists of electrical cables wh ich transmit the electricity at various voltages. The objective is to position protection devices so that the least number of customers are affected by any given fault on the network. Two approaches are used for this prupose, namely, a frequency based method and some implementations of metaheuristics such as SA and TS...

2) Locating a Server on a Network of Unreliable Machines Using Approximations, ***Oded Berman***, Univ. of Toronto, Fac. of Mgmt., 105 St. George St., Toronto, Ontario, L4J 3B7, Canada, berman@fmgmt.mgmt.utoronto, ***Sandeep Vasudeva***

The problem requires finding the system uptime, which involves dealing with a very large number of states of the system. We concentrate on developing approximate models, which, with a relatively small compromise in accuracy, make the uptime calculation for problems of practical interest possible.

3) Tabu Search Methods in Maximum Normal Probability Covering Problems, ***Zvi Drezner***, CA State Univ., Dept. of MS/IS, Fullerton, CA 92834, zdrezner@fullerton.edu, ***George O. Wesolowsky***

We consider a product which has several measurements. It is considered usable if each of these measurements is within a given tolerance from the measurements of the user. A manufacturer is producing such items and would like to have several measurement combinations to fit a large proportion of a population...

WA21 Advances in Microscopic Traffic Simulation III

Cluster: Advances in Microscopic Traffic Simulation
Invited Session
Chair: Moshe E. Ben-Akiva, MIT, Dept. of Civil & Env. Eng., 77 Massachusetts Ave. Rm 1-181, Cambridge, MA 02139, mba@mit.edu

1) Determining the Dynamic User Equilibrium in a Traffic Simulation Model, ***Christian Gawron***, Univ. of Cologne, Ctr. for Parallel Comp., Weyertal 80, Koln, 50931, Germany, gawron@zpr.uni-koeln.de

We present an iterative algorithm to determine the dynamic user equilibrium in traffic simulation models. The route choice of each driver is modelled by a probability distribution which is iteratively shifted to minimize the cost for the drivers. The stability of the algorithm is analyzed for a simple example network.

2) Toward a Statistical Classification of Traffic Flow, ***Peter Wagner***, German Aerospace Research est., Div. FF-MS, Linder Hoehe, Koeln, D-51147, Germany, peter.wagner@dlr.de, ***Stefan Krauss***, ***Christian Gawron***

By using a statistical method, the velocity time-series of traffic flow (single car data) is decomposed into small pieces which are approximately stationary. Subsequent clustering yields statistically homogeneous groups, enabling a more reliable determination of observables. The results can be used to design better tests for microscopic models.

3) The Applicability of Greatly Simplified Microscopic Traffic Flow Models to Real-World Traffic, ***Stefan Krauss***, German Aerospace Research Est., Division FF-MS, Linder Hoehe, Koeln, D-51147, Germany, stefan.krauss@dlr.de, ***Peter Wagner***, ***Christian Gawron***

In recent years, new microscopic model approaches, that describe traffic using greatly simplified equations of motion for individual vehicles (for instance cellular automation models), have been proposed. The validity and robustness of some of these approaches is investigated within a unified theoretical framework. It is shown, which model properties are essential to acquire a valid model...

4) Modeling Technology Improvements at a Truck Weigh Station, ***Richard A. Glassco***, MITREtek Systems, 600 Maryland Ave. SW, Ste. 755, Washington, DC 20024, rglassco@mitretek.org

The Westa model simulates the motion and routing of trucks at each stage

through a weigh station. The paper quantifies the benefits of electronic transponders, weigh-in-motion scales, and computer-aided safety inspection, in terms of reducing delay and queue spillback to the highway, and increasing safety and efficienty.

WA22 Frameworks for Group Decision & Negotiation: Decision Support for Negotiators

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: Keith W. Hippel, Univ. of Waterloo, Fac. of Eng., Systems Design Eng., Waterloo, Ontario, N2L 3G1, Canada, kwhipel@sysoffice.watstar.uwaterloo.ca

Co-Chair: Marc Kilgour

1) Qualitative & Quantitative Criteria in Negotiation Support, *Siamak Rajabi*, Univ. of Waterloo, Dept. of Systems Design Eng., Waterloo, Ontario, N2L 3G1, Canada, siamak@watnow.uwaterloo.ca, ***Marc Kilgour, Keith W. Hippel***

Negotiators must frequently compare alternative according to measures of their performance on several agreed-upon criteria. Standard MCDM methods, including screening of undesirable alternatives, may be difficult to apply when both qualitative and quantitative criteria are included. Procedures for isolating better alternatives are described and investigated.

2) A Multi-Strategy Reasoning System for Environmental Conflict Resolution, ***Jason K. Levy***, Univ. of Waterloo, Dept. of Systems Design Eng., Waterloo, Ontario, N2L 3G1, Canada, jlevy@systems.watstar.uwaterloo.ca, ***Keith W. Hippel, Marc Kilgour***

To improve environmental conflict resolution, a comprehensive multi-strategy reasoning system is proposed that integrates inductive (case-based) reasoning with deductive (rule-based) reasoning. The architecture and inference mechanism are designed to induce cooperation in managing complex environmental phenomena, despite differences in objectives, preferences, and responsibilities.

3) GMCR II:Interface Design for Negotiation Support, ***Xiaoyong Peng***, Univ. of Waterloo, Dept. of Syst. Design Eng., Waterloo, Ontario, ON N2L 3G1, Canada, xjpeng@watnoow.uwaterloo.ca, ***Liping Fang, Marc Kilgour, Keith W. Hippel***

4) Coalition Analysis in Negotiation Support, ***Marc Kilgour***, Wilfrid Laurier Univ., Ctr. Mil. Strategic & Disarm., Waterloo, Ontario, N2L 3C5, Canada, mkilgour@mach1.wlu.ca, ***Keith W. Hippel, Liping Fang, Xiaoyong Peng***

Negotiation Support Systems have difficult analyzing the vulnerability of states to coalition formation. States stable against individual moves may become unstable when coalitions consider sequences of moves that benefit all their members. The likelihood of such sequences can be measured, enabling NSSs to assess stability against coalition formation.

WA23 Implementing Decision Analysis in Large Organizations

Sponsor: Decision Analysis Society
Sponsored Session

Chair: David C. Skinner, 5711 Henniker Dr., Houston, TX 77041, skinnerdc@aol.com

1) Defining Team Processes in Decision Analyses, ***James McCuish***, Amoco, 3700 Bay Area Blvd., Houston, TX 77058, jdmccuish@amoco.com

In applications of DA, teams often have difficulty in following through after the initial framing. At Amoco, we utilize approaches from both value engineering and project management tools to augment the team's planning and define steps to apply the appropriate DA s. We present the methods used and discuss their relative successes.

2) Implementing DA in a Large Company: The Conoco Model, ***Ellen M Coopersmith***, Conoco Inc, 600 North Dairy Ashford, P O Box 2197, Houston, TX 77252-2197

Many companies attempt to implement DA in their organizations, all using different implementation strategies and results. Conoco has implemented the process in an attempt to make better decisions and to change the decision culture of the company. We discuss Conoco's business environment, implementation strategy, results and critical success factors associated with their success to date.

3) Experience of Applying Decision Analysis to Equipment Maintenance Planning, ***Daniel I. Ash***, Southwest Research Inst., Materials & Structures Div., 6220 Cuebra Rd., San Antonio, TX 78238-5166, ***David A. Mauney***

We illustrate maintenance planning for a variety of equipment in the power generation, petroleum refining, petroleum production and gas pipeline industries. Also, the unique application of DA techniques is discussed.

4) withdrawn - author request of 3/8, ***Phil Kerig***, Conoco, Inc., POB 2197, Rm. MC 3075, Houston, TX 77252-2197

WA24 DEA II

Contributed Session

Chair: Cornelis van de Panne, Univ. of Calgary, Dept. of Econ., Calgary, Alberta, T2N 1N4, Canada, vandepan

1) Data Envelopment Analysis as an Alternative to Linear Programming, ***Alexander Y. Vaninsky***, Netanya Academic Coll., Haviva Raich St. 58/3, Haifa, 32542, Israel, vaninsky@mail.netanya.ac.il, ***Shlomo Maital***

DEA is modified to permit constraints on inputs and/or outputs, and applied to project optimization. It provides major advantages over the conventional LP approach. In particular DEA permits non-linear objective function, and does not require empirical estimates of its coefficients. The concepts of resource-intensive and resource-extensive efficiecies are introduced. A numerical example is provided.

2) Modeling Categorical Variables in Data Envelopment Analysis, ***Richard E. Wendell***, Univ. of Pittsburgh, Katz Grad. Sch. of Bus., 262 Mervis Hall, Pittsburgh, PA 15260, wendell@katz.business.pitt.edu

In 1986 Banker and Morey introduced the important concepts of controllable and noncontrollable categorical variables. Unfortunately, their model for controllable variables had an error to which subsequent corrections have been proposed. Here we present an alternative approach to correcting the error, an approach yielding simpler and more flexible models for both the controllable and noncontrollable case.

3) The Concept of Representativeness as a Technique for Ranking Efficient Units, ***Moez Hababou***, York Univ., Schulich Sch. of Bus., Office 345, 4700 Keele St., North York, Ontario, M3J 1P3, Canada, mhababou@bus.yorku.ca, ***Wade D. Cook***

We present an alternate approach to prioritize DMUs in DEA based on representativeness where we assume that inefficient units are not equally important to the decision maker. Ranking efficient units is obtained by the mean of an optimization problem in which we consider that representing an inefficient unit belonging to a specific cluster is of higher importance than representing a unit belonging to another...

4) withdrawn - author request of 3/6, ***Cornelis van de Panne***, Univ. of Calgary, Dept. of Econ., Calgary, Alberta, T2N 1N4, Canada, vandepan, ***Mohammad R. Alirezaei***

WA25 Applied Probability I

Contributed Session

Chair: Karl Sigman, Columbia Univ., Dept. of IEOR, 500 W 120th, MC 4704, New York, NY 10027, sigman@ieor.columbia.edu

1) Independent Sampling of a Stochastic Process, ***Karl Sigman***, Columbia Univ., Dept. of IEOR, 500 W 120th, MC 4704, New York, NY 10027, sigman@ieor.columbia.edu, ***Peter W. Glynn***

When does sampling a stochastic process X at the times of an independent point process yield its time average distribution? Two main cases are considered: when X is asymptotically stationary and ergodic, and the point process satisfies a mixing condition, and when X has a constant finite time average.

2) Change in Probability Measures: An Application, ***Andrew W. Braunstein***, Iona Coll., Hagan Sch. of Bus., 715 North Ave., New Rochelle, NY 10801, abraunstein@iona.edu, ***Michael McGrath, Donn R. Pescatrice***

Logistic regression analysis techniques are employed in a model used to predict whether or not accepted applicants actually enroll at a private college. Delta-p statistics reflecting changes in the probability of enrollment associated with various demographic, academic and financial factors are calculated. Results are generated separately for 3 years for each.

3) Principal Components for Rank Order Data, ***Jill T. Richie***, RPI, Dept. of DS/ES, CII 5015, Troy, NY 12180, thomlj@rpi.edu, ***Madabhushi Raghavachari***

Principal components analysis transforms correlated interval-scaled variables into uncorrelated variables while preserving the underlying correlation structure. Real data, however, is often rank order (ordinal) only. We investigate methodologies for principal component analysis of rank order data when the correlation matrix is composed of rank correlations.

4) New Techniques for the Coupon-Collector Problem, ***Shahar Boneh***, Metropolitan State Coll., Dept. of Math., POB 173362, Denver, CO 80217-3362, bonehs@mscd.edu

The CCP deals with the number of samplings needed until we observe all the N coupons, which may have different probabilities. We will discuss a new approach for studying the detection curve in CCP with applications to LP.

WA26 Spatial Stochastics

Sponsor: Applied Probability Section
Sponsored Session
Chair: Erhan Cinlar

1) Nonlinear Behavior of Spatially Distributed Queueing Systems, ***Dimitris Bertsimas***, MIT, Sloan Sch. of Mgmt., OR Ctr., E53-359, Cambridge, MA 02139, dbertsim@aris.mit.edu

The waiting time in usual queueing systems behaves as $0(1/(1-\rho))$, where $/rho$ is the traffic intensity. We show natural examples of spatially distributed queueing systems, in which the waiting time behaves like $0(1/(1-\rho)*a)/log(1/(1-\rho)))$. These examples exhibit an interesting interplay between queueing systems and discrete optimization.

2) Birth & Death on Flows, ***John S. Kao***, Univ. of San Francisco, Dept. of Math., 2130 Fulton St., San Francisco, CA 94117, kao@euclid.math.usfca.edu

An important class of problems in oceanography concerns the Lagrangean dynamics of pollutant particles transported by a turbulent flow. Models of Birth and Death on Flows attempt to predict the spatial distribution of contaminants by marrying the theories of birth-death processes with that of stochastic flows. This talk summarizes recent results regarding equilibrium behavior, statistical estimation, and numerics for these models.

3) Approach to Stationarity for Birth & Death on Brownian Flows, ***Michael J. Phelan***, RAND Corp., Dept. of Stats., 1700 Main St. POB 2138, Santa Monica, CA 90407, mphelan@rand.org

We consider a model for mass transport by a flow called a Birth and Death on a Brownian Flow. This Markov process takes values in the space of counting measures, so its stationary states describe point processes representing equilibrium distributions of points of unit mass. The idea for the model...

4) withdrawn - author request of 3/2, ***Richard F. Serfozo***, GA Inst. of Tech., Sch. of ISyE, 765 First Dr., Atlanta, GA 30332-0205, rserfozo@isye.gatech.edu

WA27 Large-Scale Energy Models

Sponsor: ENRE
Sponsored Session
Chair: Richard J. Loulou, McGill Univ. & GERAD, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, loulou@management.mcgill.ca

1) Analysing Interprovincial Cooperation in Response to Uncertain GHG Caps with an Advanced Bottom-Up Model, ***Richard J. Loulou***, McGill Univ. & GERAD, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, loulou@management.mcgill.ca, ***Claude Berger***, ***Amit Kanudia***

When uncertain GHG emission caps are imposed on several countries (or provinces), the degree of coordination and cooperation between them greatly influences the expected cost of meeting the targets. The Extended MARKAL model is used to explore cooperation via electricity exchanges and GHG permit trading.

2) The Influence of Canada Carbon Stabilization Programs on Natural Gas Exports to the US, ***Steven A. Gabriel***, ICF Kaiser Intl., 9300 Hwy, Fairfax, VA 22031-1207, sgabriel@icfkaiser.com, ***Bob Baron***, ***David Ribar***

We present the results of an analysis of the impact of Canadian carbon stabilization on exports of natural gas to the US. We make use of the Gas Systems Analysis Model, developed by ICF Kaiser for the US Dept. of Energy which computes market equilibrium prices, quantitites and flows in the North American natural gas market.

3) Decomposition of Multi-Regional Market Equilibrium Models, ***William Chung***, Univ. of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, wchung@mansci2.uwaterloo.ca, ***June Wu***, ***J. David Fuller***

Market equilibrium models, e.g. energy models, often distinguish several regions. We show how decomposition can be applied to non-optimization models, e.g. asymmetric variational inequality models. Dantzig-Wolfe and Lan-Fuller decomposition principles are adapted to decompose models into equilibrium submodels for each region. Preliminary tests on energy models are discussed.

WA28 Education Programs in Manufacturing

Sponsor: Forum on Education
Sponsored Session
Chair: James Bradley, Cornell Univ., 552 Malott Hall, Johnson Grad. Sch. of Mgmt., Ithaca, NY 14853-4201, jrb28@cornell.edu

1) The Executive Master of Manufacturing Management Program, ***Dean H. Kropp***, Washington Univ., Olin Sch. of Bus., 1 Brookings Dr., CB 1133, St. Louis, MO 63130, kropp@wuolin.wustl.edu

Washington University's Executive Master of Manufacturing Management (EM3) Program is a single degree joint venture between the John M. Olin School of Business and the School of Engineering and Applied Science EM3, a 24 month program offered to established professionals, hits all the essentials of modern management education.

2) Making the Next Generation of Manufacturing Engineer, ***Paul Rogers***, Dept of Mech Eng, Univ of Calgary, 2500 University Dr NW, Calgary, AB T2N 1N4, CANADA, rogers@enme.ucalgary.ca

This talk describes the newest accredited Manufacturing Engineering undergraduate program in Canada, which is the result of more than a decade of planning in collaboration with industry. We will discuss program philosophy, structure, industry participation, and how things may evolve over the next decade given the many external pressures on universities.

3) The Semester in Manufacturing, ***James Bradley***, Cornell Univ., 552 Malott Hall, Johnson Grad. Sch. of Mgmt., Ithaca, NY 14853-4201, jrb28@cornell.edu

The Semester in Manufacturing (SiM) at Cornell's Johnson School is designed to give students a basic understanding of the fundamentals of manufacturing, as well as a broad overview of current issues and trends. This 15-credit course develops the linkage of manufacturing to other functions in the enterprise.

WA29 Crew Planning & Management

Sponsor: Aviation Applications Section
Sponsored Session
Chair: Jun-Min Liu, TransQuest, 1001 Intl. Airport, Atlanta, GA 30354-1801, junmin.liu@transquest.com

1) A Two-Phase Genetic Algorithm-Based Approach for the Efficient Construction of Monthly Schedules for Airline Crew Members, ***Ioannis Christou***, Delta Tech. Inc., 1921 W. Dayton St., Madison, WI 53706, ***Armand Zakarian***

We propose a 2-phase algorithm for the construction of high quality monthly schedules, called lines of time, for the pilots of Delta Airlines. The first phase constructs as many high quality lines of time as possible based on a user-defined metric of quality. Most of the tasks, or pairings, that the crew members must fly for the given period are assigned in this phase...

2) Solving Non-Uniform Crew Scheduling Problem, ***Dasong Cao***, TransQuest Info. Solutions, 101 Crawfords Corner Rd., Rm. 2L-332, Holmdel, NJ 07733, USA

Traditionally, crew scheduling problems are formulated as a set partitioning, or covering, problem. The formulation is based on the assumption that the crew requirements for each plane leg is identical. This may not be always true; different legs may have different crew sizes, i.e., the crew size is not uniform. We developed and implemented a method to solve non-uniform crew scheduling problems.

3) Reserve Lines of Time, ***Milind Sohoni***, Tranquest Information Solutions, 53-8A Winding Wood Dr, Sayreville, NJ 08872

The problem of generating reserve lines of time for airline pilots is closely linked to the reserve coverage requirements of the airline during a given bid period. We propose a solution procedure that looks at the best estimate of the required reserve coverage and generates reserve lines to cover these requirements...

4) Crew Scheduling Under Uncertainty, ***Andrew J. Schaefer***, 4602 Noble Creek Dr NW, Atlanta, GA 30327-5133, schaefer@isye.gatech.edu, ***Ellis L. Johnson***, ***Anton J. Kleywegt***, ***George L. Nemhauser***

Standard crew scheduling models are deterministic and do not consider the adverse effects of disruptions. We present a daily crew scheduling model which takes possible disruptions into account and develop schedules to reduce crew costs incurred during operations.

WA31 New Technologies in Logistics

Sponsor: Section on Logistics
Sponsored Session
Chair: Arthur Hsu, Carnegie Mellon Univ., GSIA, Pittsburgh, PA 15213-3890, art@om.gsia.cmu.edu om.gsia.cmu.edu

1) Sourcing of Supply in the Presence of Imperfect Yield, ***Shitao Yang***, Chinese Univ. of Hong Kong, Dept. of SE & EM, Shatin NT, Hong Kong, styang@se.cuhk.edu.hk, ***Arthur Hsu***

We find the optimal quantities to order from a set of suppliers with different yield proportion distributions. The yield proportion may depend on the order quantity. This explains why a low-volume buyer must order from many suppliers to achieve the same reliability as a high-volume buyer can with one.

2) Uncertainty Modeling & Management in MRP Systems, ***Ramesh Bollapragada***, Lucent Tech. Bell Labs., 101 Crawfords Corner Rd., Rm. 2L-515, Holmdel, NJ 07733, rbollapragada@lucent.com, ***Uday S. Rao***

We examine an MRP environment with demand and supply uncertainty, capacity limits and service level requirements. A stochastic program of the static, finite horizon problem is presented. For feasible instances, we exploit properties of the model to develop optimal/ heuristic solutions that are tested computationally. Our algorithm may also be used to identify a good, feasible combination of capacity and service level.

3) A Framework Integrating Inventory Decision with Product & Service Offerings in Supply Chains, ***Arthur Hsu***, Carnegie Mellon Univ., GSIA, Pittsburgh, PA 15213-3890, art@om.gsia.cmu.edu om.gsia.cmu.edu, ***Dajun Zeng***

We develop a framework that analyzes the interaction between multi-echelon inventory control, management of supply chain activities and a marketing model. Management chain activities are a stochastic extension of our previous work on leadtime-cost tradeoffs in supply chain networks. The marketing model considers selecting a mix of product and service offerings.

WA32 Reliability I

Contributed Session
Chair: James Flynn, Cleveland State Univ., Dept. of OM & Bus. Stats., Cleveland, OH 44115, j.flynn@popmail.csuohio.edu

1) Optimal Component Test Plans for Series System Reliability with Exponential Failure times, ***Madabhushi Raghavachari***, RPI, 112 8th St., CII 5th Fl., Troy, NY 12180-3590, ragavm@rpi.edu

The determination of optimal component test plan for a series system reliability with exponential failure times was considered by Rajgopal & Majumdar (Technometrics, 1995). We show that this problem is equivalent to a linear programming problem. This equivalence yields an improved algorithm for the problem.

2) Maintenance Policy Structure Characterization for Three States of Deterioration with Probabilistic Monitoring, ***Julie E. Simmons***, Univ. of MI, 2249 Cram Place, Apt. 5, Ann Arbor, MI 48105, jsimmons@engin.umich.edu, ***Stephen M. Pollock***

We prove (using the theory and results of POMDPs) that for three states of deterioration, the policy that minimizes the total expected cost of system maintenance has a monotonic structure. This allows us to represent the optimal policy by a collection of decision rules characterized by at most three functions.

3) Order Statistics Using Correlated Random Variables, ***Huseyin Sarper***, Univ. of Southern CO, 2200 Bonforte Blvd., Pueblo, CO 81001, sarper@uscolo.edu, ***Suriya Ruangpattana***

Extreme value and range distribution statistics are presented for various common aircraft and spacecraft engine configurations. Underlying random variables, e.g. engine lives, are considered as correlated to each other. Both simulation and analytical methods are used to assess reliability of various system scenarios using risk analysis.

4) A Branch & Bound Algorithm for Computing Optimal Replacement Policies in Consecutive k-out-of-n Systems, ***James Flynn***, Cleveland State Univ., Dept. of OM & Bus. Stats., Cleveland, OH 44115, j.flynn@popmail.csuohio.edu, ***Chia-Shin Chung***

Earlier, we showed that for an undiscounted, infinite horizon, DP model of a consecutive k-out-of-n system, there exists a critical component policy optimizing the component replacement and system failure costs. Here, we develop a B&B algorithm for computing such policies. Numerical tests illustrate its effectiveness.

WA33 Marketing II

Contributed Session
Chair: Jack A. Lesser, Miami Univ., Dept. of Mktg., Oxford, OH 45056, lesserja@miamiu.muohio.edu

1) Preliminary Framework of Ego Development Dimensions in Consumer Behavior, ***Jack A. Lesser***, Miami Univ., Dept. of Mktg., Oxford, OH 45056, lesserja@miamiu.muohio.edu

Within the social sciences, Loevinger and others developed ambitious ego development models to examine human development and change. This research develops a preliminary conceptual framework of ego dimensions for consumer behavior. The framework can be used to develop ego development scales in marketing to examine consumer change.

2) Brand Equity Scale Development, ***Naveen Donthu***, GA State Univ., Dept. of Mktg., Atlanta, GA 30303, ndonthu@gsu.edu http://www.gsu.edu/~mktnnd, ***Boonghee Yoo***

We present the development and validation of a consumer-based overall brand equity scale using data from a multi-product multi-country study.

3) A Psychometric Look at Global Branding & Market Introduction in Developing Economies, ***Pandora L. Patton***, Maryhurst Coll., Box 300001-5280, Las Cruces, NM 88003, ppatton@nmsu.edu http://web.nmsu.edu/~ppatton/365.html, ***Charles R. Patton***

The use of the model of psychic distance in measuring product diffusion and export performance involves six multinationals in the Caribbean: Colgate Palmolive, Kraft, Nestle, Proctor & Gamble, Quaker Oats, Unilever. The Caribbean has several developing ecnonomies where this research is from: Grand Cayman, Aruba, St. Maarten, Bahamas, Barbados and Jamaica.

4) Warranty Practices in Service Industries, ***Jay G. Patankar***, Univ. of Akron, Dept. of Mgmt., 259 S Broadway, Akron, OH 44325-4801, jpatankar@uakron.edu, ***Amit Mitra***, ***Il-woon Kim***

We explore warranty practices in service industries. Issues addressed include the nature of warranty, cost of warranty service, and the administration of warranty. Survey research was sponsored by the National Association of Service Managers (NASM).

WA34 Advanced Concepts in Information Systems

Sponsor: College on Artificial Intelligence
Sponsored Session
Chair: Alok Chaturvedi, Purdue Univ., Krannert Sch. of Mgmt., W Lafayette, IN 47907, alok@mgmt.purdue.edu

1) G-Viss, Intergrating Visual Interaction Modeling with Multiple Criteria Group Decision Support Systems, ***Sreedhar Sundaram***, Blackwell Consulting Services, 100 S Wacker Dr., Ste. 200, Chicago, IL 60606, sree@bcsinc.com, ***Hemant K. Jain***

To analyze multi-dimensional group decision problems, an approach Combining the technologies of GDSS and VIM is presented. A prototypical system called G-VISS is described. G-VISS stands for group visual interactive support system whose architecture is essentially that of a GDSS which can support MCDM problems using VIM.

2) Synthetic Economy for Advanced Simulations, ***Alok Chaturvedi***, Purdue Univ., Krannert Sch. of Mgmt., W Lafayette, IN 47907, alok@mgmt.purdue.edu, ***Shailendra Mehta***

We describe a research testbed called SEAS. SEAS provides a collaborative teaching and research infrastructure, available globally through the Internet. In this synthetic economy participants can simulate decisions at the strategic, tactical, or operational levels for any type of firm in any industry, in any economy.

3) Economics of Software Reusability, ***Vijay Mookerjee***, Univ. of WA, Sch. of Bus., 370 Mackenzie Hall, Seattle, WA 98195

Software reuse can be studied using models of sequential investments under uncertainty. Reusability efforts made early may be recovered if future versions of the product are launched. However, these efforts must be traded off with short term goals of delivering a product with time and budget constraints.

WA35 Routing In Communication Networks

Cluster: Networks
Invited Session
Chair: Andrzej Proskurowski, Univ. of OR, Comp. Sci. Dept., Eugene, OR 97403, andrzej@cs.uoregon.edu

1) Mass Transit as Gossiping, ***David Krumme***, Tufts Univ., EECS Dept., Medford, MA 02155, krumme@cs.tufts.edu

In the gossiping problem, each participant knows an item of information and

wishes to communicate it to all others. Consider a mass transit system. A passenger arrives at an arbitrary station wishing to be carried to an arbitrary destination. One can view a schedule for a mass transit system as a solution to a gossiping problem. We explore such a view of transportation systems...

2) Compact Routing, ***Pierre Fraigniaud***, CNRS, Lab. de Info. du Parallelisme, Ecole Nor. Superieure de Lyon, Lyon Cedex, 69364, France, pfraign@ens-lyon.fr

We present some basic techniques (e.g., interval routing) used to encode routing functions so the result of the encoding makes use of a small amount of memory space. We recall that 1 of the main results of this theory is the incompressibility of the routing tables as far as shortest-path routing and worst case analysis are concerned...

3) Fault-Tolerant Broadcasting in Trees, ***Andrzej Pelc***, Univ. du Quebec, Dept. of Info., CP 1250, Succ. B, Quebec, Quebec, J8X 3X7, Canada, pelc@uqah.uquebec.ca, ***P. Panaite***

We consider broadcasting a message from 1 node of a tree to all other nodes. In the presence of link failures the tree becomes disconnected and only nodes in the connected component C containing the source can be informed. The maximum ratio between time used by a broadcasting scheme to inform C and 'ptimal time to inform C, taken over all components C yielded by configurations of at most k faults, is the k-vulnerability of the broadcast scheme...

4) Forwarding Indices of Networks & Their Applications, ***Dominique Sotteau***, CNRS, LRI, Paris-Sud, LRI, Bat. 490, Univ. Paris Sud, Orsay Cedex, 91405, France, sotteau@lri.fr, ***Marie-Claude Heydemann***

For a given connected graph, a routing is a set of simple paths specified for every ordered pair of vertices. The vertex forwarding index of a graph with a given routing is the maximum number of paths passing through any vertex of the graph. The parameter corresponds to the maximum amount of forwarding done by any node when messages are exchanged over all pairs of vertices...

WA36 Nonlinear Networks Problems

Cluster: Networks
Invited Session
Chair: Panos M. Pardalos, Univ. of FL, 303 Weil Hall. ISE Dept., Ctr. for Applied Opt., Gainesville, FL 32611-6595, pardalos@ufl.edu

1) Network Modeling of International Financial Equilibria with Hedging: Statics & Dynamics, ***Anna B. Nagurney***, Univ. of MA, Sch. of Mgmt., Dept. of Finance & OM, Amherst, MA 01003, nagurney@gbfin.umass.edu, ***Stavros Siokos***

We develope international financial equilibrium models with hedging and demonstrated the network structure of the individual sector's optimization problems as well as that of the economy in equilibrium. We utilize variational inequality theory for the analysis of the statics and projected dynamical systems theory for the dynamics, including the computational procedure.

2) A Dynamic Slope Scaling Procedure for Solving Fixed Charge Network Flow Problems, ***Dukwon Kim***, Univ. of FL, Cntr. for Applied Opt., ISE Dept., 303 Weil Hall, Gainesville, FL 32611-6595, dkim@thalia.ise.ufl.edu, ***Panos M. Pardalos***

We present a new approach to the general capacitated Fixed Charge Network Flow Problem (FCNFP) by adapting an economic viewpoint to the fixed charge. A new concept of the dynamic slope scaling procedure is presented and some numerical results on a wide range of randomly generated problems are reported.

3) New Solution Methods for Nonconvex Network Optimization Problems, ***Bruce W. Lamar***, MITRE Corp., Economic & DA Ctr., 202 Burlington Rd., Bedford, MA 01730, bwlamar@mitre.org, ***Gavin J. Bell***

Many real world network-related optimization problems involve nonconvex costs such as fixed-charges, price-breaks, or other economies of scale. Furthermore, determining the globally optimal solution for large-scale problems is very difficult. We present several recent computational techniques that significantly reduce the solution time for these problems.

4) A GRASP for the Steiner Problem in Graphs, ***Kristina Holmqvist***, Linkoping Inst. of Tech., Div of Opt., Dept. of Math., Linkoping, S58183, Sweden, ***Athanasios Migdalas, Panos M. Pardalos, Mauricio G.C. Resende***

Due to its numerouse applications in areas such as manufacturing systems and communication and Transportation network design, the Steiner problem in Graphs (SPG) has attracted much attention. We consider the heuristic technique GRASP for solving the SPG. Computational results are reported.

WA37 Neural Networks

Sponsor: CSTS
Sponsored Session
Chair: Bruce L. Golden, Univ. of MD, PO Box 149, Simpsonville, MD 21150, bgolden@umdac.umd.edu

1) Support Vector Models for Individual Tree Mortality, ***Kristin Bennett***, RPI, Math. Sci. Dept., Troy, NY 12180, bennek@rpi.edu, ***Susan L. King, Shannon List***

The support vector methodology, a powerful new approach for classification, is applied to predicting noncatastrophic individual tree mortality. The method is used to produce polynomial, neural network, and radial basis function discrimination functions. Computation issues are discussed and the results are compared with logistic regression and backpropagation methods.

2) Approximation of Multiattribute Utility Functions Using Radial Basis Function Networks, ***Theodore Trafalis***, Univ. of OK, Sch. of IE, 202 W. Boyd, Ste. 124, Norman, OK 73019, trafalis@mailhost.ecn.ou.edu, ***Milan Milatovic***

We discuss as comparative study where radial basis function and backpropagation networks are used as an approach for approximating a decison makers's utility function. Training and testing sets are limited to a small number of alternatives, and each evaluated on several criteria. Preliminary computational results are provided and discussed.

3) Predicting the Success of Nations in the Olympics Using Neural Networks, ***Bruce L. Golden***, Univ. of MD, PO Box 149, Simpsonville, MD 21150, bgolden@umdac.umd.edu, ***Ed Condon, Edward A. Wasil***

We construct neural network models that predict the point score for a country participating in the Summer Olympic Games. Our data set consists of results from the 1996 Games (273 Olympic events) and information we gathered on 29 independent variables for 195 of the 197 participating countries.

WA38 Resource Management in ATM Networks

Sponsor: TST
Sponsored Session
Chair: Hussein T. Mouftah, Queen's Univ., Dept. of Elect. & Comp. Eng., Kingston, Ontario, K7L 3N6, Canada, mouftah@eleceng.ee.queensu.ca

1) Title Design & Implementation of Point-to-Multipoint ABR Services, ***Wenfeng Chen***, Queen's Univ., Dept. of Elect. & Comp. Eng, Kingston Ontario, K7L 3N6, Canada, wfchen@nortel.ca, ***Hussein T. Mouftah***

This work analyzes the functional and performance requirements of the point-to-multipoint ABR services in ATM networks. An Explicit-Rate-based flow control mechanism is extended to cover this multicasting service with elaborated algorims for rate computation and synchronization. The performance is evaluated via simulation as well as mathematical analysis.

2) ATM Network Design for Multimedia Applications, ***Janelle Harms***, Univ. of Alberta, Dept. of Comp. Sci., Edmonton, Alberta, T6G 2G3, Canada, harms@cs.ualberta.ca, ***Neil Flynn***

The problem of configuring a network of ATM switches to provide performance guarantees is complicated by the need for the network to efficiently support different traffic media (such as voice, video and data). We consider different methods of designing the physical network to provide multiple virtual paths (for different media streams) between source pairs in order to meet quality of service requirements.

3) On Virtual Finish Time-Based Packet Fair Queueing Algorithms, ***Tao Yang***, Dalhousie Univ., Dept. of IE, Halifax, Nova Scotia, B3J 2X4, Canada, yangt@tuns.ca

We study a class of PFQ algorithms in which packets are served in order of their virtual finish times. The objective is to examine the impact of the system virtual time on the performance (fairness and delay bounds) of a PFQ algorithm and to provide guidance on the design of PFQs.

eA30 Defense Enterprise Management

Cluster: Military Applications
Invited Session
Chair: Lynne M. Sullivan, Dept. of Defense, 1100 Defense Pentagon, Room 3C965, Washington, DC 20 01-1100, sullival@oousdc.osd.mil

1) An Enterprise Management Model for DoD Installation Management, ***David L. Olson***, CALIBRE Systems, Inc., 5111 Leesburg Pike, Ste. 514, Falls Church, VA 22041, ***Rainer Sommer***

We provide an overview of Defense Enterprise Planning and Management as

applied to the management of DoD installations. The installations model includes strategic planning, performance measurement, management by processes and process-aligned ISs.

2) Reengineering the Army Planning Process, ***Larry Kelly***, CALIBRE Systems, Inc., 5111 Leesburg Pike, Ste. 514, Falls Church, VA 22041, ***David L. Olson***

We demonstrate how Defense Enterprise Planning and Management was applied to the reengineering of the Army planned process. The to-be model for the Army Plan is discussed in some detail.

3) The Role of Senior Management in Implementing Defense Enterprise Integration Initiatives, ***Kathlyn Emmons***, Defense Information Systems Agency, D6, 701 S Cthouse Rd., Arlington, VA 22204-2199, ***Thomas R. Gulledge***

This research documents the antecedents of implementation success and relates the findings to national policy for using IT to enhance the efficiency of government departments. Firms are using integrated standard software solutions to become more effective and efficient. Federal agencies can benefit from these same improvements.

Wednesday 09:45-11:15

WB01 Dynamic Traffic Network Modeling with Applications I

Sponsor: TSS & IFORS
Sponsored Session
Chair: Michel Bierlaire, MIT, 3 Cambridge Ctr., Ste. 208, Cambridge, MA 02142, mbi@mit.edu

1) The Optimal Dynamic Network Toll Problem, ***Terry L. Friesz***, George Mason Univ., Dept. of Systems, Fairfax, VA 22030-4444, tfriesz@mason1.gmu.edu, ***David H. Bernstein***

We show how appropriate disequilibrium dynamics can be employed to formulate the problem of setting otpimal dynamic network tolls which are asymtotically stable and consistent with classical static user equilibrium. We discuss the qualitative properties of this optimal control problem and suggest numerical solution techniques.

2) Dynamic Traffic Control & Traffic Assignment, ***Owen J. Chen***, MIT, Ctr. for Trans. Studies, 3 Cambridge Ctr., Ste. 208, Cambridge, MA 02142, chenj@mit.edu, ***Moshe E. Ben-Akiva***

In order to solve a dynamic system optimal signal setting and a dynamic user optimal traffic flow that are mutually consistent with each other, we integrate the dynamic traffic control and the dynamic traffic assignment problems as a non-cooperative game between a traffic authority and travelers.

3) Heuristics for Determining A Priori Pareto-Optimal Least Time Paths in Stochastic, Time-Varying Networks, ***Elise D. Miller-Hooks***, Duke Univ., PO Box 90287, Dept. of Civil & Envir. Eng., Durham, NC 27516, edmh@acpub.duke.edu, ***Hani S. Mahmassani***

Future travel times in congested transportation networks are time-varying uncertain quantities. Algorithms for determining a priori shortest paths in such sthochastic and time-dependent networks may enumerate every path. Heuristics that preclude this possibility are presented and illustrated in extensive numerical tests.

4) withdrawn - author request of 2/23, ***Chee Chung Tong***, Tankang Univ., Dept. of Transport. Mgmt., 151 Ying-Chun Rd., Tansui, Taipei Hsien, 251, Taiwan, cctong@ntmail.tku.edu.tw

WB02 Multimodal, Multicommodity Transportation Systems I

Sponsor: TSS
Sponsored Session
Chair: Bernard Gendron, Univ. de Montreal, DIRO, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, bernard@crt.umontreal.ca

1) Models & Methods for Merge-in-Transit Operations, ***Keely L. Croxton***, MIT, OR Ctr., Bldg. E-40, Cambridge, MA 02139-2208, croxton@mit.edu, ***Bernard Gendron***, ***Thomas L. Magnanti***

To better serve their customers' needs, several manufacturing firms are using merge centers as in-transit consolidation points. We present a large-scale MIP model for planning these operations and a combined cutting-plane/branch-and-bound solution method calibrated from an actual application. The multiperiod multimode multicommodity model features merge center capacities and discontinuous cost functions.

2) Tabu Search for Capacitated Location Problems with Balancing Requirements, ***Patrick Soriano***, Ecole Polytech., Univ. of Montreal, CP 6128 Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, patrick@crt.umontreal.ca, ***Bernard Gendron***, ***Jean-Yves Potvin***

We study a class of discrete capacitated location problems on networks, which arises as applications in freight transportation planning. We describe a solution methodology based on TS. Experimental results will be presented and analyzed.

3) Extentions to the STAN Model & Method, ***Samba Diallo***, Univ. of Montreal, CTR, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, samba@crt.umontreal.ca, ***Michael A. Florian***, ***Teodor Gabriel Crainic***

STAN is a model and software aimed at the strategic planning of multimode, multicommodity transportation systems. This talk focuses on extentions to the network model to allow more flexibility in modelling transshipment cost functions and to the assignment to allow for explicit consideration of production and consumption vectors.

WB03 Transportation II

Contributed Session
Chair: Sal Amirkhalkhali, St. Mary's Univ., Dept. of Economics, Halifax, NS, B3H 3C3, Canada, sal.amirkhalkhali@stmarys.ca

1) On Travel Behavior Using Cross-Country Data, ***Sal Amirkhalkhali***, St. Mary's Univ., Dept. of Economics, Halifax, NS, B3H 3C3, Canada, sal.amirkhalkhali@stmarys.ca, ***Andrew S. Harvey***

The study of activity systems strives to develop both a theoretical and empirical base for modeling daily behavior in general and travel behavior in particular. We outline the essence of an approach which allows the researcher to utilize in modeling, relevant contextual information, taking account of the varying context. It utilizes a random coefficient approach to explain travel behavior captured by time-use studies...

2) Why Adaptive Signal Control is Critical in an ATIS Environment, ***Isaac R. Porche***, Univ. of MI, EECS Dept., 1301 Beal Ave., Ann Arbor, MI 48109-2122, porche@umich.edu http://www.eecs.umich.edu/~porche, ***Stephane Lafortune***

Long run analysis of the re-routing effects on traffic flow induced by traffic signals, for both fixed-plans and adaptive traffic signal control, suggests that adaptive traffic signal controllers are more suitable for urban traffic environments in which a large percentage of drivers have access to real-time travel times.

3) withdrawn - author request of 2/27, ***Marguerite L. Zarrillo***, Univ. of Central FL, Dept. of Civil & Env. Eng., Orlando, FL 32816-2450, mlz@ece.engr.ufc.edu http://www-ece.engr.ucf.edu/~mlz, ***A. Essam Radwan***

4) Cellular Automata for Traffic Flow Modeling, ***Saifallah Benjaafar***, Univ. of MN, Dept. of Mech. Eng., Minneapolis, MN 55455, saif@maroon.tc.umn.edu, ***Kevin J. Dooley***

We explore the usefulness of CA to traffic flow modeling and extend existing CA models to capture characteristics of traffic flow that have not been possible to model using either conventional analytical models or existing simulation techniques. In particular, we examine higher moments of traffic flow and evaluate their effect on overall traffic performance...

WB04 New Product Development I

Contributed Session
Chair: Kevin J. Dooley, AZ State Univ., PO Box 875906, Tempe, AZ 85287-5906, kevin.dooley@asu.edu eas.asu.edu/~kdooley/index.html

1) How Marketing Research Affects New Product Performance in Technology Intensive Industries, ***Gloria Barczak***, Northeastern Univ., Mktg. Group, Coll. of Bus., 202 Hayden Hall, Boston, MA 02115, barczak@cba.neu.edu, ***Fareena Sultan***

Research on new products indicates that understanding customers through the use of market research is an important factor impacting new product success. We examine if and how the collection, dissemination and use of marketing research information affects new product performance in technology intensive industries. In addition, we explore which marketing research methods and techniques are considered most valuable...

2) withdrawn - author request of 3/4, ***Gary Scudder***, Vanderbilt Univ., Owen Sch. of Mgmt., Nashville, TN 37203, gary.scudder@owen.vanderbilt.edu, ***Joe Blackburn***

3) The Maturity Construct & Its Application in New Product

Development, ***Kevin J. Dooley***, AZ State Univ., PO Box 875906, Tempe, AZ 85287-5906, kevin.dooley@asu.edu eas.asu.edu/~kdooley/index.html, ***John C. Anderson***

We generalize the construct of maturity as the organization-level implementation of the plan-do-study-act improvement cycle. The construct is then operationalized in the context of new product development. We find organizations tended to implement goals first, followed by metrics, learning and structured process. Learning was not tightly tied to metrics.

WB05 Cellular Manufacturing I

Contributed Session

Chair: Samir V. Amiouny, Concordia Univ., Dept. of Mech. Eng., 1455 de Maisonneuve W, Montreal, Quebec, H3G 1M8, Canada, amiouny@alcor.concordia.ca

1) Lot Splitting in a Bottlenecked Manufacturing Cell, ***William T. Lockwood***, Clarkson Univ., Sch. of Bus., Box 5770, Potsdam, NY 13699-5770, lockwowt@agent.clarkson.edu, ***Farzad Mahmoodi, Robert A. Ruben, Charles T. Mosier***

Several studies address scheduling cellular manufacturing systems. However, no study has examined the impact of lot splitting by utilizing exhaustive and non-exhaustive scheduling heuristics simultaneously at different workcenters. This study fills that void by utilizing exhaustive and non-exhaustive heuristics at non-bottleneck workcenters while applying exhaustive heuristics at the bottleneck workcenter.

2) Design of Cellular Manufacturing Systems with Assembly Considerations, ***Poornachandra Panchalavarapu***, Case Western Reserve Univ., Dept. of Systems Eng., 10900 Euclid Ave., Cleveland, OH 44106, prp3@po.cwru.edu, ***Vira Chankong***

We present a 0-1 nonlinear programming model which determines an optimal assignment of parts, machines and subassemblies to manufacturing cells. The model employs a similarity coefficient associated with part, machine and subassembly. Illustrative examples suggest that the model has potential to reduce material flow significantly.

3) Control of a Robotic Cell Under Stochastic Conditions, ***Samir V. Amiouny***, Concordia Univ., Dept. of Mech. Eng., 1455 de Maisonneuve W, Montreal, Quebec, H3G 1M8, Canada, amiouny@alcor.concordia.ca, ***Kudret Demirili, Radha Penekelapati***

We consider the case of a robotic manufacturing cell with a conveyor used both for material transportation and as an intermediate buffer. We study the effect of different part loading and robot sequencing strategies on the performance of the system.

WB06 Industry

Contributed Session

Chair: Defne Berkin, DuPont Canada, 101 Burnside Dr., Toronto, Ontario, M6G 2M9, Canada, defne.berkin@can.dupont.com

1) Use of Simulation to Support DuPont's Heathering Plant Capacity Expansion Project, ***Defne Berkin***, DuPont Canada, 101 Burnside Dr., Toronto, Ontario, M6G 2M9, Canada, defne.berkin@can.dupont.com, ***T. L. Turman***

The Athens Heathering Plant of DuPont, which is a make-to-order operation, is faced with a demand forecast, showing a substantial increase, within the next 5 years. Simulation is employed to verify additional capacity needed to satisfy future demand, to identify bottlenecks in the process, to uncover cost-effective opportunities to improve the plant's capacity.

2) Extension of Ordinal Optimization to Non-i.i.d. Stochastic Problems, ***Mike S. Yang***, Harvard Univ., Dec. of Eng. & Applied Sci., Pierce Hall G12H 29 Oxford St., Cambridge, MA 02138, msyang@arcadia.harvard.edu, ***Loohay Lee, Yu-Chi Ho***

OO has enjoyed a great deal of success in addressing stochastic optimization problems by means of soft computation. We will extend the results of OO to a more general class of stochastic selection problems by relaxing the i.i.d. requirement on the noise term. Two theoretical scenarios and a real-world application example are discussed to substantiate the benefits of this more general framework.

3) funStep: How Can STEP Help the Integration of Commercial Applications Within an Industrial Environment - A Case Study, ***Ricardo J. Goncalves***, UNINOVA, Quinta da Torre, 2825, Portugal, rg@uninova.pt http://www.uninova.pt, ***Adolfo Steiger-Garcao***

WB07 Lot Sizing

Contributed Session

Chair: Harvey H. Millar, St. Mary's Univ., Finance & MS Dept., Halifax, NS, B3H 3C3, Canada, harvey.millar@stmarys.ca

1) Batch Sizing for Products with Rework Process & Scrapping, ***Bhaba R. Sarker***, LA State Univ., Dept. of IE, Baton Rouge, LA 70803-6409, bsarker@unixl.sncc.lsu.edu, ***Gyana R. Parija, Sanjay Mondal***

Products with rework processes minimize the material cost but incurrs additional cost for each rework of the products. The paper addresses some relevant issues in this processes and develops a model to determine the optimal batch size for such a situation with rework and scraps. Results are demonstrated with examples.

2) The Economic Lot & Delivery Scheduling Problem: Common Cycle, Rework & Variable Production Rate Case, ***Moutaz J. Khouja***, Univ. of NC, Info. & Op. Mgmt. Dept., Charlotte, NC 28223, mjkhouja@email.uncc.edu

We develop an algorithm for solving the economic lot and delivery scheduling problem for a supplier using a volume flexible production system where component quality depends on both lot sizes and unit production times. We test the performance of the algorithm and illustrate the models with numerical examples.

3) Multi-Item Lot Sizing with Setup Times Using Lagrangean Solution Schemes, ***Harvey H. Millar***, St. Mary's Univ., Finance & MS Dept., Halifax, NS, B3H 3C3, Canada, harvey.millar@stmarys.ca, ***Yanqun Cai***

In this talk, we present Lagrangean decomposition schemes for the capacitated, single-level, multi-item lot sizing problem with setup times. The model is generalized to include backorders, shelf-life restrictions, and restrictions on the age of backorders permitted. Computational results for several test problems are presented.

4) withdrawn - author request of 3/20, ***Eleni Pratsini***, Miami Univ., Dept. of DSC & MIS, 311 Upham Hall, Oxford, OH 45056, pratsie@muohio.edu, ***Neil B. Marks***

WB08 Production & Scheduling I

Contributed Session

Chair: Li-Lian Gao, Hofstra Univ., Dept. of Mgmt., 228 Weller Hall, Hempstead, NY 11549, mgblzg@hofstra.edu

1) A Lagrangean Dual-Ascent Heuristic for the Capacitated Multi-Product Dynamic Demand Coordinated Replenishment Problem, ***Li-Lian Gao***, Hofstra Univ., Dept. of Mgmt., 228 Weller Hall, Hempstead, NY 11549, mgblzg@hofstra.edu, ***Powell Robinson***

We will present the modeling and computational experience for the capacitated multi-product dynamic demand coordinated replenishment problem. It is formulated as a MIP model and solved with a Lagrangean dual-ascent heuristic.

2) Performance Analysis of Long-Run Average Criterion for a Stochastic Manufacturing System Prone to Failure, ***Baichun Xiao***, Seton Hall Univ., Sch. of Bus., 50 Whitewood Dr., S Orange, NJ 07079, xiaobaic@shu.edu, ***Youyi Feng***

This research considers an optimal inventory/production control problem in a failure prone manufacturing system facing uncertain demand. We address the problem with inventory holding cost, stockout penalties, and the exponential production rate. The objective is to minimize the long-run average costs over the infinite planning horizon.

3) Bottleneck Management in Cyclic Schedules, ***Alan Bowman***, Union Coll., 829 Middle St., Niskayuna, NY 12309, bowmana@union.edu

In a cyclic schedule, a sequence of activities is specified for each process, then repeated indefinitely. We present an approach for managing material flow in a cyclic schedule to achieve a desired throughput with minimum inventory. The key to the approach is the proper identification and management of bottlenecks.

4) A Model for the Scheduling of Operation Modes at a Refinery, ***Jan A. Persson***, Linkoping Univ., Dept. of Math., Linkoping, S 58183, Sweden, japer@mai.liu.se, ***Maud Gothe-Lundgren, Jan T. Lundgren***

We study the problem of scheduling operation modes for interconnected processing units at a refinery. The objective is to minimize setup and inventory costs while satisfying demand. The problem is formulated as a Mixed Integer Programming model. Solution methods and computational results are presented.

WB09 Flowshop Scheduling

Contributed Session

Chair: Philip Kaminsky, Univ. of CA, Dept. of IEOR, 4135 Etcheverry Hall, Berkeley, CA 94720-1777, kaminsky@ieor.berkeley.edu

1) A Solution Scheme for Some Static Flowshop Problems, ***Ayodeji E. Oluleye***, Univ. of Ibadan, Dept. of IE, Oyo State, Nigeria, arcis@infoweb.abs.net

The general static flowshop scheduling problem (minimise makespan) has remained largely intractable due to the computational complexity. We propose a number of heuristics for the general as well as some special structure problems. Arising from the results obtained solving random problems, we outline a scheme for obtaining good solutions.

2) withdrawn - author request of 4/2, ***Chia-Shin Chung***, Cleveland State Univ., Dept. of OM & Bus. Stats., East 24 St., Cleveland, OH 44115, r1135@vmcms.csuohio.edu, ***Omer Kirca***

3) Hybrid Flowshop: Scheduling Heuristics Assessment, ***Omar Moursli***, Univ. Catholique de Louvain, 1 place de Doyens, Louvai-La-Neuve, 1348, Belgium, moursli@qant.ucl.ac.be, ***Yves Pochet***

This paper compares heuristics for scheduling a K-stage hybrid flowshop with respect to the makespan criterion. Three classes of heuristics, 2-stage flowstop-, priority rules-and single-stage sub-problem-based heuristics are considered. The hybrid flowshop configurations can be very diversified. A general benchmark framework is put forward for algorithms...

4) New Results in Dynamic Flowshop Scheduling, ***Philip Kaminsky***, Univ. of CA, Dept. of IEOR, 4135 Etcheverry Hall, Berkeley, CA 94720-1777, kaminsky@ieor.berkeley.edu, ***David Simchi-Levi***

We present new probabilistic results for the dynamic flowshop scheduling problems.

WB10 Advances in Project Management: From Traditional to Virtual Organizations

Cluster: Scheduling
Invited Session
Chair: George L. Vairaktarakis, Case Western Reserve Univ., Dept. of OR/OM, 10900 Euclid Ave., Cleveland, OH 44106-7235, gxv5@po.crwu.edu

1) Human Resources, Material & Equipment Planning in Project Scheduling: An Integrated Model, ***Bajis M. Dodin***, Univ. of CA, Anderson Grad. Sch. of Mgmt., Riverside, CA 92521, ***Abdelghani A. Elimam***

In earlier work we developed MIP models for HR, equipment and material planning in project management. We extend these to intergrated human resources, equiptment, and materials in project scheduling under variable activity duration. The model cptures the real life tradeoffs involved in various project costs. Computational results are presented.

2) Forming Partnerships in a Virtual Factory, ***George L. Vairaktarakis***, Case Western Reserve Univ., Dept. of OR/OM, 10900 Euclid Ave., Cleveland, OH 44106-7235, gxv5@po.crwu.edu, ***Jamshid C. Hosseini***

We develop a model for formation of partnerships to execute a project. Possible alliances amongst partners are given in a partnership matrix induced by a set of operating characteristics for each partner. Our ojective is to minimize project duration. Lower bounds and heuristics are developed, and computational experiments are reported.

WB11 In-Process Quality Improvement Methodologies: Fusion of Engineering Knowledge with Advanced Statistics

Cluster: Quality
Invited Session
Chair: Gary Herrin, Univ. of MI, Dept. of IOE, 1733 IOE, Ann Arbor, MI 48109-2117, gdherrin@unmich.edu

1) In-Process Quality Improvement Research: An Overview & New Progress, ***Jan Shi***, Univ. of MI, Dept. of Industrial & Op. Eng., 1815 IOE, Ann Arbor, MI 48019-2117, shihang@umich.edu

IPQI methodologies rely on in-process measurements to shift the focus from the product to the manufacturing process. By focusing on the process, IPQI can go beyond detection of process faults to isolation, root cause determination and in-process compensation/action. We provide an overview of R&D activities in this filed at the IPQI lab at UM. The fundamental concepts, research progresses and their implementations are highlighted.

2) Process Monitoring & Control via Multiresolution Analysis, ***Suraj Mammen Alexander***, University of Louisville, Dept of Industrial Eng, Louisville, KY 40292, smalex01@ulkyvm.louisville.edu

The premise of this paper is that the choice between compensatory and corrective control action should not be taken without an appropriate diagnosis of the cause of process disturbance. We present the utilization of multiresolution analysis via wavelet transforms for process control. We plan to combine discrete wavelet analysis and neural nets to automate this process.

3) Data Compression of Tonnage Signal Using Wavelet Analysis, ***Jionghua Jin***, Univ. of MI, Dept. of IOE, IPQI Lab., Ann Arbor, MI 48019-2117, jhjin@engin.umich.edu, ***Jan Shi***

In Process sensoring has a significant impact on the quality improvement. However, saving and analyzing these tremendous data is a current challenge. Wavelets with its nature compactness show a great power to compress non-stationary tonnage signals with a wider frequency region. A new segmental thresholding strategy is presented for this purpose.

4) In-Process Prediction & Control of Gray Iron Machining, ***Art Baker***, Lucas Varity Light Vehicle Braking Systems, 12000 Tech Center Dr, Livonia, MI 48150, a_baker@kh.com

The machining of gray iron brake rotors is very dependent on the properties of the casting. In-process prediction of casting properties allows for the optimization of the process given a particular set of casting properties. This is accomplished through the development of in-process sensing technology that correlates casting properties and serves as a bridge to automatic process control through the application of statistical methods.

WB12 OR/MS in Forestry I: Nature Reserve Design

Sponsor: ENRE
Sponsored Session
Chair: Richard L. Church, Univ. of CA, Dept. of Geography, Santa Barbara, CA 93110-1226, church@geog.ucsb.edu

1) Conserving Biodiversity Under a Budget Constraint, ***Stephen Polasky***, OR State Univ., Dept. of Agr. & Resource Econ., Ballard Hall 213, Corvallis, OR 97331-3601, steve.polasky@orst.edu, ***Jeffrey D. Camm***

In the reserve site selection problem, N sites can be included in a reserve network to maximize the species represented. We use land value data and maximize the number of species represented given a budget. We vary the budget to trace out a cost curve for species preservation.

2) A Genetic Algorithm with Decomposition for Selecting a Reserve Network, ***Jeffrey L. Arthur***, OR State Univ., Dept. of Stats., Kidder 44, Corvallis, OR 97331-4606, arthur@stat.orst.edu, ***Derek J. Nalle***

The determination of a geographically compact reserve network for the Klamath-Siskiyou region of southwest Oregon and northwest California is addressed. A genetic algorithm is utilized in which the overall network design is decomposed into subproblems based on physical habitat characteristics. Numerical results and extensions are discussed.

3) Selecting Biodiversity Management Areas, ***Richard L. Church***, Univ. of CA, Dept. of Geography, Santa Barbara, CA 93110-1226, church@geog.ucsb.edu, ***William J. Okin***

We present a land management model to select area for biodiversity management and portection. This IP model was developed as part of the Sierra Nevada Ecosystem Project of the U.S. Forest Service. The basic model and extensions to handle spatial connectivity goals are described along with several solution approaches.

4) Modeling Short-Term Harvesting with Environmental Constraints, ***Andres F. Weintraub***, Univ. of Chile, Dept. of IE, PO Box 2777, Republica 701, Santiago, Chile, aweintra@dii.uchile.cl, ***Bruce Manley***, ***Rafael Epstein***

Both in Chile and New Zealand models are used for scheduling harvests including machine location and access roads: Environmental constraints include not using heavy equiptments on fragile soils, buffer strips along rivers and roads. We discuss how the models are modified to include these aspects, and used for decision making.

WB13 Discrete Optimization

Cluster: Discrete Optimization
Invited Session
Chair: Peter L. Hammer, Rutgers Univ., RUTCOR, 640 Bartholomew Rd., Piscataway, NJ 08854-8003, hammer@rutcor.rutgers.edu

1) How to Store Origin-Destination Matrices Efficiently, ***Endre***

Boros, Rutgers Univ., RUTCOR, PO Box 5062, New Brunswick, NJ 08903, boros@rutcor.rutgers.edu, ***Peter L. Hammer***, ***Bruno Simeone***, ***Federica Ricca***

OD matrices appear frequently in transportation problems, related to the study and modeling of traffic conditions of large cities. Such a matrix A=(a(i,j)) registers the traffic flow, i.e., the expected number of people or cars, etc., between various regions of the city. Usually there are many such matrices considered, corresponding to specific conditions...

2) Practical Timetabling: Scheduling to Minimize Conflict, ***Lynn Kiaer***, Rose-Hulman Inst. of Tech., Dept. of Math., 5500 Wabash Ave., Terre Haute, IN 47803

We use a modified graph model for the problem of scheduling to minimize some measure of conflict, which facilitates the use of heuristics based loosely on vertex coloring. We describe extensions to our earlier work and the successful implementation of heuristic algorithms on real scheduling problems.

3) Maximally Disjoint Solutions of the Set Covering Problem, ***David J. Rader, Jr.***, Rose-Hulman Inst. of Tech., Dept. of Math., Terre Haute, IN 47803, david.rader@rose-hulman.edu, ***Peter L. Hammer***

We are concerned with finding multiple solutions of a set covering problem that share a minimum number of variables. We describe several heuristics based on the standard greedy method for set covering problems. Extensive computational results are given for random problems and problems found in the literature.

4) Nonmonotonic Trading Properties for Boolean Functions, ***Alan D. Taylor***, Union College, Dept. of Math., Schenectady, NY 12308, taylora@idol.union.edu, ***William Zwicker***

Simple games are just monotonic Boolean functions, but come with distinct intuitions and questions; we provide examples of cross-fertilization. For example, while the "trading" notion arose within simple games, several interesting Boolean function properties turn out to be nonmonotonic trading properties, and thus, invite importation of trading intuitions and techniques.

WB14 Integer Programming II

Contributed Session

Chair: Wilbert E. Wilhelm, TX A&M Univ., Dept. of IE, 237-H Zachry Eng. Ctr., College Station, TX 77843, wilhelm@tamu.edu

1) Concave Minimization Over a Convex Polyhedron & Integer Variables, ***Idalia Flores***, Cascada 526 Col Banjidal, Mexico, 09450, Mexico, idalia@servidor.unam.mx

A general algorithm is developed for minimizing a well-defined concave function over a convex polyhedron. The algorithm combines B&B techniques and a cutting plane procedure to identify the global minimum extreme point of the convex polyhedron. As it needed the minimum point to he integer, it if isn't an extreme point, it is looked for by B&B...

2) The p-Cycle Problem, ***Ozgur Ozluk***, Univ. of NC, Dept. of OR, 404 Jones Ferry Rd. A-14, Carrboro, NC 27510, ozluk@or.unc.edu www.or.unc.edu/~ozluk

We examine the convex hull of the incidence vectors corresponding to the simple cycles of length p over a complete graph on n nodes, for an arbitary but fixed p value. We derive some valid inequalities and facets of the polytope and investigate some of its other characteristics.

3) Positive Neighbor Cuts for the Uncapacitated Facility Location Problem, ***Frederick R. Watson***, Wright State Univ., 3640 Colonel Glenn Hwy, Dayton, OH 45435-0001, fwatson@wright.edu, ***Jeffrey D. Camm***, ***David F. Rogers***

We examine the polyhedral structure of the Benders' master problem and demonstrate why traditional Benders' cuts often do poorly in obtaining integer solutions for the UFLP. Stronger cuts are examined, resulting in a new classification scheme for cuts, based on the dimension of the resulting face. Proofs and computational results are included.

4) A Facet Generation Procedure with Applications to Flexible Manufacturing Systems, ***Radu C. Gadidov***, TX A&M Univ., Dept. of IE, 237-H Zachry Eng. Ctr., College Station, TX 77843, rcg5078@tam2000.tamu.edu, ***Wilbert E. Wilhelm***

We model the flexible assembly system design problem for multiple product types, prescribing optimal design including specifying machine tooling. We describe a facet generation procedure which exploits embedded structures, generating facets computationally within B&C. Computational results show dramatic gains in run time and number of nodes explored.

WB15 Nonlinear Programming I

Contributed Session

Chair: Walter Murray, Stanford Univ., Dept. of EES & OR, Terman Eng. Ctr., Stanford, CA 94305-4023, walter@sol-walter.stanford.edu stanford.edu/~murray

1) Sequential Quadratic Programming Methods that Use Nonconvex QP Subproblems, ***Walter Murray***, Stanford Univ., Dept. of EES & OR, Terman Eng. Ctr., Stanford, CA 94305-4023, walter@sol-walter.stanford.edu stanford.edu/~murray, ***Meredith Goldsmith***

SQP methods have traditionally used convex subproblems. Not to do so creates difficulties with convergence. However, insisting on a convex subproblem restricts how to approximate the Hessian of the Lagrangian. We show how the theoretical and practical difficulties associated with a nonconvex subproblem can be solved.

2) Quasi-Newton Approximations to the Hessian of the Lagrangian in Nonlinearly Constrained Optimization, ***Meredith Goldsmith***, Stanford Univ., Dept. of EES & OR, Terman Eng. Ctr., Stanford, CA 94305-4023, mgold@leland.stanford.edu http://www.stanford.edu/~mgold, ***Walter Murray***

3) Optimal Multivariate Chebyshev Inequalities: A Semidefinite Programming Approach, ***Ioana Popescu***, MIT, OR Ctr. & Math. Dept., OR Ctr. Bldg. E40-130, Cambridge, MA 02139, ioana@mit.edu, ***Dimitris Bertsimas***

We present the first polynomial time algorithm, based on semidefinite programming, for finding sharp bounds on the probability of an event involving n correlated random variables, given 2nd order moment information. We also show that for high order moment information, this is NP-hard. We derive "optimal" inequalities that improve Chebyshev's.

4) Redundancy in Semidefinite Programming, ***Shafiu Jibrin***, Carleton Univ., Dept. of Math. & Stats., Ottawa, Ontario, K1S 5B6, Canada, sjibrin@math.carleton.ca, ***Irwin Pressman***

A probabilistic method for the detection of nonredundant linear matrix inequalities is presented. It generalizes the stand and hit method for linearly constrained regions and is called the senidefinite stand and hit method. We present evidence that this is a practical and useful approach to removing redundant constraints in large positive semidefinite programming problems.

WB16 Structured Nonlinear Optimization

Cluster: Linear Programming
Invited Session

Chair: Tamas Terlaky, Delft Univ. of Tech., Dept. of Tech. Math. & Info., Fac. of ITS, Mekelweg 4, Delft, 2600 GA, The Netherlands, t.terlaky@twi.tudelft.nl

1) Condition Number Complexity of "Elementary" Algorithms for Convex Feasibility Problems in Conic Form, ***Marina A. Epelman***, MIT, Sloan Sch. of Mgmt., 77 Massachusetts Ave., Cambridge, MA 02139-4307, mepelman@mit.edu

We study the complexity properties of variations of "elementary" algorithms for finding a point in a convex feasible region (in conic form), and solving linear optimization problems over feasible regions of such form. We analyze the complexity of the algorithms in the light of the inherent conditioning of the system.

2) Cell Placement via Smooth Convex Optimization, ***Andrew Kennings***, Ryerson Polytech. Univ., Dept. of Elec. & Comp. Eng., Toronto, Ontario, M5B 2K3, Canada, ***Mark Frazer***, ***Anthony Vannelli***

Cell placement may be accomplished via a sequence of smooth convex optimization problems. We consider interior point methods as an efficient solution technique. Low accuracies allow iterative solvers for computing search directions. Numerical results are presented to demonstrate computational aspects of the method.

3) New Developments on the Analytic Center Cutting Plane Method, ***Jean-Louis Goffin***, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, jlg@crt.umontreal.ca

We will investigate averaging schemes in the analytic center cutting plane method, when applied to monotone variational inequalities.

WB17 Metaheuristics II

Contributed Session

Chair: Burcin Bozkaya, Univ. of Alberta, Fac. of Bus., Edmonton, Alberta, T6G 2R6, Canada, bbozkaya@gpu.srv.ualberta.ca ualberta.ca/~bbozkaya/myhp/

1) withdrawn - author request of 3/12, ***Andrini Prabandari***, Univ. of OK, 202 W Boyd, Ste. 124, Norman, OK 73019, andrini@ou.edu, ***S. Pulat***

2) Political Districting: A Tabu Search Algorithm, ***Burcin Bozkaya***, Univ. of Alberta, Fac. of Bus., Edmonton, Alberta, T6G 2R6, Canada, bbozkaya@gpu.srv.ualberta.ca ualberta.ca/~bbozkaya/myhp/, ***Erhan Erkut, Gilbert Laporte***

We develop a TS algorithm for the political districting problem and experiment on real data. In our approach, we consider both objective and political criteria. We describe the features of our algorithm and compare the electoral maps drawn by the algorithm with those that are actually in use.

3) A Ghost Image Approach for Resource-Constrained Scheduling, ***Balu Rangaswamy***, Univ. of CO, CB 419, Boulder, CO 80309, rangaswa@eddie.colorado.edu, ***Fred W. Glover***

We examine issues for implementing a ghost image (GI) strategy for resource-constrained scheduling. The GI methodology progressively refines coordinated mappings of target problem representations and trail solutions to create successive generations of each, augmented by adaptive memory from TS. We focus on insights from computational experiments.

4) withdrawn - author request of 3/19, ***Jose C. Brandao***, Univ. do Minho, EEG, Largo do Paco, Braga, 4709, Portugal, sbrandao@ci.uminho.pt

WB18 Metaheuristics II

Cluster: Metaheuristics
Invited Session

Chair: Rene Seguin, Univ. of Montreal, CRT, CP 6128, Succ. Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, rene@crt.umontreal.ca

1) A Tabu Search Approach for Stochastic Integer Programs with Recourse, ***Michel Gendreau***, Univ. de Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, michelg@crt.umontreal.ca, ***Francois V. Louveaux***

A general solution approach for two-stage stochastic programs with recourse, in which first-stage variables are integer and the number of possible realizations of the random variables is large or possibly infinite. An application is capacitated location problems with random demands will be used to illustrate the approach.

2) Modeling Pickup & Delivery Problems in Constraint Programming, ***Vincent Furnon***, ILOG, 9 rue de Verdun BP85, Gentilly Cedex, 94253, France, furnon@ilog.fr, ***Bruno De Backer, Daniel Godard***

The Pickup and Delivery problem is a good basic model for complex routing problems. A constraint programming model based on precedence and path constraints is presented. Optimization is performed using local search thanks to a set of new move operators derived from the ones used for the VRP.

3) A Tabu Search Heuristic for the Calibration of Automatic Incident Detection Algorithms, ***Michel Gendreau***, Univ. de Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, michelg@crt.umontreal.ca, ***Faycal Bach, Teodor Gabriel Crainic***

Automatic incident detection Algorithms allow for the rapid identification of possible incidents in modern highway monitoring systems. In order to perform efficiently, these algorithms must be carefully calibrated using site-dependent data. This involves solving a nonlinear non-convex multi-objective optimization problem for which we propose a new TS heuristic.

4) Tabu Search Diversification Strategies for Stochastic Routing Problems, ***Rene Seguin***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, rene@crt.umontreal.ca, ***Michel Gendreau, Josephine Pelleu, Patrick Soriano***

We address vehicle routing problems where the demands and/or the presence of customers are stochastic. The objective is to design a priori routes that minimize the expected cost of routing and penalties. The problems are solved using a tabu search heuristic where cross-exchange moves are used in a diversification phase.

WB19 Integrated Models in Location Theory

Sponsor: SOLA
Sponsored Session

Chair: Joy Bhadury, Univ. of New Brunswick, Fac. of Admin., PO Box 4400, Fredericton, NB, E3B 5A3, Canada, bhadury@unb.ca

1) Distance-Constrained Location-Routing Problems, ***Rosemary Berger***, Northwestern Univ., Dept. of IE/MS, 2225 N Campus Dr., Evanston, IL 60208, ***Collette R. Coullard, Mark S. Daskin***

We study the design of two-tier distribution networks in which the location and the routing decisions are interdependent. We present polynomial-time algorithms for special cases of the distance-constrained location-routing problem and specify conditions under which the LP relaxation of the integer programming formulation provides integral solutions.

2) Generalized Spatial Interaction Location Models, ***Oded Berman***, Univ. of Toronto, Fac. of Mgmt., 105 St. George St., Toronto, Ontario, L4J 3B7, Canada, berman@fmgmt.mgmt.utoronto, ***Dmitri Krass***

A major assumption of spatial interaction location models is that the whole available market is split up between the facilties. Thus the problem of locating facilities is relevant only in the presence of existing facilities. The above assumption is relaxed allowing to model both competing and non-competing facilities.

3) The Plant Location & Technology Acquisition Problem, ***Vedat Verter***, McGill Univ., Fac. of Mgmt., 1011 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, verter@management.mcgill.ca, ***Abdullah Dasci***

We will discuss simultaneous optimization of the location and technology content of a firm's manufacturing facilities, where FMSs are considered among the technology alternative. The problem is usually encountered by the managers of global firms, who have to incorporate the interdependencies between configurational decisions in their stratgegy planning process.

4) Simultaneously Designing & Location in a Network, ***Joy Bhadury***, Univ. of New Brunswick, Fac. of Admin., PO Box 4400, Fredericton, NB, E3B 5A3, Canada, bhadury@unb.ca, ***L. P. Gewali***

We consider the problem of simultaneously designing a network and locating a facility in it. The problem is shown to be NP Hard. Heuristics are then proposed and their performances are discussed.

WB21 Simulation

Contributed Session

Chair: Robert G. Sargent, Syracuse Univ., Dept. of IE, 439 Link Hall, Syracuse, NY 13244, rsargent@syr.edu

1) Modeling Using Hi-MASS-j, ***Robert G. Sargent***, Syracuse Univ., Dept. of IE, 439 Link Hall, Syracuse, NY 13244, rsargent@syr.edu

The use of the Hierarchical Modeling and Simulation System-java (Hi-MASS-j) for developing Hierarchical Control Flow Graph (HCFG) Models will be described. HCFG Models use two complementary hierarchical specification structures (one for coupled components and one for atomic component behaviors) and these are specified in Hi-MASS-j via GUIs and dialog boxes.

2) An Approach to Unstructured Simulation-Optimization Problems, ***Justin Boesel***, Northwestern Univ., IEMS Dept., 2225 N Campus Dr., Evanston, IL 60208, jboesel@nwu.edu, ***Barry L. Nelson***

We present an evolutionary algorithm-based method to provide robust, statistically valid solutions to unstructured simulation-optimization problems. For small problems, our method is at least as efficient as exhaustive statistical procedures. For large problems, our method finds good solutions quickly and finds better solutions in the longer run.

3) The ABCs of Simulation-Based Decision Support, ***Michel Fabre***, MultiCIM Technologies Inc., 169 Labrosse Ave., Pte.-Claire, Quebec, H9R 1A3, Canada, multicim@compuserve.com

Teaching, learning and using simulation have always been centered on modeling and not analyzing. We present the versatile ABC Planner that combines the user-friendliness of Excel with the power of AutoMod, giving decision-makers the opportunity to perform quickly and easily finite capacity planning and Activity-Based Cost analysis.

WB22 Frameworks for Group Decision & Negotiation: Game Theory

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: Kalyan Chatterjee, PA State Univ., MS & Econ., 309 Beam BAB, University Park, PA 16802, kchatterjee@psu.edu

1) Fallback Bargaining, ***Steven J. Brams***, NYU, Dept. of Politics, 715 Broadway, 4th Fl., New York, NY 10003, brams@is.2.nyu.edu, ***Marc Kilgour***

A practicable bargaining procedure, whereby two or more players rank-order a finite set of alternatives, is shown to produce a Pareto-optimal compromise if the players are truthful. They are likely to be so because the procedure, which involves progressively dipping lower into the players' fallback positions, is difficult to manipulate.

2) How Communication Channels Influence Coalition Bargaining: An Experimental Investigation, ***Gary Bolton***, Penn State, 303 Beam Bab, Penn State Univ, University Park, PA 16802, ***Kalyan Chatterjee, Kathleen L. Valley***

Multilateral negotiations can be distinguished by configurations of communications channels. We present laboratory data on the effect of varying communication structure on coalition formation and payoff allocation in a 3-person game. We compare the results with 3 theoretical models, of which one gets several qualitative and counter-intuitive features broadly right.

3) Coalition Formation under Costly Computation, ***Tuomas W. Sandholm***, Washington Univ., Dept. of Computer Science, Camp. Box 1045 One Brookings DR, St. Louis, MO 63130-4899, sandholm@cs.wustl.edu

When computation is costly, coalitions do not find it worthwhile to optimize. In a normative theory of coalitions among boundedly-rational agents, optimal coalition structure and stability are significantly affected by the agents' algorithms, performance profiles, and computation costs. Theoretical results are compared with experimental results on vehicle routing.

4) Coalition Size & Bargaining Power, ***Aniruddha Dasgupta***, PA State Univ., University Park, PA 16802-1913

Labor economics provides evidence that smaller unions have more bargaining power than their larger fellows. To explain th is, we consider a model where management bargains with a coalition of randomly chosen workers with heterogeneous discount rates. For many discount rate distributions, labor's share decreases with the size of the coalition.

WB23 Modeling Flexibility in the Energy Markets

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Anne Ku, Enron Europe, 4 Millbank, London SWIP, 3ET, UK, aku@enron.co.uk

1) Case Studies of a Real Options Approach to Asset Valuation in the Energy Industry, ***Gardner Walkup***, Applied Decision Analysis Inc., 2710 sand Hill Rd., Menlo Park, CA 94025, gardner@adainc.com

We present a practical approach to asset valuation which combines the strengths of Option Pricing Theory (OPT) with DA. Three real case studies from the Power Industry are presented. The results demonstrate that explicitly valuing managerial flexibility, corporate synergies and market opportunities result in significantly different valuations and optimal policies.

2) Flexibility in the Natural Gas Regulatory Framework: A Case Study, ***Alexsandr Rudkevich***, Tellus Institute, 11 Arlington St, Boston, MA 02116, arudkevi@tellus.org, ***Daniel Smith***

Gas distribution companies entering long-term contracts with pipelines must justify their decisions before state regulators. In reviewing these decisions, regulators apply 3 standard criteria - service reliability, cost and flexibility. Unlike the 1st 2 criteria, flexibility is hard to quantify. An approach to quantifying flexibility is tested in a litigated case.

3) withdrawn - author request of 3/6, ***Tom Hoff***, Pacific Energy Group, 10 Glen Ct., Napa, CA 94558, tomhoff@leland.stanford.edu, ***Howard Wenger, Christy Herig***

4) withdrawn - author request of 3/6, ***Anne Ku***, Enron Europe, 4 Millbank, London SWIP, 3ET, UK, aku@enron.co.uk

WB24 Session Withdrawn

Contributed Session

Chair: Gholam-Reza Jahanshahloo, Dept. of Math., 599 Taleghani Ave., Tehran, 15614, Iran, jahansha@saba.tmu.ac.ir

1) withdrawn - Semet email of 3/23, ***Mohammad R. Alirezaei***, Teacher Training Univ., Inst. of Math., 599 Taleghani Ave., Tehran, 15614, Iran, mralirez@saba.tmu.ac.ir, ***Murray Howland, Cornelis van de Panne***

2) withdrawn - Semet email of 3/23, ***Gholam-Reza Jahanshahloo***, Dept. of Math., 599 Taleghani Ave., Tehran, 15614, Iran, jahansha@saba.tmu.ac.ir, ***Mohammad R. Alirezaei, Saeid Mehrabian***

3) withdrawn - Semet email of 3/23, ***Saeid Mehrabian***, Dept. of Math., 599 Taleghani Ave., Tehran, 15614, Iran, saeid@saba.tmu.ac.ir, ***Gholam-Reza Jahanshahloo, Mohammad R. Alirezaei***

4) withdrawn - Semet email of 3/23, ***Sahand Daneshvar***, Dept. of Math. PO Box 31375, 314 Mehrvila Bostan Ave., Mehrshahr, Karaj, Iran, ***Gholam-Reza Jahanshahloo, Mohammad R. Alirezaei***

WB25 Applied Probability II

Contributed Session

Chair: Constantinos Maglaras, Stanford Univ., Info. Systems Lab., 110 Durand Bldg., Stanford, CA 94305-9510, maglaras@isl.stanford.edu isl.stanford.edu/~maglaras

1) Threshold Policies for Dynamic Control of Stochastic Processing Networks, ***Constantinos Maglaras***, Stanford Univ., Info. Systems Lab., 110 Durand Bldg., Stanford, CA 94305-9510, maglaras@isl.stanford.edu isl.stanford.edu/~maglaras

A family of greedy/threshold control policies is described. Under such a policy the instantaneous allocation vector greedily optimizes a desired objective that depends on the queue length vector. Implementation of these policies involves enforcement of safety stocks. Different objectives yield stable, fluid-scale asymptotically optimal, or trajectory-tracking policies.

2) Decomposition & Optimal Inventory Allocation in Networks of Inventory-Queues, ***Xiaoming Liu***, HKUST, Dept. of IEEM, Clear Water Bay, Hong Kong, China, ielxm@usthk.ust.hk, ***Liming Liu, David D. Yao***

We consider two-stage make-to-stock tandem inventory-queues. By modifying the service time of the downstream station, using analytical estimates of the starvation probability, we decompose the system to individual queues. M/G/1 and M/SM/1. We then derive performance measures and optimize inventory allocation subject to a fill rate requirement.

3) Blocking Analysis of Multi-Class Reader-Writer Queues, ***Tugrul Sanli***, Univ. of NC, Dept. of OR, 3180 Smith Bldg., Chapel Hill, NC 27599, sanli@or.unc.edu, ***Vidyadhar G. Kulkarni***

A multi-class reader-writer queue manages two types of customers: readers and writers. It is used as a queueing model of databases. We discuss database systems without queueing. We show the insensitivity property of the system, and derive analytical expressions for performance measures.

4) A Continuous-Time Airline Seat Allocation Model with Time-Dependent Demands, ***Youyi Feng***, Ntl. Univ. of Singapore, Dept. of ISCS, Kent Ridge Rd., Singapore, 119260, Singapore, fengyy@iscs.nus.edu.sg, ***Baichun Xiao***

We study a continuous-time airline seat allocation model with multiple fare classes and time-dependent demands. The model allows overbooking policies and takes no-shows into consideration. We solve the continuous-time directly instead of using DP approximations. We show that the optimal control rule coincides with the concept of expected marginal seat revenue...

WB26 Rare Events in a Network

Sponsor: Applied Probability Section
Sponsored Session

Chair: David R. McDonald, Univ. of Ottawa, Dept. of Math. & Stats., 585 King Edward Ave., Ottawa, Ontario, Canada K1N 6N5, dmdsg@omid.mathstat.uottawa.ca

1) Asymptotically Optimal Importance Sampling & Stratification for Gaussian Intergrals, with Applications to Option Pricing, ***Paul Glasserman***, Columbia Univ., Bus. Sch., 403 Uris Hall, New York, NY 10027, pgiasser@research.gsb.columbia.edu, ***Philip Heidelberger, Perwez Shahabuddin***

We use a Laplace principle to identify the asymptotically optimal change of drift for importance sampling applied to functions of Gaussian vectors. The change of drift eliminates the linear part of the log of the integrand. Stratification reduces variance from the quadratic part. We identify the optimal direction for stratification and a surprising connection with the optimal drift. We apply the method to pricing path-dependent options.

2) Join the Shortest Queue Systems: Stability & Exact Asymptotics, ***Robert D. Foley***, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, rfoley@isye.gatech.edu, ***David R. McDonald***

3) A Unified Approach to Fast Teller Queues an ATM, ***David R. McDonald***, Univ. of Ottawa, Dept. of Math. & Stats., 585 King Edward Ave., Ottawa, Ontario, Canada K1N 6N5, dmdsg@omid.mathstat.uottawa.ca, ***Beno Beck, Andre Dabrowski***

We consider a model with A independent sources of customers where each source is modeled by a Markov renewal point process with batch arrivals. We do not assume the sources are necessarily identically distributed. These arrivals join a queue served by multiple independent servers with service times modeled also as a Markov renewal process...

WB27 Marine Logistics in the Petroleum Industry

Sponsor: ENRE
Sponsored Session
Chair: Emmanuel D. Chajakis, Maritrans Mgmt. Services Inc., One Logan Square, 26th Fl., Philadelphia, PA 19103, echajakis@maritrans.com

1) A Multimodal, Multiproduct Strategic Model of Marine Oil Transportation, ***Lefteris Iakovou***, Univ. of Miami, Dept. of IE, PO Box 248294, Coral Gables, FL 33124, lefteris@eng.miami.edu, ***Christos Douligeris***, ***Lalit Yudhbir***

We present the development of a comprehensive strategic model of marine oil transportation in the Gulf of Mexico. The model interfaces with a risk analysis module and identifies weak links in the system. It also evaluates alternative shipping and routing scenarios and aids in the designation of lightering zones.

2) Using Simulation to Analyze Lightering Operations in Delaware Bay, ***Emmanuel D. Chajakis***, Maritrans Mgmt. Services Inc., One Logan Square, 26th Fl., Philadelphia, PA 19103, echajakis@maritrans.com

Tankers that deliver crude in the Delaware Bay need to be lightered to sail upriver. We present a simulation model that helps analyze the operation of a lightering fleet of vessels. The model is fully animate and insights from it have assisted Maritrans in critical decisions.

3) Maritrans Gulf-Coast Simulation Model, ***Murthy V. Mudrageda***, Maritrans Mgmt. Services, One Logan Sq., 26th Fl., Philadelphia, PA 19103, mmudrageda@maritrans.com, ***Frederic H. Murphy***

Maritrans provides marine transportation between Gulf-Coast refineries and Florida and the Eastern seaboard. Maritrans offers a variety of contracts to serve the customer. The simulation model allows Maritrans to estimate its service reliability when taking on new customers. A feature of the model is a vessel assignment algorithm written in C++.

WB28 Education Tutorial: Case Teaching 101 or "How Do I Get Started Teaching with Cases?"

Sponsor: Forum on Education
Sponsored Session
Chair: Patrick S. Noonan, Emory Univ., Goizueta Bus. Sch., Atlanta, GA 30322, patrick_noonan@bus.emory.edu

1) Education Tutorial: Case Teaching 101, or "How Do I Get Started Teaching with Cases?", ***Patrick S. Noonan***, Emory Univ., Goizueta Bus. Sch., Atlanta, GA 30322, patrick_noonan@bus.emory.edu

Considering using OR/MS cases in management education, but unsure of how to get started? This tutorial offers "hands on" guidance for educators who are beginners at the case method: basic techniques and principles, finding good cases, course design, facilitating high-quality discussions, grading participations, etc.

WB30 Military Operations II

Cluster: Military Applications
Invited Session
Chair: P. Desmier, Ntl. Canada Defense Hq., Dept. of Ntl. Defense, 101 Colonel By Dr., Ottawa, Ontario, K1A 0K2, Canada, desmier@ora.dnd.ca

1) An Optimal Air-Defense Engagement Model Assuming Perfect Kill Assessment, ***B. U. Nguyen***, 1 Canadian Air Div., Centre of OR, Box 17000, Station Forces, Winnipeg, Manitoba, R3J 3Y5, Canada, ***P. Smith***, ***D. Nguyen***

We present an air-defense engagement model to counter an attack by multiple anti-ship missiles, assuming perfect kill assessment. In this model, the probability of shooting down all incoming missiles is maximized. A generating function is used to produce analytical results.

2) Rucksack Design for Optimal Weight Distribution, ***Ronald P. Pelot***, Tech. Univ. of Nova Scotia, Dept. of IE, PO Box 1000, Halifax, Nova Scotia, B3J 2X4, Canada, ***Janos D. Pinter***, ***A. Rigby***, ***T. Bryant***

The forces exerted on the shoulders and waist by a rucksack depend on many factors, including load configuration, strap attachment points and pack shape. An optimization program has been developed to evaluate design improvements using a biomechanical lead carriage model.

3) Terrain Effects on Geostationary Satellite Communications, ***Daniel U. Thibault***, Centre de recherces pour la defense, Valcartier, Canada

Geostationary telecommunication satellites are invaluable assets for Canada's maritime patrol forces. In high latitudes, near coastal areas, their utility is hampered by significant terrain and vegetation masking "wooding" in Naval parlance. We discuss a computer model developed to assess such screen areas and the subsequent impact on naval operations.

4) JANUS & the Line-of-Sight Bias Under Polygonal Approximations of Terrain Elevation, ***William Hurley***, Royal Military Coll. of Canada, Dept. of Bus. Admin., Kingston, Ontario, K7K 5L0, Canada, hurley-w@rmc.ca

JANUS is a computerized war-gaming tool developed by the US Army and used by the land forces of a number of NATO countries, including Canada. Within JANUS, terrain elevation is modeled using a polygonal approximation of the actual terrain. We discuss the implications of this approximation for line-of-sight measurement.

WB31 Panel: A Society's Perspective on the Future of INFORMS

Sponsor: Military Applications Society
Sponsored Session
Chair: To be announced

1) Panel: A Society's Perspective on the Future of INFORMS, ***William P. Hutzler***, MITRE Corp., 1820 Dolley Madison Blvd., McLean, VA 22102, whutzler@mitre.org, ***Keith Womer***, ***Thomas R. Gulledge***, ***Dean Hartley***

The Magnanti Report documents the decline of OR/MS in Business Schools. Beyond the schoolyard, producing a "seasoned" analyst requires the steady hand of a senior analyst and "project solving" experience. If INFORMS is to thrive, we must pay more attention to our "incubators" - societies, sections and chapters. We debate the role of INFORMS and focus on devising a shared vision that facilitates this "seasoning" process.

WB32 Reliability II

Contributed Session
Chair: Velma J. Deleveaux, PA State Univ., Dept. of IME, 207 Hammond Bldg., University Park, PA 16802-1401, vjd103@psu.edu

1) Impact of Variance & Mean Setting on Reliability, ***Velma J. Deleveaux***, PA State Univ., Dept. of IME, 207 Hammond Bldg., University Park, PA 16802-1401, vjd103@psu.edu, ***M. Jeya Chandra***

Product reliability is a critical factor affecting the customer's perception of product quality and ultimately impacts market share. Numerous studies have shown that products whose quality characteristics have smaller variance and means closer to their target value will also have superior performance and last longer. Currently available reliability functions fail to capture this relationship...

2) Estimation of Field Failure Rates from Warranty Return Data, ***Martin H. Czigler***, Thomson Consumer Electronics, 1002 New Holland Ave., Lancaster, PA 17601, cziglerm@lancaster.indy.tce.com, ***Michael C. Sharp***, ***Tracy L. Bendinsky***

We introduce a practical and robust procedure for producing timely estimates of failure rates from truncated data. The probability distributions of failure times are estimated conditioned on the degree of data truncation. A dynamic Bayesian time series model is used to smooth and provide confidence intervals for the monthly estimated rates.

WB33 Organization Theory I

Contributed Session
Chair: George H. Haines, Jr., Carleton Univ., Sch. of Bus., 1125 Colonel By Drive, Ottawa, Ontario, K1S 5B6, Canada, george_haines@ccs.carleton.ca

1) Are Firms Generous? A Challenge for Organizational Theory, ***Emmanuel B. Raufflet***, McGill Univ., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 2G5, Canada, raufflet@management.mcgill.ca

Most Organizational Theories state that firms act only motivated by their direct or indirect interests. However, there is concrete evidence of community

involvement not motivated by organizational interests. Based on cases, this paper argues for the need to incorporate new theorectical perspectives to understand this phenomenon.

2) Organizational Sensemaking in the Management of Environmental Risks, ***Robert Gephart***, Univ. of Alberta, Fac. of Bus., Edmonton, Alberta, T6G 2R6, Canada, rgephart@gpu.srv.ualberta.ca

I assess 3 perspectives on organizational risk management: normal accidents theory, high reliability theory and risk transformation theory. I discuss the role of sensemaking and interpretation in these theories and offer an integrative framework and research agenda for understanding organizational sensemaking in environmental management.

3) A Value-Based Model of Parametric Organizational Destochastization, ***Phillip L. Davidson***, Kaiser Permanente, 25 N Via Monte, Walnut Creek, CA 94583, phil.davidson@kp.org

Organizations surviving at the event horizon between stability and chaos are the next evolutionary step. We describe a values-based model that uses universal values as a means of quantifying the current stochastic organizational position. Using this model, a method is suggested for working at the edge of chaos.

4) A Simple Explanation of Why Organizations Refuse Market Research Requests, ***George H. Haines, Jr.***, Carleton Univ., Sch. of Bus., 1125 Colonel By Dr, Ottawa, Ontario, K1S 5B6, Canada, george_haines@ccs.carleton.ca, ***Theodore J. Mitchell***

An expanded marketing concept, appicable to buyers and sellers in negotiation situations, is presented. It is shown that a major implication of the model is that organizations should not answer market research requests. Empirical data on response rates to market research requests are presented which supoort the model inference.

WB34 AI Applications

Sponsor: College on Artificial Intelligence
Sponsored Session
Chair: Siddhartha Bhattacharyya, Univ. of IL., Dept. of Info. & Dec. Sci., Coll. of Bus. Admin., Chicago, IL 60607-7124

1) Measuring Efficiency: An Empirical Comparison of Data Envelopment Analysis & Genetic Algorithms, ***Paul Ambrose***, Southern IL Univ., Dept. of Mgmt., Coll. of Bus. Admin., S. Carbondale, IL 62901-4627, paulamb@siu.edu

Using simulated data, we compare DEA and GAs for assessing multiple input-output efficiency. The results show that the variation of actual and computed efficiency using DEA was minimal for individual units. However, GAs consistently outperformed DEA when used to compute relative efficiency ranks of units.

2) Genetic Learning of Decision Rules in Financial Markets, ***Kumar Mehta***, Univ. of IL, Dept. of Infor. & Dec. Sci., MC 294, University Hall 2426, Chicago, IL 60607, kmehta1@tigger.uic.edu, ***Siddhartha Bhattacharyya***

We focus on establishing an adequate rule structure and operators needed to learn decision rules for various financial instruments using GAs. The decision rules not only provide significantly increased profitability over a buy-and-hold strategy, but also indicate reduced variability in the returns. Decision rules were also obtained using risk-adjusted and non-risk-adjusted fitness criteria and compared.

3) Knowledge-Based Decision Support for Audit Planning, ***Roman Wong***, Southern IL Univ., Dept. of Mgmt., Coll. of Bus. Admin., Carbondale, IL 62901, rwong@siu.edu

We suggest an alternative approach for the development of a knowledge-based system for audit planning. Based on prior research on generic tasks and the corresponding tools, this alternative approach emphasizes the understanding of the task properties and the structure of the required knowledge; and the modeling of their relationships into a workable knowledge model.

WB35 Networks & Graphs I

Contributed Session
Chair: Earl R. Barnes, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, earl.barnes@isye.gatech.edu

1) AutoGraphiX: A System for Finding Extremal Graphs, ***Gilles Caporossi***, Ecole Polytech. of Montreal, GERAD, 3000 Cote Ste. Catherine, Montreal, Quebec, H3T 2A7, Canada, gillesc@crt.umontreal.ca, ***Pierre Hansen***

The variable neighborhood search metaheuristic is applied to the problem of finding external graphs for various graph invariants or formulae involving such invariants. This leads to automated or assisted refutation of conjectures, formulation of new ones and hints at proofs of such conjectures.

2) Efficient Vertex-Generation for Network Polyhedra with Application to a Class of Generalized Network, ***Yaw Chang***, Univ. of NC, Dept. of Math. Sci., 601 S College Rd., Wilmington, NC 28403-3297, changy@sol.cms.uncwil.edu

3) Bounds for the Largest Clique in a Graph, ***Earl R. Barnes***, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, earl.barnes@isye.gatech.edu

It is well-known that the problem of determining the largest clique in a graph reduces to a nonconvex quadratic programming problem whose coefficient matrix is the adjacency matrix for the graph. We show that this quadratic programming problem becomes convex if the off-diagonal 0s in the adjacency matrix are replaced by certain numbers between 0 and 1. Solving this gives a clique which, in almost all experiments, is the largest clique in the graph...

WB36 Quadratic Assignment Problems I

Cluster: Networks
Invited Session
Chair: Federico Malucelli, Univ. of Perugia, Inst. of Electronics, Via G Duranti 1/A-1, Perugia, 06131, Italy, maluc@istel.ing.unipg.it

1) Branching Strategies for a Quadratic Assignment Problem Branch & Bound Algorithm, ***Peter M. Hahn***, Sci-Tech. Services, Inc., 1416 Park Rd., Elverson, PA 19520, peter_hahn@compuserve.com, ***William Hightower***, ***Terri Johnson***

We present improvements to a branch-and-bound algorithm for solving the QAP. The improvements have been used to solve the Nuget 24 test problem with what is currently the least total CPU time. Solutions and/or attack strategies for test problems up to and including the Nugent 30 are discussed. The theoretical basis of the bounding technique is included. The interaction between bounding techniques and branching strategies in B&B QAP solution algorithms is investigated.

2) A Dual Framework for Lower Bounds of the Quadratic Assignment Problem Based on Linearization, ***Stefan E. Karisch***, Tech. Univ. of Denmark, Dept. of Math. Modeling, DTU Bldg. 321, Copenhagen, DK-2100, Denmark, sk@imm.dtu.dk, ***Eranda Cela***, ***Jens Clausen***

A dual framework allowing the comparison of various bounds of the quadratic assignment problem based on linearization, e.g., the bounds of Adams & Johnson, Carraresi & Malucelli, and Hahn & Grant, is presented. We discuss the differences of these bounds and propose a new bound based on the Lagrangian dual.

3) An Exact Method for the QAP, ***Mauricio G.C. Resende***, AT&T Labs Research, Room C241, 180 Park Ave., Florham Park, NJ 07932-0971, mgcr@research.att.com, ***K. G. Ramakrishnan***, ***Panos M. Pardalos***

An exact method for solving instances of the QAP is proposed. This method, based on B&B, uses LP relaxations of the QAP to produce good lower bounds and is implemented on a distributed computing environment. Computational results are presented.

WB37 Data Management Systems

Sponsor: CSTS
Sponsored Session
Chair: Anindya Datta, Univ. of AZ, MIS Dept., McClelland Hall, Tucson, AZ 85721, adatta@loochi.bpa.arizona.edu

1) Schema Integration Methodology for Heterogeneous GIS Databases, ***Jinsoo Park***, Univ. of AZ, MIS Dept., Tucson, AZ 85721

This research attempts to develop a theoretical framework and methodology for schema integration for distributed and heterogeneous GIS databases. Set theory, fuzzy set theory and predicate logic are used to formalize the semantic model and the schema integration methodology. A comprehensive framework for classifying semantic inconsistencies in heterogeneous GIS databases is proposed. A prototype will be implemented to provide proof of concept for this work.

2) Early Stopping in Belief Networks, ***Vijay Mookerjee***, Univ. of WA, Sch. of Bus., 370 Mackenzie Hall, Seattle, WA 98195, ***Michael V. Mannino***, ***Robert Gilson***

In Bayesian networks, it is difficult to ensure that observing further inputs will not substantially alter the belief in a goal node. Hence, a condition for the early stopping of input acquisition is not easy to derive. This research offers an early stopping method leading to cost optimized belief networks.

3) Mobility, Mobility, Everywhere Mobility, ***Vijay Kumar***, Univ.

of MO, CSTP Dept., Kansas City, MO

Mobility is becoming an inherent property of existance. Business organizations require unrestricted mobility to achieve efficiency in managing their data. We discuss a number of problem areas of global mobile information management systems. In particular, we identify the unsuitability of ACID transaction, effect of mobility on transaction processing and its commit and discuss the role of mobility in managing workflows.

4) A Novel Approach for Indexing Data Warehouses, ***Igor Viguier***, Univ. of AZ, MIS Dept., Tucson, AZ 85721, ***Anindya Datta***

One structure that seems promising for storing and managing warehoused data is the gridfile. We present efficient algorithms to manage gridfields for vast amounts of compressed data. In particular, we show that our approach yields both dramatically reduced storage costs and highly improved processing efficiencies and alleviates problems associated with conventional gridfiles.

WB38 Telecommunications I

Contributed Session

Chair: Eli V. Olinick, Univ. of CA, Dept. of IEOR, 4175 Etcheverry Hall, Berkeley, CA 94720-1777, olinick@ieor.berkeley.edu ieor.berkeley.edu/~olinick

1) Representing Reliable Network Design Problems in Genetic Algorithms, ***Elham Ghashghai***, The Aerospace Co., Satellite Navigation Dept., M 4/962, El Segondo, CA 90245-4691, elham@monstro.aero.org, ***Ronald L. Rardin***

The term reliability is defined as the capability to be restored in case of either node of the network services or link failure. These problems are (NP)-hard on general graphs. We present a GA based on identifying a good decomposable 3-tree subgraph and on accepting the optimal solution on that subgraph as an approximate optimum for the full problem.

2) An Integer Programming Formulation for Estimating Hierarchical Levels in an Undirected Graph, ***Norman D. Curet***, Dept. of Defense, Ctr. for OR, 9800 Savage Rd., Ft. Meade, MD 20755-6550, ndcuret@afterlife.ncsc.mil, ***John Brandeau***, ***Al Olson***

We present several variants of an integer programming model for determining each node's level in a hierarchical public switch telephone network, PSTN. Applications and computational insights on several real world regional PSTNs are given.

3) SONET/SDH Ring Assignment with Capacity Constraints, ***Eli V. Olinick***, Univ. of CA, Dept. of IEOR, 4175 Etcheverry Hall, Berkeley, CA 94720-1777, olinick@ieor.berkeley.edu ieor.berkeley.edu/~olinick, ***Olivier Goldschmidt***, ***Alexandre Laugier***

We study the problem of interconnecting customer sites with SONET/SDH rings with capacity limit B. Bandwidth demand between pairs of nodes is given. A rings' capacity is the total bandwidth required by its nodes. Also, the total bandwidth required between pairs of nodes in different rings can not exceed B.

Wednesday 12:30-14:00

WC01 Dynamic Traffic Network Modeling with Applications II

Sponsor: TSS & IFORS

Sponsored Session

Chair: Bruce N. Janson, Univ. of CO, Dept. of Civil Eng., PO Box 173364, CB 113, Denver, CO 80217-3364, bjanson@carbon.cudenver.edu

1) Evaluating Traveler Costs of Alternative Traffic Management Plans at Highway Work Zones Using a Dynamic Traffic Assignment Model, ***Juan Robles***, Univ. of CO, Dept. of Civil Eng., PO Box 173364, CB 113, Denver, CO 80217-3364, jrobles@carbon.cudenver.edu, ***Bruce N. Janson***

A dynamic traffic assignment model including spillback queuing effects is described to calculate differences in total travel times for alternative traffic management plans at highway work zones. Examples compare 40 construction scheduling and traffic management alternatives that vary by length of work zone, time-of-day of work, and ramp closures.

2) Dynamic Network Assignment for Management of Information to Travelers Real-Time System for Traffic Prediction & Guidance Generation, ***Michel Bierlaire***, MIT, 3 Cambridge Ctr., Ste. 208, Cambridge, MA 02142, mbi@mit.edu, ***Moshe E. Ben-Akiva***, ***Haris N. Koutsopoulis***, ***R. Mishalani***

DynaMIT is a real-time dynamic traffic assignment system that generates prediction-based guidance for a variety of travel decisons such as departure time, mode choice and route choice (both pre-trip and en-route). It is designed to support the operations of a variety of information systems and information dissemination strategies, both prescriptive and descriptive, in real time. The system consists of many modules which include various models and algorithms implemented with appropriate data structures.

3) Development of a Dynamic Guidance Model for Car Drivers in the City Center of Liege, Belgium, ***Alassane Balle Ndiaye***, Univ. of Liege, ANAST Transport. Systems Dept., 6 Quai Banning, Bat. C2, Biege, B-4000, Belgium, a.ndiaye@ulg.ac.be, ***Jean Marchal***

We focus on the strategies for the development of the model: methodological approach, steps, choice and implementation of the algorithms, practical problems encountered and methods used to solve them in the first version of the model, future developments planned and links with the future Liege Traffic & City Transport Management Model.

4) withdrawn - author request of 3/6, ***Der-Horng Lee***, Univ. of CA, Inst. of Trans. Studies, 523 Social Sci. Tower, Irvine, CA 92697-3600, dhlee@translab.its.uci.edu, ***Bin Ran***, ***Seongil Shin***

WC02 Multimodal, Multicommodity Transportation Systems II

Sponsor: TSS

Sponsored Session

Chair: Teodor Gabriel Crainic, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, theo@crt.unmontreal.ca

1) Scheduling of Handling Equipment in a Rail-Rail Combined Transport Terminal: A Multiple Traveling Salesman Modeling Approach, ***Nathalie Bostel***, Ecole Central Paris, Lab. Prod. Log. & CNAM, Grande Voie des Vignes, Chatenay Malabry, 92295, France, bostel@pl.ecp.fr

The problem of scheduling of handling equipments in a transshipment shunting yard is complex. It can be viewed as a hoist scheduling problem. To solve it, we propose a model and algorithm bvased on the multiple traveling salesman problem and we present experimentations from a real data set.

2) Transportation Planning in Fast Growing, Densely Populated Areas, ***Shuguang He***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, theo@crt.umontreal.ca, ***Teodor Gabriel Crainic***, ***Claude Comptois***

Transportation is strongly linked to economic activities. Planning the transportation of freight in urban regions faced with rapid economic growth, old infrastructures, a mixed land use and a very dense population raises particular challenges. We review the main issues and the tools available, and point to interesting research issues. Shanghai (R.P. China) serve as an illustrative case.

3) A Macroscopic Model for Urban Land Use & Transportation Coordination, ***Yiwen Xu***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, yiwen@crt.umontreal.ca, ***Claude Comptois***, ***Michel Gendreau***

We describe a new model for urban land use and transportation coordination. The land use model involves an urban form based activity location. The transportation model includes trip generation, trip distribution, and combined mode choice and traffic assignment. Macroscopic model for simultaneously considering the land use development and the transportation development is addressed. Solution method is discussed and computation result is reported.

4) Playing with Paths in STAN, ***Teodor Gabriel Crainic***, Univ. of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, theo@crt.unmontreal.ca, ***Michael A. Florian***, ***Gina Dufourt***, ***Diane Larin***

The number of paths generated during assignment of a multimode, multicommodity formulation of realistic dimensions is usually extremely large. The presentation will focus on an efficient approach to save and manipulate these paths for subsequent analyses. Several applications will be illustrated.

WC03 Transportation III

Contributed Session

Chair: Jacques Renaud, Univ. du Quebec, Tele-univ., 2600 Blvd. Laurier, Tour de la Cite, CP 10700, Quebec, Quebec, G1V 4V9, Canada, jrenaud@teluq.uquebec.ca

1) A Heuristic for the Fixed Charge Facility Location Problem, ***Herbert F. Lewis***, SUNY, Harriman Sch. of Mgmt./Policy, Stony Brook, NY 11794, hlewis@fac.har.sunysb.edu

We model the problem of determining which locations should be refueling sites for various vehicle fleets as a fixed charge facility location problem and present a greedy heuristic for generating solutions using an approach similar to

Kruskal's minimum spanning tree algorithm.

2) The Gas Stations Supply Problem, ***Jacques Renaud***, Univ. du Quebec, Tele-univ., 2600 Blvd. Laurier, Tour de la Cite, CP 10700, Quebec, Quebec, G1V 4V9, Canada, jrenaud@teluq.uquebec.ca, ***Fayez F. Boctor***, ***Dounya Taqa Allah***

3) The Mixed Rural Postman Problem with Turn Restrictions, ***Xu Jun Eberlein***, Caliper Corp., 1172 Beacon St., Newton, MA 02161, xje@caliper.com

The mixed postman problem is NP-complete. The problem is further complicated when the service network is disconnected and bad turns are minimized. We present a heuristic algorithm that solves such a problem with turn restrictions in the settings of a real-world solid-waste collection routing problem.

4) Routing Winter Maintenance Vehicles, ***Jaime M. Taube***, Univ. of MI, Dept. of IOE, 1801 Willowtree Ln. Apt. A2, Ann Arbor, MI 48105, taube@engin.umich.edu, ***Chelsea C. White, III***

We present a multiobjective arc routing model which was used for the development of winter maintenance routes at the County level in Southeast Michigan. We will also discuss computational results of a number of heuristics implemented.

WC04 New Product Development II

Contributed Session

Chair: Amiya K. Chakravarty, Tulane Univ., AB Freeman Sch. of Business, New Orleans, LA 70118-5669, amiyac@freeman.tulane.edu

1) Minimizing Time & Cost to Market with Periodic-Prototyping of Products, ***Amiya K. Chakravarty***, Tulane Univ., AB Freeman Sch. of Business, New Orleans, LA 70118-5669, amiyac@freeman.tulane.edu, ***Samar K. Mukhopadhyay***

Prototyping is a function that interfaces design with manufacturing. Periodic-prototyping allows a multifunctional team approach that lets tasks be performed in parallel within a prototype cycle. We discuss a mathematical model of periodic prototyping cycles of a product that minimizes the total cost and completion time.

2) Multiple Objective Mathematical Programming & the Dual Response Problem, ***Julia Pet-Edwards***, Univ. of Central FL, Dept. of IE & Mgmt. Systems, PO Box 162450, Orlando, FL 32816-2450, edwards@iems.engr.ucf.edu, ***Robert L. Armacost***, ***Deborah M. Osborne***

Several different multiple response surface methods have been proposed to solve the "dual response problem" when both the mean and variance of the response must be optimized. We pose the dual response problems as a multiple objective mathematical programming problem which allows comparisons of the existing dual response approaches.

3) Product Design With Multiple Attributes, ***Kilsun Kim***, Univ. of IL, 339 Commerce West, 1206 W 6th St., Champaign, IL 61820, kkim2@uiuc.edu, ***Dilip Chhajed***

When the firm designs products with multiple attributes, it can use different attributes to mitigate the cannibalization using heterogenuous perference of segments for different attributes. We provide some properties of the optimal product design and insights which were not observed in a single attribute case. We also address the issue of commonality in this setting.

4) Scheduling to Minimize Product Design Time Using a Genetic Algorithm, ***Shiu-Chung Lam***, The Chinese Univ. of Hong Kong, Systems Eng. & Systems Mgmt., Shatin NT, Hong Kong, China, sclam@se.cuhk.edu.hk http://www.se.cuhk.edu.hk/~sclam, ***Chelliah Sriskandarajah***, ***Houmin Yan***

We consider a scheduling problem encountered in a semiconductor manufacturing company where the time for designing products (or makespan) need to be minimized. We develop a Genetic Algorithm (GA) for this problem which is one of the combinatorial optimization subject to many practical constraints. The lower bound is also discussed. We have tested our algorithms and bounds with some real data.

WC05 Cellular Manufacturing II

Contributed Session

Chair: Aaron L. Nsakanda, Laval Univ., Fac. des sciences de l'admin., Pavillon Palasis-Prince, Ste-Foy, Quebec, G1K 7P4, Canada, nsakanda@lagrande.osd.ulava.ca

1) A Model for Pallet Allocation in Flexible Manufacturing Cells, ***Reza S. Lashkari***, Univ. of Windsor, Dept. of IE, 401 Sunset Ave., Windsor, Ontario, N9B 3P4, Canada, lash@uwindsor.ca, ***Balakrishnan Baskar***, ***Sourin P. Dutta***

We present a 0-1 integer programming model for the optimal allocation of pallets in flexible manufacturing cells. The model determines the optimal grouping of parts, machines, and the pallets considering the limitations on machine capacities, and on pallet-part and pallet-machine comaptibilities.

2) Price-Directed Decomposition Applied to the Route Selection Problem in Multi-Cell Manufacturing Systems, ***Aaron L. Nsakanda***, Laval Univ., Fac. des sciences de l'admin., Pavillon Palasis-Prince, Ste-Foy, Quebec, G1K 7P4, Canada, nsakanda@lagrande.osd.ulava.ca, ***Moustapha Diaby***, ***Wilson Price***

A RSP arises when parts associated with alternative routings must be routed through a manufacturing system. A formulation to this problem in the context of analysis of cellular manufacturing facility is presented. We use Dantzig-Wolfe decomposition to solve large problems that occur and present results from randomly generated problems.

3) withdrawn - author request of 2/27, ***Taeho Park***, San Jose State Univ., 1 Washington Sq., San Jose, CA 95192-0070, park_t@cob.sjsu.edu

WC06 Semiconductor Industry Applications

Contributed Session

Chair: R. John Milne, IBM Microelectronics, 60 Kriste Ln., Jericho, VT 05465, jmilne@us.ibm.com

1) Advanced MRP for Semiconductor Manufacturing, ***R. John Milne***, IBM Microelectronics, 60 Kriste Ln., Jericho, VT 05465, jmilne@us.ibm.com, ***Robert A. Orzell***, ***Chih-Kuan Yen***

An Advanced Material Requirements Planning (AMRP) algorithm is described. Because semiconductor manufacturing has complexities (binning, substitutions, alternate processes) which are not handled well with traditional MRP methods, AMRP intergrates Linear Programming (LP) and heuristic technologies to create an advanced material requirements plan. This algorithm as been used successfully at IBM's semiconductor plant in Burlington, Vermont.

2) Scheduling Policies for Long Cycle-Time & Large Load Size Operations in a Semiconductor Wafer Fab, ***Sumer S. Johal***, Analog Devices Inc., 804 Woburn St., Wilmington, MA 01887, sumer.johal@analog.com, ***Hemant Taneja***

In a semiconductor wafer fab, unit process with long processing time, e.g., most diffusion recipes, certain anistropic etches, etc., and equipment with large load sizes, e.g., diffusion furnaces, photo/MHDS runs, etc., usually generates the most attention from a production perspective because such processes can have a large impact on the short term revenue of a company. Fabs tend to expedite the work at these operations...

3) Efficient Setup/Dispatching Policies in Semiconductor Manufacturing Plants, ***Kwok Fai Chu***, Chinese Univ. of Hong Kong, Dept. of Sys. Eng./Eng. Mgmt., Shatin, NT, Hong Kong, China, kfchu@se.cuhk.edu.hk, ***Houmin Yan***

We consider the problem of reducing the mean and the variance of cycle time in semiconductor manufacturing environments where machines require setups for changing one lot type to another. We introduce new scheduling policies incorporating setups since the policies developed in the literature for systems having no setups are found to perform poorly in our context...

4) withdrawn - author request of 3/12, ***Roger Villeneuve***, MultiCIM Technologies, Inc., 169 Labrosse Ave., Pte.-Claire, Quebec, H9R 1A3, Canada, multicim@compuserve.com, ***Michel Fabre***

WC07 Scheduling for Assembly Lines

Contributed Session

Chair: Leonora Fuxman, St. John's Univ., 8000 Utopia Parkway, Jamaica, NY 11439, fuxmanl@stjohns.edu

1) Job Assignment & Scheduling in Mixed-Model Asynchronous Assembly Lines, ***Leonora Fuxman***, St. John's Univ., 8000 Utopia Parkway, Jamaica, NY 11439, fuxmanl@stjohns.edu

We address job assignment and scheduling strategies in labor intensive asynchronous mixed-model assembly lines. Few alternative job assignment strategies to workers are considered. Their impact on line performance and scheduling is investigated. The implications of the proposed stragegies on the assembly lines design are discussed.

2) Worker Cross Training in Synchronous Assembly Lines with Cyclic Job Sequence, ***Janice K. Winch***, Pace Univ., Lubin Sch. of Bus., One Pace Plaza, New York, NY 10038, winch@pace.edu, ***George L. Vairaktarakis***

We consider a synchronous assembly line which processes mixed jobs ordered in a cyclic sequence. For various levels of cross training, we find the sequence of jobs which minimizes the size of workforce required. We use the results to analyze the effect of cross training on the workforce size.

3) Analysis of Scheduling Policies for Assembly Lines with Duplicate Stations, ***Mehmet Savsar***, Kuwait Univ., PO Box 5969, Safat, 13060, Kuwait, mehmet@kuc01.kuniv.edu.kw

In assembly lines, some stations are duplicated due to their long cycle times. Handling and sequencing considerations may require these stations to be arranged in series. This study compares several scheduling policies with respect to their effects on the utilization of serial duplicate stations and line output rate.

4) Mixed Model Sequencing with Two Objectives, ***Robin H. Lovgren***, Univ. of Memphis, Dept. of INSE, Memphis, TN 38152, rlovgren@cc.memphis.edu, ***Michael J. Racer***

This research in mixed-model sequencing defines a method for evaluating the two-objective problem, evaluating tradeoffs between two goals: meeting the customer due dates, and leveling the usage of components on the final assembly line. This research also provides and tests several heuristic methods for solving the Mixed-Model two-objective sequencing problem.

WC08 Production & Scheduling II

Contributed Session

Chair: Steven E. Butt, Western MI Univ., IME Dept., Kalamazoo, MI 49008, steven.butt@wmich.edu

1) Solving Large Aggregate Planning Problems Using a Functional Approximation Dynamic Programming Approach, ***Deepak K. Mohapatra***, Case Western Reserve Univ., Dept. of Systems Eng., 10900 Euclid Ave., Cleveland, OH 44106, dxm56@po.cwru.edu http://k2.crwu.edu/dsm56, ***Vira Chankong***

We present a variation of dynamic programming approach to solve a large scale aggregate planning model. We use a functional approximation technique that eliminates the need of discretizing the state space and hence alleviates the dimensionality problem faced by a standard DP procedure. We discuss the DPFA technique briefly and...

2) An Integrated Production & Transportation Planning Model for Winstone Aggregates, ***Steven E. Butt***, Western MI Univ., IME Dept., Kalamazoo, MI 49008, steven.butt@wmich.edu, ***David M. Ryan***, ***Stuart Mitchell***

We describe an LP model developed for a New Zealand company, which minimizes the costs associated with production, inventory and transportation. The company under consideration primarily supplies rock, gravel and sand products from 21 quarry locations to customers in the road construction and building industries.

3) Integration Production & Transportation Scheduling Decisions Between Remote Facilities, ***Tan Miller***, Warner-Lambert, 201 Tabor Rd., Morris Plains, NJ 07950, mille15@mops.wl.com, ***Renato de Matta***

Synchronizing production and transportation scheduling decisions on a multi-echelon manufacturing network where intermediate plants produce WIP goods into ends products represents a significant challenge. We propose a multi-echelon plant scheduling model which simultaneously develops integrated production and transportation schedules for all echelons.

WC09 Flow Shop & Job Shop Scheduling

Contributed Session

Chair: Erhan Kutanoglu, Lehigh Univ., Dept. of IMSE, Mfg. Logistics Inst., Bethlehem, PA 18015-1582, erk3@lehigh.edu

1) Flow-Shop Scheduling with Deteriorating Jobs, ***Gur Mosheiov***, The Hebrew Univ., Sch. of Bus., Dept. of Stats., Jerusalem, 91905, Israel, gm253@columbia.edu

We study flowshop scheduling of deteriorating jobs, i.e., jobs whose processing times are an increasing function of their starting times. We introduce a simple polynomial-time solution to makespan minimization on a 2-machine flowshop. We then prove that makespan minimization on an M-machine flowshop is NP-hard. We propose and test numerically a heuristic algorithm of a greedy type.

2) withdrawn - author request of 4/2, ***Murat Bayiz***, Tulane Univ., AB Freeman Sch. of Bus., New Orleans, LA 70118, mbayiz@freeman.tulane.edu, ***Ihsan Sabuncuoglu***

3) An Improved Search Template for the Job-Shop Scheduling Problem, ***Anant S. Jain***, Univ. of Dundee, Dept. of APEME, Fulton Bldg., Dundee, Tayside, DD1 4HN, Scotland, UK, a.z.jain@dundee.ac.uk, ***Sheik Meeran***

Current methods for the deterministic job-shop scheduling problem provide only a restricted search of the solution space. We propose a search template, marrying ideas from evolutionary computation and TS, which applies both intensification and diversification strategies. Such a framework provides a more thorough investigation of the solution space and can be easily adapted to any type of combinatorial optimization problem.

4) Distributed Resource Scheduling Using a Lagrangean-Based Decomposition, ***Erhan Kutanoglu***, Lehigh Univ., Dept. of IMSE, Mfg. Logistics Inst., Bethlehem, PA 18015-1582, erk3@lehigh.edu, ***David Wu***

We propose a scheduling method mapping the concept of auction and bidding with a Lagrangean-based decomposition. Using job shop scheduling model, we study the connection between an incentive compatible auction mechanism and price directed search for Lagrangean dual. We will present the results of our preliminary investigation.

WC10 New Approaches in Solving Scheduling Problems

Cluster: Scheduling
Invited Session

Chair: Shanling Li, McGill Univ., Fac. of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, li@management.mcgill.ca

1) Cyclic Scheduling & Design Considerations in Synchronous Production Lines, ***Panos Kouvelis***, Washington Univ., Olin Sch. of Bus., 1 Brookings Dr., St. Louis, MO 63130-4899, ***Selcuk Karabati***

Abstract: We address the scheduling problem in unpaced synchronous mixed model production lines operated under a cyclic scheduling policy. We present an integer programming formulation of the problem and an approximate solution procedure with very good average performance. We then suggest ways to improve the performance of the line via buffering or clever planning approaches.

2) Production Flow Control for a Tandem Line with Piecewise Constant Demand, ***Sherman X. Bai***, Univ. of FL, ISE Dept., 303 Weil Hall, Gainesville, FL 32611, bai@ise.ufl.edu, ***Marie Edenhammer***, ***Yihui Li***

Abstract: We consider a production system consisting two machines in sequence and producing one product type. The planning horizon consists of N intervals of different lengths. The demand is constant in each interval and may vary from one interval to another. If demand is not satisfied immediately, it is backlogged. the objective is to determine an optimal production plan so as to minimize the total cost.

3) A Fast Labeling Algorithm for Single Machine Batching Problems to Minimize the Total Weighted Completion Time, ***Wanzhen Huang***, Lakehead Univ., Dept. of Math & Stats., Thunder Bay, Ontario, P7B 5E1, Canada

We study a single machine scheduling problem with batch setup times to mininize the total weighted completion time. First, we show that the problem is equivalent to a shortest path problem. An O labeling algorithm can be set up, which is polynomial provided that the number of batches is bounded. Several criterion are given to reduce the size of the problem significantly.

4) Solving Parallel Machine Scheduling Problems with Setup Times by Column Generation, ***Zhi-Long Chen***, Princeton Univ., Dept. of Civil Engr. & OR, 272 Towne Bldg, 220 S 33rd St., Philadelphia, PA 191046315, zlchen@seas.upenn.edu, ***Warren B. Powell***

We present exact and heuristic methods based on column generation approach, for solving parallel machine scheduling problems with setup time.

WC11 In-Process Quality Improvement Methodologies: Multivariate Statistical Analysis & Quality Improvements

Cluster: Quality
Invited Session

Chair: Fugee Tsung, Univ. of MI, Ind. Eng. & Eng. Mng. Dept., Ann Arbor, MI, season@engin.umich.edu

1) Multivariate Process Capability Analysis of Assembled Stamped Parts, ***Luis Guzman***, Univ. of MI, Dept. of IOE, 1733 IOE, Ann Arbor, MI 48019-2117, lmyito@engin.unmich.edu, ***Gary Herrin***

Process capability analysis has traditionally focused in the study of univariate measures where quality characteristics are assumed to be "in control" and follow a normal distribution. We study stamped parts which are assembled and several

target points are measured using optical measurement devices. Correlations exist among these different points and issues such as multicolinearity, autocorrelation, data reduction and interpretation must be resolved to facilitate the assessment of process capability.

2) Monitoring Multivariate Process Variation, ***Behrad Moeinzadeh***, Univ. of Cincinnati, PO Box 210116, Cincinnati, OH 45221-0116, ***Ali A. Houshmand***

We describe a new online process control system that can be used in modern manufacturing environments (e.g. CIM). The model incorporates advanced statistical techniques with an expert system and several data acquisition systems. The model is packaged as a Windows based software for ease of use by manufacturing engineers.

3) Multivariate Statistical Methods for Diagnosing Tooling Failures in Autobody Assembly, ***Daniel Apley***, Univ. of MI, Dept. of Ind. & Oper. Eng., IOE Building, Ann Arbor, MI 48019-2117, apley@engin.unmich.edu, ***Jan Shi***

We discuss a number of statistical techniques for analyzing multivariate dimensional data in autobody assembly for the purpose of detecting and identifying tooling faults. Various techniques have been developed for automatic fault detection and identification in situations where a set of candidate faults is a priori known, and to serve as a powerful diagnostic aid to the process engineer in situations where no such set of candidate faults can be postulated.

4) Canonical Correlation Analysis for Root Cause Analysis in the Body-in-White Assembly Process, ***Shawn Hui***, General Motors Corp., 45703 Irvine Dr., Novi, MI 48374, tzeonbui@ameritech.net

The body-in-white assembly process is a multi-stage process. CCA is used to identify and quantify the associations between 2 sets of variables, viz, the underbody and full body dimensional measurements. First, principal components (PC) are extracted from each set and significant PC retained. CCA is then performed with these 2 sets of retained PC scores. Root causes are identified by looking into the pairs of canonical coefficient vectors (for the original variables)...

WC12 OR/MS in Forestry II: Nature Reserve Design

Sponsor: ENRE
Sponsored Session
Chair: Claire Montgomery, OR State Univ., Dept. of Forest Resources, Corvallis, OR 97331, montgomc@ccmail.orst.edu

1) Optimization Western Washington's Forest for Economic & Habitat Conservation Values, ***Bruce Bare***, Univ. of Washington, Coll. of Forest Resources, Box 352100, Seattle, WA 98195-2100, bare@u.washington.edu, ***Bruce R. Lippke***

An LP model is developed to optimize economic and physical objectives while satisfying different habitat conservation goals across multiple ownerships and regional landscapes. Tradeoffs among owners and regions are possible in order to satisfy biodiversity goals at least-cost. Solutions help identify where forest production investments are best targeted.

2) A Multiobjective Optimization Model for Selecting Areas for Habitat Reserves & Timber Harvesting, ***Stephanie Snyder***, JHU, Dept. of Geog. & Environ. Eng., 313 Ames Hall, Baltimore, MD 21218, ***Charles ReVelle***

A 0/1 multiobjective programming model was developed to optimize the spatial allocation of forest parcels for habitat reserves and harvesting activities; resources often in conflict. Spatial adjacency constraints were incorporated into the mode. The multiobjective weighting method was used to solve the model and explore trade-offs.

3) Pricing Biodiversity, ***Claire Montgomery***, OR State Univ., Dept. of Forest Resources, Corvallis, OR 97331, montgomc@ccmail.orst.edu, ***Robert A. Pollak***

We propose a management price framework for evaluating optimality in land use at the local, or land management unit, level when biodiversity is one of the land management objectives. We construcrt a case study set in Monroe County, Pennyslvania to illustrate the approach, its feasibility and potential usefulness.

4) Simple Models of Flammable Forests, ***J. Scott Rogers***, Univ. of Toronto, Dept. of MIE, 5 Kings College Rd., Toronto, Ontario, M5S 3G8, Canada, rogers@mie.utoronto.ca, ***David L. Martell, R. Saporta***

Large mathematical programming models can identify good strategies for managing flammable forests but they do not always provide insight into basic system structure or form of optimal solutions. We explore the use of linear programming model solutions to estimate parameters of simpler analytic models, which provide insight into the sturcture of optimal policies.

WC13 Mixed Integer Programming

Cluster: Discrete Optimization
Invited Session
Chair: Gabor Pataki, Columbia Univ., IEOR Dept., Mudd 331, New York, NY 10027, gabor@ieor.columbia.edu

1) Relaxations for Mixed Logical/Linear Programming, ***John N. Hooker***, Carnegie Mellon Univ., GSIA, Pittsburgh, PA 15213, jh38+@andrew.cmu.edu gsia.cmu.edu/afs/andrew/gsia/jh38/jnh, ***Hak Jin Kim***

MLLP allows the discrete elements of a problem to be presented in logical form rather than in the integer variables. This forfeits the continuous relaxation, but equivalent or alternative relaxations are often available. This will be illustrated with production scheduling and planning examples.

2) DMIPO - A Second Generation Disjunctive Solver, ***Gabor Pataki***, Columbia Univ., IEOR Dept., Mudd 331, New York, NY 10027, gabor@ieor.columbia.edu, ***Sebastian Ceria***

DMIPO is a branch-and-cut solver for problems with linear and logical constraints - the latter can be used directly in branching and cut generation, without representing them using integer variables. Extensive computational results are reported on problems from MIPLIB, on linear complementarity and scheduling problems.

3) EMOSL: A New Framework for Rapid MIP Algorithm Development, ***Bob Daniel***, DASH Assoc., Blisworth House, Church Ln., Blisworth, Northants, NN7 3BX, UK, rcd@dash.co.uk, ***James Tebboth***

EMOSL (a combined modelling and optimisation subroutine library) overcomes the major drawbacks in MIP algorithm development: slow transfers between modeller and optimiser or lost problem structure. With EMOSL the optimiser can manipulate in-core problem representation using the model's algebric formulation.

4) Solving Set Partitioning Problems in Parallel, ***Jeffrey T. Linderoth***, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, jeff@akula.isye.gatech.edu, ***Eva K. Lee, Martin W. P. Savelsbergh***

We propose schemes for effectively parallelizing a B&C approach to solving large set partitioning problems on distributed memory computer architectures. Computational results indicate that good speedups can be obtained by the parallelization.

WC14 Integer Programming II

Contributed Session
Chair: Alper Atamturk, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, atamturk@isye.gatech.edu http://akula.isye.gatech.edu/~atamturk

1) Polyhedral Methods for Nonseparable Piecewise-Linear Functions, ***Dan Wilson***, Univ. of KY, 715 Patterson Office Tower, Lexington, KY 40506, wilsondl@ms.uky.edu, ***Jon Lee***

We present mixed-integer programming models for nonseparable piecewise-linear functions. We develop polyhedral methods for attacking these models, and we present some computational results using AMPL.

2) Valid Inequalities for Some Resource Allocation Problems, ***Alper Atamturk***, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, atamturk@isye.gatech.edu http://akula.isye.gatech.edu/~atamturk, ***George L. Nemhauser, Martin W. P. Savelsbergh***

Mixed integer models of a variety of resource allocation problems include a common structure with demand constraints, additive variable upper bounds and mutual exclusitivity constraints on sets of binary decision variables. We derive valid inequalities for this structure and present computational results.

3) An MILP for Continuous Scheduling in a 2-Stage System, ***Vipul Jain***, Carnegie Mellon Univ., Dept. of Chem. Eng., Pittsburgh, PA 15213, vjain@andrew.cmu.edu, ***Ignacio E. Grossmann***

This presentation deals with short-term scheduling of a 2-stage continuous process with parallel units and intermediate storage tanks. A disjunctive model is presented to minimize makespan for a given set of orders. The model is transformed into an MILP model. Computational results are presented.

4) A Systematic Modeling Framework for Process Networks, ***Hector Yeomans***, Carnegie Mellon Univ., Dept. of Chem. Eng., 5000 Forbes Ave., Pittsburgh, PA 05213, yeomans@andrew.cmu.edu, ***Ignacio E. Grossmann***

A modeling and optimization framework for process networks is presented. The State Task Network and State Equipment Network are proposed as fundamental

representations for process systems, to be modeled with Generalized Disjunctive Programming and then converted into MILP/MINLP problems. The methodology is illustrated with chemical plant design problems.

WC15 Nonlinear Programming II

Contributed Session

Chair: Faiz A. Al-Khayyal, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, faiz@isye.gatech.edu

1) Nonmonotone Trust Region Methods for Nonsmooth Optimization, ***Fangjun Zhou***, Ctr. for Disease Control & Prevention, Immunization Services Div., 12 Corporate Square Blvd., Atlanta, GA 30329, fangjun@isye.gatech.edu, ***Faiz A. Al-Khayyal***

Nonmonotone trust region methods are presented for solving nonsmooth optimization problems. Convergence rates of the procedure are proven to be the same as for monotone trust region methods, under certain conditions. Computational results on difficult test problems indicate that nonmonotone methods have better average case convergence rates than monotone methods.

2) On Dual Convergence of the Generalized Proximal & Point Method with Bregman Distances, ***Renato D. C. Monteiro***, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332, monteiro@isye.gatech.edu, ***Alfredo Iusem***

We consider the proximal point method with Bregman distances applied to linearly constrained convex optimization problems and study the behavior of the dual sequence of optimal multiplier of the subproblems. We show that a certain averaged dual sequence converges to the centroid of the dual optimal face.

3) A Unification of Linearly Constrained Entropy Optimization Methods, ***H.-S. Jacob Tsao***, Univ. of CA, Inst. of Transport Studies, 109 McLaughlin Hall, Berkeley, CA 94720-1720, tsao@euler.berkeley.edu http://www.its.berkeley.edu/staff/tsao/jacob, ***Shu-Cherng Fang***

In this talk, we present an uncostrained dual framework that unifies the existing entropy optimization methods with linear constraints in finite, countably infinite or continuous spaces.

WC16 Topics in Semidefinite Programming

Cluster: **Linear Programming**

Invited Session

Chair: Katya Scheinberg, IBM, TJ Watson Research Ctr., PO Box 218, Yorktown Heights, NY 10598, katyas@watson.ibm.com

1) Error Bounds for Linear Matrix Inequalities, ***Jos F. Sturm***, McMaster Univ., Communications Research Lab., 1280 Main St. W, Hamilton, Ontario, L8S 4K1, Canada, sturm@few.eur.nl

For iterative sequences that converge to the solution set of a linear matrix inequality, we show that the distance of the iterates to the solution set is at most\(O(\epsilon*{2*{-L}}) \). The nonnegative integer L is the so--called semidefinite irregularity level of the linear matrix inequality, and $\epsilon $ denotes the amount of constraint violation in the iterate...

2) Some Fundamental Characterizations of Semidefinite Programming Relaxation, ***Masakazu Kojima***, Tokyo Inst. of Tech., Dept. of Math. & Comp. Sci., Oh-Okayama Meguro, Tokyo, 152, Japan, kojima@is.titech.ac.jp

We apply the SDP relaxation originally developed for combinatorial optimization problems and 0-1 integer programs to a general conconvex QP having a linear objective function and quadratic inequality constraints, and present some fundamental characterizations of the SDP relaxation including its equivalence to a relaxation using convex-quadratic valid inequalities for the feasible region of the QP.

3) Sensitivity in Semidefinite Programming, ***Katya Scheinberg***, IBM, TJ Watson Research Ctr., PO Box 218, Yorktown Heights, NY 10598, katyas@watson.ibm.com

We consider SDPS with objective function depending linearly on a scalar parameter. We study the sensitivity of the solution with respect to such a parameter. We show similarities and differences with LP, e.g. we study the use of the SDP equivalent of the LP minimum ratio test.

WC17 Metaheuristics III

Contributed Session

Chair: Fernanda R. Kri-Amar, Av. Ecuador #3659 Est. Central, Santiago RM, Chile, fdakri@toqui.usach.cl anakena.usach.cl/academicos/fkri.html

1) A Study on the Genetic Algorithms for the Scheduling of Parallel Computation, ***Kiseok Sung***, Kangnung Ntl. Univ., IE Dept., Chibyon-Dong, Kangnung, Kangwan, 210-702, Korea, sung@knusun.kangnung.ac.kr, ***Jeehyuk Park***

For parallel processing, the compiler partitions a loaded program into a set of tasks and makes a schedule for the tasks that will minimize parallel processing time for the loaded program. Building an Optimal schedule for a given set of partitioned tasks of a program has known to be NP-complete.

2) Parallel Models for Genetic Algorithms, ***Fernanda R. Kri-Amar***, Av. Ecuador #3659 Est. Central, Santiago RM, Chile, fdakri@toqui.usach.cl anakena.usach.cl/academicos/fkri.html, ***Mauricio G. Solar***, ***Victor M. Parada***

This work shows a comparison of different paralled models for GAs applied to the scheduling problem. The study presents the performance of the parallel models and compares them to a sequential GA. Results about the processing time and the solution cost of the models are shown.

3) Real-Time Optimization: Bin Packing Using a Parallel Distributed Architecture, ***Joseph P. Wetstein***, Drexel Univ., 32nd & Chestnut Sts., Philadelphia, PA 19104, j.wetstein.ieee.org

There is a need to perform highly complex real-time optimization during manufacturing to solve the problem of maximizing the yield of production while minimizing the cost of materials. We are interested in developing a solution to the leather nesting task, an NP-hard problem. Our algorithm will offer a better solution...

WC18 Metaheuristics III

Cluster: **Metaheuristics**

Invited Session

Chair: Patrick Soriano, Ecole Polytech., Univ. of Montreal, CP 6128 Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, patrick@crt.umontreal.ca

1) Memory Management Strategies for Cooperative Multithread Parallelism, ***Alexandre Le Bouthillier***, Univ. of Montreal, DIRO & CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, ***Teodor Gabriel Crainic***, ***Michel Gendreau***

A central memory (or solution pool) is an often used mechanism to implement coopeative multithread paralled metaheuristics. We compare several strategies to manage such a pool in the context of a parallel tabu search for fixed cost, multicommodity capacitated network design problems. We also discuss the role of these mechanisms...

2) Improving Tabu Search Heuristics for Multi-Commodity Fixed Charge Network Design, ***Ilfat Ghamlouche***, Univ. of Montreal, DIRO & CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, ***Teodor Gabriel Crainic***, ***Michel Gendreau***

Heuristics for multi-commodity fixed charge network design focus either on the binary design variables or on the continuous flow variables. TS heuristics based on design variables are generally less efficient, but have other advantages, especially in dynamic settings. We present here various techniques aimed at accelerating these heuristics.

3) Enumeration of Polyhex Hydrocarbons, ***Gilles Caporossi***, Ecole Polytech. of Montreal, GERAD, 3000 Cote Ste. Catherine, Montreal, Quebec, H3T 2A7, Canada, gillesc@crt.umontreal.ca, ***Pierre Hansen***

New algorithms are proposed for enumeration of benzenoids, coronoids and helicenes. They are based on the boundary edges code and reverse search. Benzenoid sets 600 times and helicene sets 10 million times larger than previously done are enumerated.

WC19 Hub Location

Sponsor: **SOLA**

Sponsored Session

Chair: James F. Campbell, Univ. of MO, Sch. of Bus. Admin., 8001 Natural Bridge Rd., St. Louis, MO 63121-4499, campbell@jinx.umsl.edu

Co-Chair: Barbaros C. Tansel

1) A Computational Study of Algorithms for the P-Hub Location Problem, ***Bahar Y. Kara***, Bilkent Univ., Dept. of IE, Bilkent, Ankara, 06533, Turkey, bkara@bilkent.edu.tr

New algorithms that take advantage of the problem structure are proposed for solving the p-hub location problem. A computational comparison of the new algorithms with existing algorithms is also given.

2) Hub Location in Ring Backbone Networks, ***John G.***

Klincewicz, AT&T Labs., 101 Crawfords Corner Rd., Rm. HO 3L-301, Holmdel, NJ 07733-3030, klincewicz@att.com

In generic hub location models, such as p-hub median, hubs are linked by a fully intgerconnected backbone network. Modern communications networks, however, can utilize a ring structure to link hubs. We review literature relevant to hub location in ring backbone networks, discuss modeling issues and propose possible avenues for future research.

3) Improved Formulations & Algorithms for Hub Location Problems, ***Mohan Krishnamoorthy***, CSIRO Math & IS, Private Bag 10, Clayton South MDC, Vic, 3169, Australia, mohan.krishnamoorthy@smis.csiro.au, ***Jamie Ebery***, ***Andreas Ernst***, ***Natashia L. Boland***

The problem of locating hub facilities arises in the design of transportation and telecommunications networks. We present improved formulations for a variety of hub location problems with different characteristics. We also present the theoretical foundations for these improvements. We then present comprehensive computational tests that help analyse the effectiveness of these formulations.

4) Polynomially Solvable Cases of the Hub Allocation Problem & Extensions to Hub Location, ***Bahar Y. Kara***, Bilkent Univ., Dept. of IE, Bilkent, Ankara, 06533, Turkey, bkara@bilkent.edu.tr, ***Barbaros C. Tansel***

By making certain assumptions on the transport network or on the structure of the city-to-city flows, we identify certain polynomially solvable cases of the hub allocation problem and discuss extensions to the hub location problem.

WC21 Simulation Applications

Contributed Session

Chair: Paul J. Kuzdrall, Univ. of Akron, 2950 Silver Lake Blvd., Silver Lake, OH 44224-3036, pkuzdral@neo.lrun.com

1) Stochastic Optimization Algorithms for Computing Headways of Stochastic Single-Bus-Line Systems, ***Huifen Chen***, Da-Yeh Inst. of Technology, Dept. of IE, 112 Shan-Jeau Rd., Dah-Tsuen, Chang-Hwa, 51505, Taiwan, huifen@aries.dyu.edu.tw, ***Fang-Chyi Liou***

We consider the problem of finding optimal headways that maximize the expected profit of a bus line. The objective function, however, is discontinuous; breaks occur when bus frequencies change. For this stochastic optimization problem, we retrospectively find optimal frequencies, then compute associate hadway estimates. The real-world implementation is discussed.

2) Application of Interactive Simulation to Airbase Logistics, ***Sundaram Narayanan***, Wright State Univ., 207 Russ Eng. Ctr., Dayton, OH 45435, snarayan@cs.wright.edu, ***Nicole Schneider***, ***John DiPasquale***

Airbase logistics is a complex domain involving logistics processes that support aircraft sortie generation at operational airbases. We present a Java-based interactive simulation architecture for airbase logistics modeling and describe its application to aircraft repair time analysis.

3) withdrawn - author request of 1/27, ***Steve D. Miller***, Goodyear Tire & Rubber Co., 514 Herbert Rd., Akron, OH 44314, ***Larry M. Takacs***, ***Paul J. Kuzdrall***

4) withdrawn - author request of 3/18, ***Patrick W. Benoit***, Univ. of ME, Biosystems Sci. & Eng. Dept., 5710 Bio-Resource Eng., Orono, ME 04469-5710, pbenoit@umenfa.maine.edu, ***Darrell W. Donahue***

WC22 Frameworks for Group Decision & Negotiation: Negotiating Agents on the Web

Sponsor: **Group Decision & Negotiation Section**
Sponsored Session

Chair: Tung X. Bui, Univ. of HI, Sch. of Bus., Dept. of DS, 2404 Maile Way E303, Honolulu, HI 96822, tbui@busadm.cba.hawaii.edu

1) Negotiation Agents for Web-Based Telemedicine, ***Regina Vu***, US Geological Survey, 1037 Lexus Way, Herdon, VA 20170, rvu@usgs.gov, ***Tung X. Bui***

We demonstrate how negotiation support software--delivered as software applets--can support group decision and negotiation activities in a special context. A virtual hospital delivers health services (consultation, diagnosis and treatment) in an anytime, anywhere mode. Software agents technology can be used to design distributed organization support systems.

2) Negotiator on the Internet, ***Tung X. Bui***, Univ. of HI, Sch. of Bus., Dept. of DS, 2404 Maile Wy E303, Honolulu, HI 96822, tbui@busadm.cba.hawaii.edu, ***Kim Blood***

We report the migration of NEGOTIATOR, a multiple-party bilateral multiattribute negotiation support system implemented on a local area network, to a Web-centric Internet. Migation issues related to graphical design, selection of development, and implementation platform are discussed.

3) Negotiation Support for a Web-Based Air Cargo Market, ***Framed Bodendorf***, Univ. of Erlangen-Nuremberg, Dept. of IS, Erlangen, Germany, freimut.bodendorf@wiso.uni-erlangen.de, ***Stephan Reinheimer***

Software agents are being used for decision support for electronic commerce, assisting airlines at meeting air cargo customers' needs. They maximize the market value chain and optimize market transactions. By performing routine operations automatically, autonomous software agents support market agents in trading tasks from information gathering to negotiation and settlement.

WC23 No Title Supplied

Sponsor: **Decision Analysis Society**
Sponsored Session

Chair: Martha Amram, Analysis Group Economics, Two Embanadero Center, Suite 1160, San Francisco, CA 94111, mamram@ag-inc.com

1) Real Options & Product Life Cycles, ***Nicolas P. Bollen***, Univ. of Utah, Eccles Sch. of bus., Salt Lake City, UT 84112, finnb@business.utah.edu

We investigate the value of projects that produce goods for markets with changes in demand. If demand is cyclical, then standard real options techniques can result in significant valuation error. There are important implications for investment decisions, especially in high-technology industries that feature regular introductions of new products.

2) Strategic Aquisition of Information Technology, ***Nalin Kulatilaka***, Boston Univ., Dept. of Mgmt., 595 Commonwealth Ave., Rm. 536, Boston, MA 02215, nalink@acs.bu.edu

IT investment decisions are difficult because of elusive benefits and diffuse costs. This is a case study of how an IT investment strategy is formulated and executed using the real options approach. We also include the timing of investment decisions in our analysis.

3) A Real Options Valuation of Electric Generation Capacity, ***Martha Amram***, Analysis Group Economics, Two Embanadero Center, Ste 1160, San Francisco, CA 94111, mamram@ag-inc.com, ***Jesse Langston***

We demonstrate how the real options approach can value the flexibility of peaking capacity in a volatile electricity market. Our approach quantifies the value of both the operating and investment options imbedded in the asset.

WC24 DEA Applications

Contributed Session

Chair: Jose H. Dula, Univ. of MS, Dept. of Mgmt. & Mktg., University, MS 38677-0053, jdula@olemiss.edu

1) Bus Transit Systems Evaluation Using DEA, ***Wendy A. Birkhead***, Lafayette Coll., Dept. of Civil & Environ. Eng., Easton, PA 18042, birkheaw@lafayette.edu, ***Maria P. Boile***

We present the application of DEA models in determining the relative efficiency of selected bus transit systems in the US.

2) Cost Efficiency & Profit Potential in Bank Branches, ***Ana Santos***, Univ. of Warwick, Warwick Bus. School, PhD Programme, Coventry, CV4 7AL, UK, phdasa@wbs.warwick.ac.uk, ***Robert G. Dyson***

The cost efficiency of bank branches is measured under two assumptions: fixed input prices and flexible input prices. The results obtained using DEA are compared and discussed. The research also addresses issues relating to the identification of optimal input and output mixes and assessment of branches' economic viability through the measurement of profit potential.

3) Interpretation of Academic Department Performance Indicators Through a Fuzzy Data Envelopment Analysis Model, ***Ana Lucia M. Lopes***, UFSC/CTC/EPS, Rua do Guapuruvu no. 155, Florianopolis SC, 88062-240, Brazil, anaaeps.ufsc.br, ***Edgar Augusto Lanzer***, ***Ricardo Miranda Barcia***

We address the measurement of the performance of decision making units when their outputs have a fuzzy meaning, e.g., volume of teaching or research, etc., and they relate to each other through competition for the same resources. A fuzzy DEA model was developed to represent performance (cross-) evaluation under these circumstances and applied to 58 academic departments within a

university.

4) withdrawn - author request of 3/4, ***Jose H. Dula***, Univ. of MS, Dept. of Mgmt. & Mktg., University, MS 38677-0053, jdula@olemiss.edu, ***Cynthia L. Corritore***, ***Betty L. Hickman***, ***A. Ravichandran***

WC25 Economics

Contributed Session

Chair: Chang Q. Jiang, Coll. of WV, Sch. of Bus., PO Box AG, Beckley, WV 25802, cjiang@cvw.edu

1) Empirical Studies & Tests of the Heckscher-Ohlin Theory, ***Chang Q. Jiang***, Coll. of WV, Sch. of Bus., PO Box AG, Beckley, WV 25802, cjiang@cvw.edu, ***Tina Jiang***

The Heckscher-Ohlin theory assumes that international differentials in supply of factors of production explain the direction of international trade. The overall conclusion of the empirical studies and tests is that the theory cannot be proved or refuted. Efforts are being made for new explanations of why the theory is difficult to prove and to provide an alternative method for testing the theory.

2) Modeling Image in Consumer Behavior, ***Philip J. Mizzi***, AZ State Univ. W, Sch. of Mgmt. 2451, PO Box 37100, Phoenix, AZ 85069-7100, pjm@asu.edu west.asu.edu/pjmizzi/

Expenditure data are analyzed using a direct utility function. Expenditure and own price elasticities of demand are derived from estimates of the constant elasticities of marginal rates of substitution, a measure of image exhiited by consumers. The estimates lend empirical support to theories of secondary utility, display and emulation.

3) Application of an Economic Index Based on LP in the Analysis of Food Cost Evolution & a Comparison with the Dieese Basic Food List, ***Solange Maria F Lucas***, Univ. of Coimbra/INESC, Rua Antero de Quental 199, Coimbra, 3000, Portugal, sfortuna@inescc.pt http://www.inescc.pt, ***Marcos E. Lins***, ***Saul Fuks***

This work develops a linear programming model able to yield optimun food lists to match the nutritional needs and the consumption habits of the workers. The results obtained are used to calculate an index able to analyze the evolution of the food cost in Rio de Janeiro.

WC26 Heavy Traffic Analysis of Processing Networks

Sponsor: **Applied Probability Section**

Sponsored Session

Chair: John Vande Vate, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, jvandeva@isye.gatech.edu

1) Brownian Models of Open Processing Networks: Canonical Representation of Workload, ***Michael Harrison***, Stanford Univ., Grad. Sch. of Bus., Stanford, CA 94305-5015, harrison_michael@gsb.stanford.edu

A recent paper by Harrison & Van Mieghem explained in general mathematical terms how one forms an "equivalent workload formulation" of a Brownian network model. Using linear programming duality, we connect that theory with the "generalized cut constraints" introduced by Kelly & Laws in their insightful analysis of alternate routing problems.

2) Periodic Load Balancing, ***Ward Whitt***, AT&T Research, 180 Park Av Rm. A117, Florham Park, NJ 07932-0971, wow@research.att.com, ***Gisli Hjalmtysson***

Real-time control in communication networks and other complex systems is complicated by the need to continuously maintain system state information. An alternative is minimal control in real time, but only occasionally reconfiguring. We study an abtraction: periodic load balancing in a collection of queues....

3) Heavy Traffic Limits for a Two-Station Five-Class Network, ***Jim Dai***, GA Inst. of Tech., Sch. of ISyE, Atlanta, GA 30332-0205, dai@isye.gatech.edu, ***John Vande Vate***

Consider a two-station five-class network with a specified static buffer priority rule. We show that (a) if the mean service time vector is in a certain region, a normalized workload process converges weakly to a two-dimensional reflected Brownian motion, and (b) if the mean service time vector is outside the region, the normalized workload process does not converge in the Skorohod-J_1 topology.

WC27 Natural Resources

Contributed Session

Chair: John G. Rowse, Univ. of Calgary, Dept. of Economics, Calgary, Alberta, T2L 2A6, Canada

1) How to Benefit from Decision Analysis in Environmental Life Cycle Assessment, ***Raimo P. Hamalainen***, Helsinki Univ. of Tech., PO Box 1100, Otakaari 1 M, Espoo, HUT 02015, Finland, raimo@hut.fi hut.fi/Units/Systems.Analysis, ***Pauli Miettinen***

LCA is an increasingly popular method for multi-attribute evaluation of products' environmental impacts. LCA grew outside the OR/MS community and its practice has serious shortcomings; the major one being the use of fixed impact weights. We show how DA modeling can be successfully used to improve the LCA process.

2) Minimax Regret Strategies for Greenhouse Gas Abatement: Methodology & Application, ***Amit Kanudia***, McGill Univ. & GERAD, 3000 Ch de la Cote-Ste-Cath., Montreal, Quebec, H3T 2A7, Canada, amit@crt.umontreal.ca, ***Richard J. Loulou***

We propose a Minimax Regret formulation, which requires only identifying the possible states of nature, as against classical stochastic programming which requires the probabilities of occurrency of these states as well. It has been experimentally verified that the minimax regret strategy depends only on the extermal reduction targets and not on the intermediate ones.

3) Efficient Allocation of Surface Water Resources in Southern Alberta, ***Robert C. Mahan***, Canadian Energy Research Inst., 3512 33 St. NW, Ste. 150, Calgary, Alberta, T2L 2A6, Canada, rcmahan@acs.ucalgary.ca, ***John G. Rowse***

A nonlinear programming model is developed to determine water resource allocations among spatially separate regions and demand sectors in Southern Alberta which maximize social welfare while observing essential institutional and hydrologic structures. Nonlinear demands, transformation processes, alternate hydrologic regimes, and the conceptual framework distinguish this work from previous research.

4) Does a Renewable Resource Usually Have Many Near-Optimal Allocation Paths?, ***John G. Rowse***, Univ. of Calgary, Dept. of Economics, Calgary, Alberta, T2L 2A6, Canada

Society pursues multiple objectives--including efficiency--when allocating a renewable resource over time. Do allocation paths exist which promote nonefficiency objectives but erode efficiency only slightly? In this paper a nonlinear programming model exhibiting demand price sensitivity and stock regeneration is used to investigate the existence of near-optimal allocations.

WC28 The Best OR/MS Cases

Sponsor: **Forum on Education**

Sponsored Session

Chair: Peter C. Bell, Univ. of Western Ontario, Ivey Sch. of Bus., London, Ontario, N6A 3K7, Canada, http:\\www.business.uwo.ca\~msis\bell.html

1) The Best OR/MS Cases

Several teachers from business schools and OR departments will distribute copies of their favorite OR/MS cases, briefly describe the cases and review how they use them in the classroom.

WC29 Aircraft Maintenance & Materials Management

Sponsor: **Aviation Applications Section**

Sponsored Session

Chair: John D. Quillinan, United Airlines, Inc., WHQKB, PO Box 66100, Chicago, IL 60666-0100, john.d.quillinan@ual.com

1) Engine Health Management at United Airlines, ***Vinodh Balaraman***, United Airlines, Inc., WHQKB, PO Box 66100, Chicago, IL 60666-0100, vinodh.balaraman@ual.com

The process of maintaining United Airlines' fleet of several thousand engines had been handled in the past in a manual-intensive fashion. These processes and systems are currently being revamped in a new manor undertaking whose objective is to automate engine health management and also provide a framework for knowledge-based decision making.

2) Material Tracking System, ***Richard Presley***, United Airlines, Inc., Applications Development LAXKA, 2255 E 220th St., Long Beach, CA 90810

We discuss an aircraft maintenance and engineering infrastructure project that lays the foundation for distributed inventory management and cradle-to-grave parts tracking. The project began with the requirement to augment core management systems which had reached capacity and constricted the user community from implementing inventory reduction strategies...

3) A Tabu Search-Based Approach to Overhaul Task Scheduling, ***Nancy Lillo***, SABRE Technology Solutions, 1 E Kirkwood Blvd., MD 7390 TSG, Southlake, TX 76092,

nancy_lillo@amrcorp.com

Overhaul task scheduling is characterized as a resource constrained project scheduling problem. Non-routine tasks and variability in resource and part availability induce constraints throughout the overhaul. The OTS problems is formalized, the solution methodology and computational results are presented and possible extensions to other operationsl scheduling problems are cited.

WC30 Military Issues I

Cluster: Military Applications
Invited Session
Chair: Richard A. Kilgore, ThreadTec, Inc., PO Box 7, St. Louis, MO 63017

1) A Process for Managing IT Investment, ***Paul Evans***, MITRE Corp., 1820 Dolly Madison Blvd., McLean, VA 22102-3481, ***Lisa K. Oakley***, ***Kenneth P. Kuskey***, ***William P. Hutzler***

Our new corporate process for managing IT investment incorporates 3 planning methods: the balanced scorecard, the goal fabric and benefits-based budgeting. In addition, a group DSS and facilitated electronic meetings enhance collaboration by executives who oversee IT management. The DoD is using our process on an experimental basis.

2) Making Decisions: The Frigate Equipment Life Extension Program, ***J. Adamsson***, Ntl. Defense HQ, George R. Pearkes Bldg., Ottawa, Ontario, K1A 0K2, Canada

The Canadian Navy is investigating a FELEX program, designed to maintain the capabilities of the city class frigates in light of advancing technologies. We will demonstrate the process used to assist in the decision making process relating to various upgrade options.

3) Identifying Economical Readiness Options: A Cost Ratio Test, ***P. F. O'Neill***, Ntl. Defense HQ, George R. Pearkes Bldg., Ottawa, Ontario, K1A 0K2, Canada

This work was carried out in conjunction with the NATO Specialist Team on the Evaluation of Readiness and Sustainment Policy. A ratio test is derived for identifying economical options for maintaining and generating operationally ready forces. Formulae are given for estimating cost savings over a planning horizon.

4) Efficient Distributions of Arms-Control Inspection Effort, ***Marc Kilgour***, Wilfrid Laurier Univ., Ctr. Mil. Strategic & Disarm., Waterloo, Ontario, N2L 3C5, Canada, mkilgour@mach1.wlu.ca, ***Rudolf Avenhaus***

An inspector with fixed resources must ensure that potential violators respect certain rules. What level of resources is required to deter all violation and how should resources be distributed over inspectees? Conclusions from game-theoretic models are applied to inspections supporting the Treaty on Non-Proliferation of Nuclear Weapons.

WC31 Military Applications I

Contributed Session
Chair: John R. James, J.R. James Assoc., Inc., 8327 Armetale Ln., Fairfax Station, VA 22039, john@jrjames.com

1) Resource Analysis of Future Army Alternatives, ***John R. James***, J.R. James Assoc., Inc., 8327 Armetale Ln., Fairfax Station, VA 22039, john@jrjames.com, ***Michell C. Clark***

We describe efforts to use simulation, the Army flow model, to analyze alternatives for moving the US Army from its current state to some future state while maintaining the ability to support operational commitments. We describe considerations for balancing the maintenance of current force readiness with investment for force modernization.

2) The Enlisted Bonus Distribution Model, ***Jeffery K. Joles***, US Military Academy, Dept. of Sys. Eng., OR Ctr., Mahan Hall, West Point, NY 10996, fj5618@trotter.usma.edu, ***Donald Barr***, ***Steven M. Charbonneau***

The US Army spends from $20-$60 million per year on enlistment bonuses. Budget reductions are tightly constraining the amount of money available. We investigate the problem background, discuss modeling alternatives and demonstrate an integer programming model that seeks to optimally allocate bonuses while meeting budgetary, quality and personnel constraints.

3) Economic Benefit of Forward Deployed Naval Forces, ***David A. Schrady***, Naval Postgrad. Sch., Dept. of OR, Monterey, CA 93943-5000, dschrady@nps.navy.mil, ***Robert Looney***, ***Ronald L. Brown***

This study examines the economic benefit of forward deployed naval forces in terms of the effect of naval crisis response on world oil prices as reflected by oil futures markets. A vector autoregression econometric model is then used to link oil prices to major economic indicators.

4) In Search of Intelligent Maintenance Practices, ***Dennis F. X. Mathaisel***, Babson Coll., Babson Hall, Babson Park, MA 02157, dfxm@mit.edu, ***Clare L. Comm***

In an effort to assist the U.S. Air Force in becoming "lean", this study focuses on: (1) the selection of leading providers of maintenance services; (2) the development and testing of a benchmarking instrument; (3) data collection; and (4) analysis of the findings.

WC32 Risk Analysis

Contributed Session
Chair: Shishir K. Mukherjee, Palo Alto Utilities Dept., 250 Hamilton Ave., Palo Alto, CA 94301, shishir_mukherjee@cerberus.city.palo-alto.ca.us

1) The Nature of New Venture Risk, ***Martin L. Martens***, Univ. of British Columbia, Fac. of Commerce, 566-2054 Main Mall, Vancouver, BC, V6T 1Z2, Canada, martinl@unixg.ubc.ca http://www.interchg.ubc.ca/martinl/, ***Kenneth R. MacCrimmon***

Typical characterizations of risk propensity fail to capture the multifaceted nature of the risks business experience from numerous internal and external sources. We use the rich data provided in IPO prospectuses to develop more complex risk assessments and relate them to standard risk determinants such as variability, uncertainty, and control.

2) The Effective Management of Risks in Concession Projects, ***Devadass P. Mootanah***, Anglia Polytech. Univ., 88 West Ave., Chelmsford, Essex, CM1 2DF, UK, dpm101@mead.anglia.ac.uk anglia.ac.uk, ***Timothy Brooking***, ***Ian Mehrtens***

The award of concession projects is governed by the effective sharing of risks between the public sector and private consortia. We consider the whole picture of risks that affect the authority representing public interest and propose a strategy for controlling risks in the procurement of privately financed projects.

3) Commodity Price Risk Managment in the Utilities: Resource Planning Post Restructuring, ***Shishir K. Mukherjee***, Palo Alto Utilities Dept., 250 Hamilton Ave., Palo Alto, CA 94301, shishir_mukherjee@cerberus.city.palo-alto.ca.us

Deregulation of the electricity industry in California on January 1, 1998 will expose the utility industry to competitive forces and possibly volatile commodity price fluctuations in the Power Exchange (PX) market. Commodity price risk management techniques to reduce the potential exposure of small utilities to large market risks will be discussed.

WC33 Organization Theory II

Contributed Session
Chair: Fred Raafat, San Diego State Univ., College of Bus., San Diego, CA 92182-8234, fraafat@mail.sdsu.edu

1) Effectively Transferring Knowledge Within MNCs: A Dream or Reality?, ***Adva Dinur***, Temple Univ., GSM Dept., Speakman Hall 380, Philadelphia, PA 19122, adinur00@nimbus.ocis.temple.edu

The transfer of knowledge among international organizational units is a resource-consuming task that is critical for sustaining advantages in the global competitive arena. We discuss contextual and knowledge-related factors that may affect the ability of a firm to effectively utilize and transfer knowledge.

2) Justification for Advanced Technologies, ***Fred Raafat***, San Diego State Univ., College of Bus., San Diego, CA 92182-8234, fraafat@mail.sdsu.edu, ***William R. Sherrard***, ***Mehdi Salehizadeh***

Organizations, whether in manufacturing or health care, use a variety of approaches in justifying their investments in new processes and technologies. We will examine some of the techniques and their rationale in the aquisition of advanced technologies. A comprehensive bibliography of relevant literature since 1990 will be presented.

WC34 Experimental Evaluation of Heuristic Optimization Algorithms: A Tutorial

Sponsor: College on Artificial Intelligence
Sponsored Session
Chair: Ronald L. Rardin, Purdue Univ., IE Dept., Gris 234, W Lafayette, IN 47907-1287, rardin@ecn.purdue.edu

Co-Chair: Reha Uzsoy

1) Experimental Evaluation of Heuristic Optimization Algorithms: A Tutorial, ***Ronald L. Rardin***, Purdue Univ., IE Dept., Gris 234, W Lafayette, IN 47907-1287, rardin@ecn.purdue.edu, ***Reha Uzsoy***

We address problems arising in the empirical evaluation of heuristic optimization algorithms through computational experiments. Outlining the basic issues of experimental design, test problem generation, evaluation of solution quality and presentation of results, we review techniques available for dealing with them. Approaches are illustrated via examples and case studies.

WC35 Networks & Graphs 2

Contributed Session

Chair: Manoj K. Chari, LA State Univ., Dept. of Math., Baton Rouge, LA 70803, chari@math.lsu.edu

1) A Shortest Path Problem with Stochastic & Dynamic Arc Lengths, ***James L. Bander***, Univ. of MI, 1205 Beal Ave., IOE Dept., Ann Arbor, MI 48105, jim.bander@umich.edu personal.engin.umich.edu/~jbander, ***Chelsea C. White, III***

We present computational experience with a variation on the shortest path problem in which the lengths of network arcs are random variables whose distribution depends on both the state of the network and the time that the arc is traversed.

2) A Game-Theoretic Improvement Model for Stochastic Networks: Reliability vs. Throughput, ***Jeffrey A. Schavland***, AFIT, AMC PO Box 33554, WPAFB, OH 45433, jschavla@afit.af.mil, ***Yupo Chan***

Common measures of effectiveness (MOEs) for stochastic networks include statistical reliability and expected throughput, both of which ignore the effects of hostile (i.e., intelligent, non-random) actions. An existing reliability-based MOE in combination with a new expected-flow-based-MOE, both of which include the effects of hostile actions were developed...

3) Recent Combinatorial Results for the Reliability Polynomial, ***Manoj K. Chari***, LA State Univ., Dept. of Math., Baton Rouge, LA 70803, chari@math.lsu.edu

We discuss recent combinatorial results about the connectedness reliability of undirected networks. This reliability model assumes that the network has perfect nodes while its links are subject to random, mutually independent failures which occur with probability p. The connectedness reliability polynomial is the probability (as a function of p) of the event such that a network is connected.

WC36 Quadratic Assignment Problems II

Cluster: Networks

Invited Session

Chair: Stefan E. Karisch, Tech. Univ. of Denmark, Dept. of Math. Modeling, DTU Bldg. 321, Copenhagen, DK-2100, Denmark, sk@imm.dtu.dk

1) withdrawn - request of 2/23, ***Volker Kaibel***, Univ. zu Koeln, Inst. fuer Informatik, Pohligstr. 1, Koeln, 50969, Germany, kaibel@informatik.uni-koeln.de

2) Quadratic Assignment Problems, Steiner Trees & Their Integration, ***James MacGregor Smith***, Univ. of MA, Dept. of MIE, Elab Bldg., Amherst, MA 01003, jmsmith@ecs.umass.edu

The complex problem of intergrating the layout and location of activities and the circulation flow requirements is examined. We present an algorithm integrating a quadratic assignment approach along with a steiner tree algorithm on a graph for this composite problem. Properties of the problem along with computational results are presented.

3) An Integrated Approach to Facility Planning, ***Bharat K. Kaku***, Univ. of MD, MD Bus. Sch., College Park, MD 20742-7215, bkaku@mbs.umd.edu, ***Arjang A. Assad***

The literature on facilities layout generally ignores interactions between layout problems and other system problems. We review some initial work in this are and extend it to an intergrated model for solving the capacity, machine, floor space, and route selection problems, simultaneously with cell formation and facility layout.

4) Variants on the Theme: A Quqdratic Transportation & a Bottleneck Quadratic Assignment Problem, ***Federico Malucelli***, Univ. of Perugia, Inst. of Electronics, Via G Duranti 1/A-1, Perugia, 06131, Italy, maluc@istel.ing.unipg.it

We will analyze a particular quadratic transportation problem arising from a statistical application. Bounding techniques and heuristic solution methods will be discussed. Moreover, a particular bottleneck QAP will be studied and very fast heuristics will be proposed.

WC37 Data Mining in the Financial Industry

Sponsor: CSTS

Sponsored Session

Chair: Aniruddha S. Deshpande, GE Capital Corp., 1600 Summer St., Stamford, CT 06927, aniruddha.deshpande@gecapital.com

1) Using Expert Systems for Customer Management at Prudential, ***Michael Sid***, Prudential Corp., msid@prudential.com

The Prudential Offer Matching System is a case-based reasoning system that produces need and product recommendations using a 2-stage case base with aspects of fuzzy logic. It also takes advantage of an advanced messaging approach to deliver the results of its reasoning to internal and external employees.

2) Data Mining: Truth & Myths, ***Daniel Kocis***, Multivariate Algorithms, ma@multivariate.com dkocis@lihti.org

We will discuss how benchmarking the knowledge discovery process first with standard multivariate statistics, can gujide the analyst to clearer faster results with neural, fuzzy, adaptive, decision tree or self correcting techniques. Examples from the financial services field will provide concrete evidence for keeping faith in centroid derived techniques while exploring proper uses for "artificial" exploration (e.g. Kangaroos and training neural networks).

3) No Title Supplied, ***Stu Whalen***, Paine Webber

4) Use of Data Mining in Market Segmentation & Customer Targeting, ***Aniruddha S. Deshpande***, GE Capital Corp., 1600 Summer St., Stamford, CT 06927, aniruddha.deshpande@gecapital.com

We will discuss the use of various statistical and GA procedures and tools to segment the market and target low risk, high response customers for one of our financial products. We will show how segmentation along with risk-based pricing results in profit maximization.

WC38 Telecommunications II

Contributed Session

Chair: Afi L. Davis, NC State Univ., OR Program, Box 7913, Raleigh, NC 27695-7913, aldavis1@eos.ncsu.edu

1) Optimum Fair Capacity of a Multireceiver Network, ***Tiina Heikkinen***, Nokia Research Ctr., PO Box 407 Nokia Group, Helsinki, FIN-00045, Finland, tiina.heikkinen@research.nokia.com

We characterize optimal information capacity in a multimedia network, by building a framework, respecting the principal of optimality of dynamic programming as well as mix-min fairness. We solve a constrained nonlinear optimization problem extending a game-theoretic model due to von Neumann.

2) On the Convergence of Interior Point Column Generation Algorithms in Adaptive Filtering, ***Kaywan Afkhamie***, McMaster Univ., Dept. of Elect. & Comp. Eng., 1280 Main St. W, Hamilton, Ontario, L8S 4K1, Canada, kaywan@cauchy.crl.mcmaster.ca, ***Zhi-Quan Luo***, ***Kon Max Wong***

It has recently been shown that interior point column generation algorithms are quite suitable for solving quadratic minimization problems that arise in the context of adaptive filtering. We investigate in more detail why the interior point methods exhibit superior initial convergence than conventional gradient descent algorithms.

3) Fuzzy Routing for Asynchronous Transfer Mode Networks, ***Afi L. Davis***, NC State Univ., OR Program, Box 7913, Raleigh, NC 27695-7913, aldavis1@eos.ncsu.edu, ***Shu-Cherng Fang***

We will discuss some of the issues on ATM network routing. A fuzzy control-based routing algorithm with test results will be presented.

4) No Title Supplied, ***E. Marin***, France Telecom CNET, 38-40 rue du General Leclerc, Issy-Les-Moulineaux, 92131, France, emmanuelle.marin@cnet.francetelecom.fr

We address the problem of designing a multicommodity network using several services with different costs and capacities. The problem is addressed in a special context of designing an ATM network using E1 and E3 services and is defined over a subset of links, (about 90% of the meshed network). We compare 2 different approaches: the first is based on SA and the second is LP-based and computes a lower bound of the problem...

Wednesday 14:15-15:45

WD01 Railway Applications I

Contributed Session

Chair: Pradeep K. Patel, SETA-TECH Assoc. Inc., 900 Kings Highway N, Ste. 208, Cherry Hill, NJ 08034, pkpatel@zetatech.com

1) withdrawn - author request of 3/29, ***Danny C. Myers***,

Bowling Green State Univ., Dept. of Applied Stats. & OR, Bowling Green, OH 43403, myers@cba.bgsu.edu

2) Railway Timetabling on Networks, *Andreas Nou*, Royal Inst. of Tech., Opt. & Systems Theory, Dept. of Math., Stockholm, S-100 44, Sweden, andreasn@math.kth.se

We consider railway timetabling on em networks. We propose to use a hierachy of models. In the outermost model we decide which trains to operate and important connections, whereas the detailed timetabling is dealt with in the innermost model. Preliminary computational results will be given.

3) Empty Freight Car Distribution at Swedish State Railways, *Martin Joborn*, Linkoping Univ., Dept. of Math., Linkoping, S-58183, Sweden, majob@mai.liu.se

We present a new system for planning the empty freight car distribtion at Swedish State Railways. The system is built to give accurate and on-line answers to empty freight car requests. The underlying ideas and the mathematical model that is the kernel of the system will be described.

4) Development of Benchmarks for Measuring the Performance of a Large Railroad Terminal, *Pradeep K. Patel*, SETA-TECH Assoc. Inc., 900 Kings Hwy N, Ste. 208, Cherry Hill, NJ 08034, pkpatel@zetatech.com, ***Randolph R. Resor***

The Kansas City Terminal Railway is owned by several large (Class I) railroads; one of the owners has proposed to assume responsibility for train dispatching. This paper describes an operations analysis of the KCT which developed a set of benchmarks to enable the railroad's owners to monitor its performance.

WD02 Aviation Applications I

Contributed Session

Chair: David J. Michael, SABRE Tech. Solutions, 1 E Kirkwood Blvd., MD 7835, Southlake, TX 76092, david_michael@sabre.com

1) SABRE's FAM: Fleet Assignment & More, *David J. Michael*, SABRE Tech. Solutions, 1 E Kirkwood Blvd., MD 7835, Southlake, TX 76092, david_michael@sabre.com

I describe SABRE's aircraft fleet assignment model, including the available constraints and other functionality. This model also supports routing-based minimum ground times in which the minimum time between flights depends on upline, downline, and via airport as well as fleet. I show how this fundamentally changes the nature of FAM.

2) Application of a Fleet Assignment Model to Intercity Bus Schedules of the Saudi Public Transportation Company, *Mohamad K. Hasan*, Lakehead Univ., Dept. of Civil Eng., 955 Oliver Rd., Thunder Bay, Ontario, P7B 5E1, Canada, mkhasan@gale.lakdheadu.ca, ***Ahmad A. Al-Hammad***

The SAPTCO intercity bus schedule comprises a list of 382 major trips per day to over 250 cities and villages utilizing 338 buses. SAPTCO operates Mercedes 404 SHD and Mercedes 404 RHL bus fleet types for the trips. The fleet assignment model developed at American Airlines was adapted and applied to this schedule. Results showed a savings of 27% in the total buses needed. This will yield a savings of 16 million Saudi riyals per year for SAPTCO.

3) Development of Heuristic Procedures for Flight Rescheduling in the Aftermath of Irregular Airline Operations, *Michael D. Clarke*, MIT, 77 Massachusetts Ave., Rm 33-212, Cambridge, MA 02141, heart@mit.edu

The airline schedule recovery problem provides a comprehensive framework that addresses how airlines can effectively reassign operational aircraft to scheduled flights in the aftermath of irregularities. The model incorporates various aspects of the airline's tactical planning process, which are traditionally considered independently. Algorithms and solution methodologies are demonstrated...

4) A Framework for Airline Crew Assignment, *Niklas Kohl*, Carmen Systems AB, Odinsgatan 9, Gothenburg, S-41103, Sweden, niklas@carmen.se

Real-world Crew Assignment is complicated by the huge amounts of personalizes information, and constraints defined on several crew members. We present the framework implemented in the Carmen PAC/CAS system for modelling and solving Crew Assignment problems. The system is in use by all major European airlines.

WD04 Global Manufacturing

Contributed Session

Chair: Donald P. Warsing, Univ. of NC, Kenan-Flagler Bus. Sch., CP 3490, McColl Bldg., Chapel Hill, NC 27599-3490, don_warsing@unc.edu

1) A Qualitative Study of Coordination in Managing Global Market Demands, *Frank Safayeni*, Univ. of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, fsafayeni@mansci.watstar.uwaterloo.ca, ***P. Robert Duimering***

An interview-based qualitative study examined interactions among three business units in a high-technology global manufacturing firm. Adhoc coordinating mechanisms used to handle market and inter-organizational variability are identified and discussed. The role of information technology as both a source of variability and a coordinating mechanism is examined.

2) Global Production Planning Under Exchange-Rate & Demand Uncertainties, *Burak Kazaz*, Loyola Univ., 25 E Pearson, Rm. 1430, Chicago, IL 60611, bkazaz@luc.edu luc.edu/schools/business/academic/kazaz/html, ***Maqbool Dada***, ***Suresh Chand***, ***Herbert Moskowitz***

We consider a multinational manufacturer which has production facilities both in the home country and abroad. We find the optimal production policy under exchange-rate and demand uncertainties for a firm whose objective is to maximize expected profits.

3) Improving Supply Chain Responsiveness Through Information-Based Coordination Mechanisms, *Donald P. Warsing*, Univ. of NC, Kenan-Flagler Bus. Sch., CP 3490, McColl Bldg., Chapel Hill, NC 27599-3490, don_warsing@unc.edu, ***Ann Marucheck***, ***Noel P. Greis***

We investigate using information to coordinate supply chain operations, motivated by the multi-echelon coordination problem inherent to global supply chains for high-tech products. Using simulation, we compare the profit and service performance of a traditional order-passing system vs. an "information-coupled" system with upstream control of inventory downstream.

4) withdrawn - author request of 2/25, *Bowon Kim*, KAIST, Grad. Sch. of Mgmt., 207-43 Cheongryangri Dongdaemo, Seoul, 130-012, Korea, bwkim@cais.kaist.ac.kr

WD05 Flexible Manufacturing Systems I

Contributed Session

Chair: Mingyuan M. Chen, Univ. of Regina, Fac. of Eng., 3737 Wascana Parkway, Regina, SK, S4S 0A2, Canada, mingyuan.chen@uregina.ca

1) A Mathematical Model for Process & Equipment Selection in a Dynamic Manufacturing System, *Mingyuan M. Chen*, Univ. of Regina, Fac. of Eng., 3737 Wascana Parkway, Regina, SK, S4S 0A2, Canada, mingyuan.chen@uregina.ca

The problem of selecting the best process and equipment in a dynamic manufacturing system is formulated as an IP model. A heuristic algorithm is developed and Lagrangian relaxation applied for testing heuristic solutions. Numerical examples are presented.

2) Allocating Servers & Work to a Production Line with Varying Service-Time Distributions, *Kenichi Futamura*, AT&T Labs., 101 Crawfords Corner Rd., Rm. 3K-312, Holmdel, NJ 07733-3030, futamura@att.com

Traditionally, research concentrates on queueing systems with infinite buffers, exponential service times and/or single servers. We examine more general systems, extending Hillier & So's L-phenomenon. Specifically, we study the effects of coefficient of variation of the service-time distributions on the optimal work and server allocation.

3) SMT Setup Optimization, *Paulo C. Brochonski*, Pontificia Univ. Catolica, R. Imaculada Conceicao 1155, Curitiba, Parana, Brazil, d9608000@cits.br paulocb@cits.br, ***Edson E. Scalabrin***, ***Anselmo C. Neto***

We present a dynamic system allowing the reduction of setup time in lines of the assembly of PCBs using surface montage technology. Frequently, the machine setup times are larger than the time of PCB assemblies. Our purpose is to organize the assembly in a way that minimizes the changes of components on the feeders.

4) Production Scheduling in a Distributed Architecture with Delivery Windows, *Pooja Dewan*, PA State Univ., 710 S Atherton St., Apt. 508, State College, PA 16801, pooja@wimpy0.psu.edu, ***Sanjay Joshi***

The problem of scheduling a set of jobs with delivery window constraints, so as to minimize the total earliness-tardiness penalties, has been examined in an agent architecture. A distributed algorithm suitable for real-time scheduling of manufacturing systems by part centered decomposition of production resources has been developed. A 2-phase heuristic is presented.

WD06 Service Industry I

Contributed Session

Chair: Kenneth J. Klassen, Univ. of Calgary, Fac. of Mgmt., Op. Mgmt., 2500 Univ. Dr., NW, Calgary, Alberta, T2N 1N4, Canada, kklassen@acs.ucalgary.ca

1) Resource Allocation to Improve Service Quality Perceptions in Multistage Service Systems, ***Andreas C. Soteriou***, Univ. of Cyprus, P.O. Box 537, Nicosia, CY 1678, Cyprus, basotir@atlas.pba.ucy.ac.cy, ***George C. Hadjinicola***

We present a model to allocate resources in multistage service systems. We show that stages that are perceived as important, are characterized by low service quality perceptions, and high cost of improving perceptions, are allocated more resources. We demonstrate our findings using empirical data from a clinic.

2) Handling Varying Demand & Supply Management Capabilities in Services, ***Kenneth J. Klassen***, Univ. of Calgary, Fac. of Mgmt., Op. Mgmt., 2500 Univ. Dr., NW, Calgary, Alberta, T2N 1N4, Canada, kklassen@acs.ucalgary.ca, ***Thomas R. Rohleder***

It will be shown that services can increase profits by maximizing the number of demand and supply management initiatives they develop. But what can a manager do if it is not possible to develop a given initiative? The somewhat surprising answer (determined through simulation) provides service managers with valuable insights.

3) Credit Line Management for Credit Card Accounts, ***Suresh Nair***, Univ. of CT, Sch. of Bus., U41IM, Storrs, CT 06269-0241, suresh@sbaserv.sba.uconn.edu

We describe a model for credit line management using Markov decision processes. In simulations with real data, we find that our methodology is superior to existing methods on measures of net revenue as well as risk.

4) withdrawn - author request of 2/27, ***Ahmet H. Kuyumcu***, DFI/ Aeronomics Inc., Waterstone, Ste. 300, 4751 Best Rd., Atlanta, GA GA30080, akuyumcu@dfi-aeronomics.com

WD07 Scheduling with Setup Times

Contributed Session

Chair: Ali Allahverdi, Kuwait Univ., PO Box 5969, Safat, 13060, Kuwait, allaha@kuc01.kuniv.edu.kw

1) Scheduling Research on Setup Times: A Review, ***Ali Allahverdi***, Kuwait Univ., PO Box 5969, Safat, 13060, Kuwait, allaha@kuc01.kuniv.edu.kw, ***Tariq Aldowaisan***

We provide an extensive review of the literature on setup time from the mid-60s to date. We classify scheduling problems into batch and nonbatch, sequence dependent and sequence independent setup and categorize the literature according to the shop environments of single machine, parallel machines, flowshops and job shops.

2) Single Machine Scheduling with Sequence Dependent Set-Up Times, ***Cerry M. Klein***, Univ. of MO, Dept. of IE, Columbia, MO 65211, klein@ecn.missouri.edu, ***James S. Noble***, ***Xiaoqing Sun***

A Lagrangian Relaxation based approach for the scheduling of n independent jobs with release dates, due dates, and sequence dependent setup times where the scheduling objective is to minimize the weighted sum of squared tardiness is presented. The algorithm is shown to perform efficiently and close to optimal for realistically sized problems.

3) An Agent-Based Solution Approach for Multi-Machine Job Scheduling, ***Rama Akkiraju***, IBM, TJ Watson Research Ctr., Rte. 134, Yorktown Heights, NY 10598, akkiraju@watson.ibm.com, ***Pinar Keskinocak***, ***Fred Wu***, ***Seshashayee Murthy***

We address the problem of scheduling jobs to non-identical machines, subject to job-machine restrictions and sequence dependent setup times. We developed an agent-based scheduling system using the A-teams framework, where each agent encapsulates a problem solving strategy. Successful implementations of this IBM product in the paper industry show the effectiveness of the approach.

4) Heuristics for Scheduling Reentrant Flowshops with Sequence Dependent Setup Times, ***Ebru Demirkol***, Purdue Univ., Sch. of IE, 1287 Grissom Hall, W Lafayette, IN 47907-1287, demirkol@ecn.purdue.edu, ***Reha Uzsoy***, ***Cheng-Shuo Wang***

We solve the problem of minimizing maximum lateness in reentrant flowshops when sequence dependent setup times are present. We present an improved decomposition method and report recent results on the performance of the approach.

WD08 Production & Scheduling III

Contributed Session

Chair: Rainer Kolisch, Christian Albrechts Univ., Inst. fur Betriebswirtsch., Kiel, 24098, Germany, kolisch@bwl.uni-kiel.de wiso.uni-kiel.de/bwlinstitute/Prod/kolisch

1) Integrated Order Acceptance & Scheduling by Column Generation, ***Rainer Kolisch***, Christian Albrechts Univ., Inst. fur Betriebswirtsch., Kiel, 24098, Germany, kolisch@bwl.uni-kiel.de wiso.uni-kiel.de/bwlinstitute/Prod/kolisch

We consider a make-to-order company which has to decide on the acceptance and the scheduling of customer-specific orders with the objective of maximizing net-revenues. A set partitioning formulation which solves the linear programming relaxation by column generation and the corresponding pricing problem by a polynomial dynamic programming algorithm is presented.

2) A Huge Integer Linear Programming Model for Finite Capacity Planning in MTO-Environments, ***Marcel F. Assen***, Univ. of Twente, WB N242, PO Box 217, Enschede, OV, 7500 AE, The Netherlands, m.f.vanassen@wb.utwente.nl, ***Steef L. Van de Velde***

First, we point out a generic finite capacity planning problem in MTO-environments which involves due data quotation and short-term work force planning decisions. Then, we formulate this problem as a huge MILP problem and solve the LP-relaxation by column generation to find approximate solutions.

3) Heuristics for the Bicriteria Sparse Multiple Knapsack Problem, ***Fatma S. Salman***, Carnegie Mellon Univ., GSIA, 5000 Forbes Ave., Pittsburgh, PA 15213, fs2c@andrew.cmu.edu, ***Jayant Kalagnanam***, ***Seshashayee Murthy***

We present heuristics that generate non-dominated solutions to the problem of assigning orders to production units in the inventory with the objectives of maximizing total assignment and minimizing total waste of production units. We compare the effectiveness of these heuristics working individually, and cooperating in an A-team architecture by an experimental analysis.

4) An Integer Linear Programming Approach for Workload Balancing in a Produce-to-Stock Foundry, ***Erwin W. Hans***, Univ. of Twente, Production & Op. Mgmt. WB N242, PO Box 217, Enschede, 7500 AE, The Netherlands, e.w.hans@wb.utwente.nl

We discuss the monthly production planning problem in a foundry. The objective is to balance the required amount of melted iron per day, subject to given replenishment orders and many specific foundry restrictions, including an upper bound on the number of orders in process.

WD09 Scheduling I

Contributed Session

Chair: Lap Mui A. Chan, Hong Kong Poly Technic Univ., Dept. of Mgmt., Kowloon, Hong Kong, mslmchan@smtpgwy.polyu.edu.hk

1) Worst-Case Analysis of the Capacitated Multi-Machine Makespan Problem, ***Lap Mui A. Chan***, Hong Kong Poly Technic Univ., Dept. of Mgmt., Kowloon, Hong Kong, mslmchan@smtpgwy.polyu.edu.hk, ***Julien D. Bramel***, ***David Simchi-Levi***

We consider the problem of scheduling independent jobs on parallel machines, with a limit on the number of jobs that can be assigned to a single machine, so as to minimize the makespan. We investigate the worst-case performance of a modified version of the familiar longest processing time heuristic.

2) Parallel Machine Scheduling with Machine Eligibility Constraints, ***Robert L. Armacost***, Univ. of Central FL, IE & Mgmt. Systems Dept., PO Box 164250, Orlando, FL 32816-2450, armacost@pegasus.cc.ucf.edu, ***Grisselle Centeno***

We evaluate alternative scheduling rules for parallel machines with machine eligibility constraints where the machines are almost nested or are poorly nested. Computational results are included.

3) Minimizing Makespan on a Single Batch Processing Machine with Non-Simultaneous Job Arrival Times, ***Fariborz Jolai Ghazvini***, 20 Allee du Gatinais, Echirolles, 38130, France, jolai-gh@inpg.fr

The batch processing machine is capable of processing up to B jobs simultaneously as a batch. The processing time of a batch is given by the processing time of the longest job in the batch. We present a new constructive and also an improving heuristic for this NP-hard problem. The performance of these heuristics is evaluated through extensive computational experiments.

4) Structured Valid Inequalities & Separation in Optimal Scheduling of the Resource-Constrained Batch Chemical Plant,

Driss Drissi, Kuwait Univ., Dept. of Math. & Comp., PO Box 5969, Safat, 13060, Kuwait, drissi@math-1.sci.kuniv.edu.kw, ***Ali Elkamel***

Various structured valid inequalities for an existing MILP batch scheduling model are derived. The scheduling model handles a variety of complexities, including variable batch sizes, limited availability of resources, intermediate product draw-offs and a number of objectives. The valid inequalities, whose validity is proven, are used to tighten the LP relaxation to the MILP scheduling formulation...

WD10 Workforce Scheduling

Contributed Session

Chair: Jin-Yuan Wang, Ntl. Chiao Tung Univ., Dept. of Transport., 1001 University Rd., Hsinchu, 300, Taiwan, jinyuan@cc.nctu.edu.tw

1) Start-Time Restrictions in Labor Tour Scheduling, ***Michael J. Brusco***, FL State Univ., IMS Dept., Coll. of Bus., Tallahassee, FL 32306-1110, mbrusco@cob.fsu.edu, ***Larry W. Jacobs***

Many service and manufacturing systems, particularly those that operate continuously, utilize 4 or more daily shift starting times. We focus on the importance of selecting a subset of starting times that can provide efficient coverage of labor requirements.

2) Single Shift Scheduling of Hierarchical Workforce with Variable Daily Demand, ***Ranga Naras***, Acadia Univ., Sch. of Bus., 310 Rhodes Hall, Wolfville, NS, B0P 1X0, Canada, rnaras@acadiau.ca http://dragon.acadiau.ca/~rnaras/main.html

We propose a polynomial time for optimally scheduling employees in organizations that work on seven days a week. The algorithm computes the workforce size and then constructs a schedule that meets the designated characteristics such as frequency of weekends-off, the length of maximum workstretches and the variable daily demand.

3) Scheduling Workforce to Maximize Employee Satisfaction, ***Anna Olecka***, AT&T/Rutgers Univ., 1513 Cornell Ave., Mercerville, NJ 08619, olecka@rutcor.rutgers.edu

This paper describes and algorithm for scheduling work force in a predominantly part-time setting, such as a supermarket or a fast food restaurant. It attempts to accommodate employees preferences regarding days and time of work, while preserving budget constraints. The solution proposed consists of two consecutive network flows.

4) The Study & Development of a Bus Drivers' Scheduling System, ***Jin-Yuan Wang***, Ntl. Chiao Tung Univ., Dept. of Transport., 1001 University Rd., Hsinchu, 300, Taiwan, jinyuan@cc.nctu.edu.tw, ***Hsueh-Shang Liaw***

A good working schedule of bus drivers will have great influences on company operations. We develop and implement a heuristic algorithm based decision support system for generating practical feasible and good schedules. A comparison of original schedules and system generated schedules is also provided and discussed.

WD11 In-Process Quality Improvement Methodologies: Multivariate Statistical Analysis & Process Monitoring

Cluster: Quality

Invited Session

Chair: Jan Shi, Univ. of MI, Dept. of Industrial & Op. Eng., 1815 IOE, Ann Arbor, MI 48019-2117, shihang@umich.edu

1) Use of Multivariate Methods in Automotive Design to Reduce Data Dimensionality, ***Chuck Hui***, General Motors Corp., huitsechun@aol.com

The current process of measurement point selection is subjective, redundant and actually can hinder the potential use of subsequent data for diagnosis and process improvement. The proposed method uses designed simulations and multivariate methods to reduce the dimensionality of measurement points for an automotive assembly.

2) Joint Monitoring of PID Controlled Processes, ***Fugee Tsung***, Univ. of MI, Ind. Eng. & Eng. Mng. Dept., Ann Arbor, MI, season@engin.umich.edu, ***Jeff Wu***, ***Jan Shi***

Using statistical process control (SPC) to monitor the special causes of a process along with engineering feedback control such as proportional-integral-derivative (PID) control is a major tool for on-line quality improvement. A joint monitoring strategy to monitor both the PID controlled outputs and the manipulated inputs using bivariate SPC is proposed, and a specific design procedure taking into account both the controller and the disturbance model is provided...

3) Sensor Placement Optimization for In-Process Quality Improvement in Multi-Fixture Assembly Systems, ***Darek J. Ceglarek***, Univ. of Michigan, 3424 G.G. Brown, Ann Arbor, MI 48109, darek@engumich.edu

The effectiveness of in-process fault diagnosis in assembly is contingent on the effectiveness of the sensor measurement of assembled parts. We propose a method for in-process quality enhancement methodology for a multi-fixture assembly system. This method uses multi-sensor data to model variation patterns of dimensional faults caused by fixture(s). A Hierarchical Group description of the assembly with fixture CAD information is used in multi-level hierarchical optimization to arrive at the sensor optimal placement...

4) The Scaled Weighted Variance Method for Shewhart X & EWMA X Control Charts, ***Philippe P. Castagliola***, Ecole des Mines de Nautes, 4 rue Alfred Kastler, La Chautrerie, Nantes Cedex 3, 4070, France, philippe.castagliola@emn.fr

We propose 2 new Shewhart-X and EWMA-X control charts based on the Scaled Weighted Variance method and devoted to unimodal skewed populations. These Scaled Weighted Variance control charts were found to give better performance, in terms of type I and type II errors, than the "classic" (gaussian) Shewhart-X and EWMA-X control charts, in the case where the population can be fitted by a gamma or a lognormal distribution.

WD12 OR/MS in Forestry III: Endangered Species Management

Sponsor: ENRE

Sponsored Session

Chair: Mike Bevers, USDA Forest Service, Rocky Mountain Research Sta., 3825 E Mulberry, Ft. Collins, CO 80524, mbevers@lamar.colostate.edu

1) Spatial Optimization for the Western Prairie Fringed Orchid, ***John G. Hof***, USDA Forest Service, Rocky Mountain Research Sta., 3825 East Mulberry, Ft. Collins, CO 80524, j.hof@mhs-fsbo.attmail.com

2) Robust Optimization for Wildlife Translocation under Cost Constraints, ***Robert G. Haight***, USDA Forest Service, North Central Forest Station, 1992 Folwell Ave., St. Paul, MN 55108, haigh003@tc.umn.edu, ***Katherine Ralls***

Capturing and releasing wild animals is increasingly used to establish or augment populations of endangered species. Translocation decisions include the number and timing of releases, the release method, and the intensity of post-release monitoring. Robust optimization is used to design translocation strategies under population growth and funding uncertainty.

3) Population Extinction Thresholds & Contiguity Effects in Biodiffusion-Based Single-Species Spatial Optimization Models, ***Mike Bevers***, USDA Forest Service, Rocky Mountain Research Sta., 3825 E Mulberry, Ft. Collins, CO 80524, mbevers@lamar.colostate.edu, ***Curt Flather***

Linear Spatial Optimization based on spatially and temporally discrete reaction-diffusion population models is shown to exhibit highly nonlinear results under passive random walk dispersal assumptions. Population contiguity effects become pronounced as reaction-diffusion processes become more strongly limiting, up to a discontinuity effect at critical extinction threshold conditions.

4) A New Harvest Operation Cost Model to Evaluate Forest Harvest Layouts, ***Mark M. Clark***, Auburn Univ., Dept. of ISE, Dunstan 207, Auburn, AL 36849, clarkma@eng.auburn.edu

We introduce a new operational cost model based on determining the optimal number and locations of landings. The approach is unique in its consideration of the interaction between harvest area shapes and access roads. Examples are presented that evaluate alternative harvest layouts.

WD13 Combinatorial Optimization & Applications

Cluster: Discrete Optimization

Invited Session

Chair: Nelson Maculan, Federal Univ. of Rio de Janeiro, PO Box 68511, Rio De Janeiro RJ, 21945-970, Brazil, maculan@cos.ufrj.br

1) MARCOLIX: A Polynomial Procedure for the General Routing Problem, ***Marcos Jose Negreiros Gomes***, Federal Univ. of Espirito Santo, R. Pereira Valente, 350 apto. 200 - Meireles, Ceara, 60160-250, Brazil, negreiro@uece.br, ***Nelson Maculan***

This article shows a polinomial heuristic procedure, MARCOLIX, designed to General Routing Problems (GRP) where are given a number of customers

located at nodes, arcs and edges of a mixed network, which offer or demand service from a homogeneos fleet of vehicles based at a central dept...

2) Comparison of Algorithms for Local Access Network Design, ***Geraldo R. Mateus***, Dept. Ciencia da Computacao UFMG, CP 702, Belo Horizonte MG, 30 161-123, Brazil, mateus@dcc.ufmg.br, ***Henrique P. L. Luna***

The local access network design problem involves topological design, capacity assignment and routing decisions. We consider a network flow formulation where we need to find a subset of arcs in the network that minimizes the sum of variables and fixed costs. We compare heuristics and exact methods, sequential and parallel algorithms.

3) A Scheduling Problem with Special Ordered Sets: A Polyhedral Approach, ***Ismael R. de Farias, Jr.***, IBM Corp., 3200 Winfy Hill Rd., Atlanta, GA 30339, ismael@akula.isye.gatech.edu, ***Ellis L. Johnson, George L. Nemhauser***

We study a scheduling problem that arises in manufacturing for which the concept of special ordered sets of type II appears naturally in its formulation. We derive three non-trivial families of facet-defining valid inequalities, and we show that the inequalities of one of these families cut off all infeasible vertices of the set of feasible solutions of the LP relaxation.

4) Stronger Minimum K-Trees Relaxation for Vehicle Routing, ***Carlos A. Martinhon***, Univ. Federal Fluminense, Campus Valonguinho, Inst. de Matematica Centro, Niteroi RJ, 24210-130, Brazil, mart@dcc.uff.br, ***Abilio Lucena, Nelson Maculan***

We investigate, within the framework proposed by Fisher (to generate Lagrangean VRP lower bounds by using Minimum k-Trees) different schemes for conducting subgradient optimization. In addition to GSECs, we attempt to dualize, in a Lagrangean fashion, combs and multi-star inequalities. Computational results are presented for test problems from the literature.

WD14 Integer Programming IV

Contributed Session

Chair: Parviz Ghandforoush, VA Polytech. Inst., Coll. of Bus., 7054 Haycock Rd., Falls Church, VA 22043, parvis@vt.edu

1) A Lagrangean Decomposition-Based Procedure for Bin Packing with Sharing, ***Meltem Denizel***, Univ. of FL, Coll. of Bus. Admin., Dept. of DIS Bus. 351, Gainesville, FL 32611-7160, denizeme@dale.cba.ufl.edu

We address a variation of the bin packing problem in which items share bin space. A Lagrangean decomposition-based lower bounding procedure, with a special multiplier adjustment scheme, is presented. The procedure provides good lower bounds and solutions that can easily be modified to also obtain good upper bounds.

2) Maximizing the Number of Mixed Packages Subject to Variety Constraints, ***David J. Robb***, Univ. of Auckland, MSIS Dept., Private Bag 92019, Auckland, New Zealand, d.robb@auckland.ac.nz, ***Dan Trietsch***

Motivated by a practical problem arising with the sales of seasonal greeting cards, we solve a variant of the classic bin-packing problem. Subject to a marketing-based variety constraint, we maximize the number of card packs that can be formed from an assortment of excess stock from previous seasons.

3) withdrawn - author request of 3/5, ***Fredrik M. Engel***, Carmen Systems AB, Odinsgatan 9, Gothenburg, S-411 03, Sweden, fredrik.engel@carmen.se

4) Scheduling of Bloodmobiles, ***Parviz Ghandforoush***, VA Polytech. Inst., Coll. of Bus., 7054 Haycock Rd., Falls Church, VA 22043, parvis@vt.edu, ***Mohammad M. Amini***

WD15 Nonlinear Programming III

Contributed Session

Chair: Knut Haase, Univ. of Kiel, Lehrstuhl fur Produk. & Logist, Olshausenstr. 40, Kiel, 24108, Germany, haase@bwl.uni-kiel.de

1) Sales Force Deployment by Mathematical Programming, ***Knut Haase***, Univ. of Kiel, Lehrstuhl fur Produk. & Logist, Olshausenstr. 40, Kiel, 24108, Germany, haase@bwl.uni-kiel.de

Sales force deployment involves the concurrent resolution of 4 interrelated subproblems: sizing the sales force, salesman location, sales territory alignment and sales resource allocation. We present a novel NL MIP model which covers all 4 subproblems. For the solution, we introduce a column generation procedure which serves to solve large-scale instances arising in practice.

2) Nonlinear Disjunctive Methods for Multiperiod Optimization, ***Susara A. Van den Heever***, Carnegie Mellon Univ., Dept. of Chem Eng., Pittsburgh, PA 15213, susara@andrew.cmu.edu, ***Ignacio E. Grossmann***

We present a disjunctive MINLP model for multiperiod design and operation/expansion planning in the process industry. An algorithm is presented, which combines logic-based disjunctive programming with a bilevel decomposition technique. Numerical results are shown to demonstrate that the algorithm can effectively handle problems with significant number of periods.

3) Optimization of Likelihood Function for Getting Latent Test, ***Iosif A. Krass***, Defense Manpower Data Ctr., 303 DelRobles Ave., Monterey, CA 93940, krassia@psd.pentagon.mil

In modern test theory any item (problem) in the test can be characterized by three latent parameters. To find those latent parameters one should be able to maximize likelihood function which is highly nonlinear and multi-variable. We designed and implemented special optimizing algorithm which is more superior than analogous software packages.

4) Optimized Point Arrangements on a Sphere, ***Janos D. Pinter***, Pinter Consulting Services, 129 Glenforest Dr., Halifax, NS, B3M 1J2, Canada, pinter@tuns.ca http://www.tuns.ca/~pinter/

We consider the optimal location of points on the unit sphere: the quality of arrangements is expressed by a criterion function. This general problem statement covers many special cases; it is related to external energy and packing problems arising in scientific modelling. Several model versions and a generic solution approach...

WD16 Linear Programming I

Contributed Session

Chair: Federico Trigos, ITESM Campus Toluca, 100 mts al Nte de San Antonio, Buenavista, Toluca Edo de Mexico, 50252, Mexico, ftrigos@campus.tol.itesm.mx

1) Efficient Implementation of Interior Point Methods for the Polynomial L1 Regression Problem, ***Aurelio R. Oliveira***, State Univ. of Campinas, UNICAMP/FEEC/DENSIS, CP 6101, Campinas SP, 13083-970, Brazil, aurelio@densis.fee.unicamp.br, ***Christiano Lyra, Mario Nascimento***

We compare the performance of several interior point methods for the L1 regression problem against a specialized simplex method. The special structure of the polynomial fitting L1 problem leads to the reduction of computational complexity, amount of memory and accelerates the cross-over procedure. These results apply to the minimax problem.

2) On the Building of Large-Scale LP Interior Point Method Computer Systems, ***Federico Trigos***, ITESM Campus Toluca, 100 mts al Nte de San Antonio, Buenavista, Toluca Edo de Mexico, 50252, Mexico, ftrigos@campus.tol.itesm.mx

Main steps that should be taken into account in order to build a, LP-IPM Computer System will be presented. Issues such as sparse matrix structures, pre-processing of problems and comparisons among some existing IPM codes will be addressed. Results will be presented based on the Net-Lib set of problems.

3) A Scalable Massively Parallel Simplex Algorithm for Block-Diagonal LP Problems, ***I. Ilkay Boduroglu***, Columbia Univ., IEOR Dept., 500 W 120th St., Mudd Rm. 331, MC 4704, New York, NY 10027-6699, ilkay@ieor.columbia.edu

A data-parallel simplex algorithm for block-diagonal LP problems is described. This algorithm is based on the 1965 (sequential) compact-inverse simplex algorithm of Kaul. One application of this is the multicommodity network flow problem with additional coupling constraints which is widely used in large-scale transportation and communication systems.

4) A Weighted Projection Centering Method, ***Antonio Carlos Moretti***, Univ. at Campinas, UNICAMP/IMECC, CP 6065, Campinas SP, 13081-970, Brazil

We develop a procedure to find a center of LP polytopes by using projections. We observe that the resulting fixed point is less sensitive to redundant constraints than the analytic center. Another advantage is that this method is less prone to accumulation errors since we always use the original data. The algorithm can also easily be implemented in a seqeuential or parallel environment...

WD17 Metaheuristics IV

Contributed Session

Chair: Merza H. Hasan, Kuwait Univ., Coll. of Commerce, PO Box 5486, Safat, 13055, Kuwait, merza@kuc01.kuniv.edu.kw

1) Metaheuristic Methods for the Guillotine 2-Dimensional Cutting Problem, ***Daniel A. Sales-Zlatar***, Univ. of Santiago, Av. Ecuador #3659 Est. Central, Santiago RM, Chile, dahny@moai.usach.cl http://ra.usach.cl/~dahny, ***Rodrigo Palma***, ***Victor M. Parada***

2) Solution to the Tree Bucking Problem by Simulated Annealing, ***Lorena Pradenas***, Univ. de Concepcion, Campus Universitario, Fac. de Ingenieria, Concepcion, Chile, lpradena@halcom.dpi.udec.cl, ***Victor M. Parada***, ***Carmen Gloria Munoz***

In this work the tree-bucking problem is considered. The goal is to rich the maximum product profit combination to be obtained from a tree taking in top account accept of demanded vector. The problem has been modeled and solved with simulated annealing algorithm and the numeric results are shown.

3) A Comparison Between Simulated Annealing, Genetic Algorithm & Tabu Search Methods for Unconstrained Quadratic Psuedo-Boolean Function, ***Merza H. Hasan***, Kuwait Univ., Coll. of Commerce, PO Box 5486, Safat, 13055, Kuwait, merza@kuc01.kuniv.edu.kw

We developed 3 meta-heuristic procedures, SA, GA and TS, for the unconstrained quadratic psuedo-Boolean function. Several benchmark test problems which were considered difficult to be solved by other procedures were generated for comparison. Several parameters were tested for each method to observe its final performance. Results demonstrate some differences among the 3 methods' final solutions and their computational time...

4) An Evaluation of Genetic Algorithm Software Packages, ***Sohail S. Chaudhry***, Villanova Univ., Dept. of Mgmt., Coll. of Commerce & Finance, Villanova, PA 19085-1678, chaudhry@ucis.vill.edu

We evaluate 3 spreadsheet-based GA software packages. A variety of MS problems were solved using each commercially available GA software. Our computational experience is reported.

WD18 Neural Networks

Contributed Session

Chair: M. Hisham Choueiki, Kuwait Univ., Mech. & Indust. Eng., PO Box 5969, Safat, 13060, Kuwait, choueiki@kuc01.kuniv.edu.kw

1) Training Data Development with the D-Optimality Criterion, ***M. Hisham Choueiki***, Kuwait Univ., Mech. & Indust. Eng., PO Box 5969, Safat, 13060, Kuwait, choueiki@kuc01.kuniv.edu.kw

The importance of using optimum experimental design concepts when selecting data for training a neural network is highlighted. We demonstrate how the D-optimality criterion can be used to enhance the value of a small training data set. This is important when collecting data is expensive, hazardous or time consuming.

2) Utilization of Neural Networks in Medical Diagnosis, ***Aviad Armoni***, Comp. & IS Dept., 19 Yehuda Hanasy St., Tel-Aviv, 69206, Israel, armonia@post.tau.ac.il

We propose a new area in medical diagnosis where neural networks can be utilized: the prediction of diagnostic probabilities. We report results of an empirical experiment, where diagnostic probabilities of insulin dependent diabetes mellitus were predicted by both linear regression and neural networks. Results show the superiority of neural networks in the sense that they provide significantly more accurate predictions.

3) Artificial Neural Network Prediction of Ascites in Broiler Chickens, ***W. B. Roush***, PA State Univ., 204 Henning Bldg., University Park, PA 16802, wbr@psu.edu, ***Y. K. Kirby***, ***T. L. Cravener***, ***R. F. Wideman, Jr.***

An artificial neural network was trained to predict ascites in poultry. The back propagation neural network had 15 physiological inputs and two outputs (normal or ascites). A verification of the network was made with two new data sets. Three false positives were identified as being birds with developmental ascites.

4) A Robust Pattern Recognition System Using Spectral Analysis & Fuzzy ART Neural Networks, ***Dong Sik Jang***, Korea Univ., IE Dept. 1, 5 ka, Anam-dong, Sungbuk-ku, Seoul, 136-701, S Korea, jang@kuccnx.korea.ac.kr, ***Mun-hwa Kim***

A robust pattern recognition system for flexible manufacture automation is developed using contouring, spectral analysis and fuzzy ART neural networks. Contouring and spectral analysis are used in the preprocessing stage in computer vision systems and fuzzy ART neural networks are used in the object classification stage.

WD19 Geographical Information Systems & Location Theory

Sponsor: SOLA

Sponsored Session

Chair: M. John Hodgson, Univ. of Alberta, Dept. Earth & Atmospheric Sci., Edmonton, Alberta, T6G 2H4, Canada, john.hodgson@ualberta.ca

1) What Von Thunen Might Have Accomplished Using IDRISI GIS, ***M. John Hodgson***, Univ. of Alberta, Dept. Earth & Atmospheric Sci., Edmonton, Alberta, T6G 2H4, Canada, john.hodgson@ualberta.ca

In 1826, J.H. Von Thunen modelled the locational distribution of crops in a landscape as an algebraic function of yields, prices, production costs, transportation rates and distance to market. We show how IDRISI GIS can be used to better visualize the model's findings and to relax its many simplifying assumptions.

2) Integrating a Desktop GIS with a Location Model, ***Rodney Schatz***, Univ. of Alberta, Dept. Earth & Atmospheric Sci., Edmonton, Alberta, T6G 2H4, Canada, schatz@gpu.srv.ualberta.ca

GISs are excellent tools for capturing, organizing, maintaining, manipulating and visualizing geographic data. They possess many spatial analysis tools, but have yet to provide powerful spatial optimization capability. We show how ArcView GIS and a location-allocation model can be integrated to organize data, optimize locations, and map the results.

3) Multicriteria Decision Making with Raster GIS: Relocating a Dentist's Office in Edmonton, Canada, ***Iain Getty***, Univ. of Alberta, Dept. Earth & Atmospheric Sci., Edmonton, Alberta, T6G 2H4, Canada, gettyi@geog.ualberta.ca

Raster GISs organize data into layers, virtual representations of maps. We develop a GIS with layers containing socioeconomic characteristics important to dental office location, the distribution of present patients, and accessibility measures. Multicriteria evaluation of these layers produces a map of suitability for locating a new practice.

4) GIS Tools for Optimal Hazardous Materials Transport Logistics, ***Jianjun Zhang***, Univ. of Alberta, Dept. Earth & Atmospheric Sci., Edmonton, Alberta, T6G 2H4, Canada, jianjun@pop.srv.ualberta.ca

Two major operations research tools for HAZMAT transport logistics are optimal routing and optimal vehicle inspection models. The data required to operationalize these models are spatially referenced and influenced by real-time environmental conditions. We show how GIS techniques can assist in the estimation, retrieval, and manipulation of these data.

5) Eliminating Aggregation Error in Discrete-Space P-Median Models, ***M. John Hodgson***, Univ. of Alberta, Dept. Earth & Atmospheric Sci., Edmonton, Alberta, T6G 2H4, Canada, john.hodgson@ualberta.ca, ***Said Salhi***

We present a procudure which eliminates, to an arbitrary degree of precision, all demand point aggregation error in multi-facility minimum weighted distance allocation, regardless of the number of demand points. A discrete space p-median solution procedure uses it to produce solutions with no aggregation error.

WD21 Advances in Microscopic Traffic Simulation IV

Cluster: Advances in Microscopic Traffic Simulation

Invited Session

Chair: Jean-Francois Gabard, ONERA/CERT SODIT SA, 2 Ave. Edouard Belin, BP 4025, Toulouse Cedex, 31055, France, gabard@cert.fr

1) Results of Different Microsimulations in the Context of the TRANSIMS Dallas/Ft. Worth Case Study, ***Kai Nagel***, Los Alamos Ntl. Lab., TSA-DO/SA, MS 997, Los Alamos, NM 87545, kai@lanl.gov, ***Marcus Rickert***, ***Martin Pieck***, ***Patrice Simon***

Three different microsimulations and 2 different routing algorithms are compared in the context of the TRANSIMS Dallas/Ft. Worth case study.

2) withdrawn - author request of 4/6, ***A. Bargiela***, Nottingham Trent Univ., Real-Time Telemetry Systems, Dept. of Computing, Nottingham, UK, ***E. Peytchev***

3) The On-Line Use of Simulation Models for real-Time Driver Information & Traffic Control in Motorway Networks, ***Jean-***

Marc Morin, ISIS Consultants, 11 ave. du Centre, Cuyancourt Cedex, F-78286, France, 100676.2110@compuserve.com

We describe 2 operational aid-to-decision tools based on real-time traffic flow simulation and forecast: MITHRA/SIMRES on interurban motorways in France and OPERA on the Scottish network. Both systems make use of the macroscopic simulation model SIMRES. General learning derived from operational experience is given together with indications about planned developments.

4) The Role of Microsimulation Models in Traffic Management Systems, ***Jaime Barcelo***, Polytech. Univ. of Catalunya, Dept. of Stats & OR, Pau Gargallo 5, Barcelona, E-08028, Spain, barcelo@eio.upc.es, ***Jordi Casas***, ***Jose Ferrer***, ***David Garcia***

Current trends in the design of dynamic traffic management systems conceive their structure as a DSS sypplying the traffic operator with estimates of the current traffic conditions on the managed network, displayed in a graphic way, to facilitate the decision making process. A desirable feature of such systems is the possibility of estimating beforehand the impact of the proposed interventions...

5) Path-Based Equilibrium Traffic Assignment & Its Interaction with Microsimulation Models, ***Dirck Van Vliet***, University of Leeds, Inst. for Transport Studies, Leeds, LS2 9JT, UK, d.vanvliet@its.leeds.ac.uk

We explore the use of equilibrium traffic assignment models based on path-flows as opposed to the more conventional link flows. These remove a number of problems and inconsistencies in the transfer of flows to microscopic simulation models such as DRACULA for more detailed analysis.

WD22 Frameworks for Group Decision & Negotiation: Negotiation Agents in Business

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: Melvin F. Shakun, NYU Stern School of Bus., 44 West 4 St., NY, NY 10012-1126, mshakun@stern.nyu.edu

1) Panel: The Roles & Functions of Negotiation Agents in Business, ***Robert W. Blanning***, Vanderbilt Univ., Owen Grad. School of Mngmnt, 401 21st Ave. South, Nashville, TN 37203, blannirw@ctrax.vanderbilt.edu, ***Framed Bodendorf***, ***Tung X. Bui***

WD23 Decision Analysis II

Contributed Session

Chair: Amy L. Pablo, Univ. of Calgary, Fac. of Mgmt., 2500 University Dr. NW, Calgary, Alberta, T2N 1N4, Canada, apablo@acs.ucalgary.ca

1) Strategic Rent-Seeking: An Experimental Investigation, ***Ayse Onculer***, Univ. of PA, OPIM 1300 SH-DH, 3620 Locust Walk, Philadelphia, PA 19104, oncul69@opim.wharton.upenn.edu

We develop an experimental rent-seeking game and examine some comparative statics properties. The results suggest rent-seeking contributions are mostly affected by one's own endowments and the number of players and less by the opponents' wealth parameters. This implies individuals behave probabilstically, rather than strategically, in a rent-seeking context.

2) Risk Taking & Risk Seeking in Contests, ***Anil Gaba***, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, anil.gaba@insead.fr

We examine risk as a choice for contestants in winner-take-all contests. It is argued that a contest with small (large) proportions of winners favors risk taking (risk aversion). Being able to choose riskiness of performance can be a substantive competitive advantage for a contestant. Implications for sponsors of contests are also discussed.

3) Risk Propensity as a Conceptual Orphan, ***Amy L. Pablo***, Univ. of Calgary, Fac. of Mgmt., 2500 University Dr. NW, Calgary, Alberta, T2N 1N4, Canada, apablo@acs.ucalgary.ca

Risk propensity as a risk research variable is rarely found to be influential, and when it is, findings are contradictory. A review of research including this variable reveals confused and inconsistent conceptualization. A new conceptually sound measure, producing consistent findings, is proposed for use where risk propensity is of interest.

4) Analyzing the Production Portfolio Decision in a Semiconductor FAB, ***Chen-Fu Chien***, Ntl. Tsing Hua Univ., Dept. of IE, 101 Sec. 2 Kuang Fu Rd., Hsinchu, Taiwan, 30043, ROC, cfchien@faculty.nthu.edu.tw, ***Bruce Jan***

We used a DA framework to assist in analyzing the production portfolio decision in a wafer fabrication plant. Due to technical changes, the plant had to decide in a timely manner the optimal combination of different production processes under risk. We used 3 different approaches and discuss the results.

WD24 Service Sector Performance Analysis Using DEA

Cluster: Data Envelopment Analysis
Invited Session

Chair: Joseph C. Paradi, Univ. of Toronto, Dept. of Chemical Eng., 200 College St., Toronto, Ontario, M5S 3E5, Canada, paradi@ie.utoronto.ca

1) Performance Evaluation of Mutual Funds, ***Ramez Chehade***, Univ. of Toronto, Dept. of IE, 4 Taddle Creek Rd., Toronto, Ontario, M5S 3E5, Canada, ramez@ie.utoronto.ca, ***Joseph C. Paradi***

We examine the use of DEA to measure the performance of mutual funds. By determining the relationship between a fund's observed performance, i.e., returns, growths as outputs, etc., and managerial factors as inputs, such as expenses and accepted risk, those funds that exhibit best practices can be identified and used to constitute better investment portfolios.

2) Performance of Insurance Companies in Canada, ***Allison J. Hewlitt***, Univ. of Toronto, CMTE, Dept. of MIE, 4 Taddle Creek Rd., Toronto, Ontario, M5S 3G9, Canada, hewlitt@mie.utoronto.ca, ***Joseph C. Paradi***

The performance of both Property and Casualty and Life and Health insurance companies in Canada is evaluated using DEA. Variables considered are general expenses, commissions, outlays, equity, investments, net earned premiums and net incurred claims.

3) Performance Analysis of Ontario Credit Unions, ***Peter Pille***, Ryerson Polytech. Univ., Sch. of Bus. Mgmt., 350 Victoria St., Toronto, Ontario, M5B 2K3, Canada, pille@acs.ryerson.ca, ***Joseph C. Paradi***

Ontario credit unions are analyzed in an attempt to detect weakness in advance of potential failure. Different models are constructed for effectiveness evaluation in failure predictions. A number of DEA models are evaluated and compared to z-score models as well as to the equity to asset ratio, in their ability to predict failure.

WD29 Aviation Operations Research Roundtable

Sponsor: Aviation Applications Section
Sponsored Session

Chair: Robert B. Rovinsky, Federal Aviation Admin., 2440 Virginia Ave. NW, Apt. D-205, Washington, DC 20037-2615, robert.rovinsky@faa.dot.gov

WD30 Military Issues II

Cluster: Military Applications
Invited Session

Chair: Jack Brimberg, Royal Military Coll. of Canada, Dept. of Eng. Mgmt., Kingston, Ontario, K7K 5L0, Canada, brimberg-j@rmc.ca

1) Strategic Mobility Options Analysis Using Mathematical Programming, ***P. Comeau***, Ntl. Defense HQ, Pearkes Bldg., Ottawa, Ontario, K1A 0K2, Canada

A mathematical programming approach has been used to analyze strategic mobility options for the Canadian Forces. Using present Canadian transportation assets and capabilities, airlift and sealift options were analyzed with respect to cost, late deliveries, readiness and pre-positioning. An optimization model, implemented using AMPL, will be discussed...

2) Scenario-Based Strategic Planning, ***G. L. Christopher***, Ntl. Defense Headquarters, Pearks Bldg., Ottawa, Ontario, K1A 0K2, Canada, ***I. Taylor***

Departmental scenarios are being introduced as a key force development tool. Capability-based, scenario-supported analyses will facilitate the identification of capability requirements and assist planners in developing force planning goals at the strategic and operational levels. Scenario analyses output will feed optimization tools to identify the best capability set permitted within approved resources.

3) Current Issues in Military Logistics Outsourcing, ***Ira A. Lewis***, Ntl. Defense HQ, DGMRS, Ottawa, Ontario, K1A OK2, Canada

The armed forces of the US and Canada are increasingly contracting out logistics and related support responsibilities. This trend is due to both perceived cost efficiencies and the need for defense organizations to concentrate on military capabilities rather than functions that are inherently commercial. Success factors, lessons learned and the potential contribution of OR will be

discussed.

4) Assessing the Impact on Pilot Retention of a Specialist Pilot Career Path in the Canadian Forces, ***Dale Reding***, CORA (1CAD/CANR), Box 17000 Stn Forces, Winnipeg, Manitoba, R3J 3Y5, Canada

Unusually high rates of pilot attrition in the Canadian Forces have led to a proposal that a specialist pilot career path be developed to increase pilot retention. We present a stochastic risk analysis model of the impact of such a career path on pilot retention.

5) Sequencing Military Convoys as a Special Class of TSP, ***Jack Brimberg***, Royal Military Coll. of Canada, Dept. of Eng. Mgmt., Kingston, Ontario, K7K 5L0, Canada, brimberg-j@rmc.ca, ***E. Korach***

We consider a hypothetical problem where the objective is to assign m objects to N fixed equi-spaced caches in order to minimize the risk of loss. The general problem is shown to be NP-hard. However, a subproblem may be solved as a special class of TSP. Applications include the sequencing of trucks in a military convoy.

WD31 Military Applications II

Contributed Session

Chair: E. L. Perry, TASC Inc., 580 Old Jasmine Hill Rd., Wetumpka, AL 36093

1) Air-to-Air Attrition Models in Constructive Simulations, ***E. L. Perry***, TASC Inc., 580 Old Jasmine Hill Rd., Wetumpka, AL 36093

The air-to-air attrition models in the Air Warfare Simulation, the Joint Theater Level Simulation, Thunder and the ACES system are compared. The author suggests a standard air-to-air attrition model for constructive simulations.

2) Attack Aviation Organization in Force XXI & Army After Next, ***David D. Briggs***, US Military Academy, Dept. of Systems Eng., Mahan Hall, West Point, NY 10996, fd8785@trotter.usma.edu se. usma.edu, ***Jon L. Shupenus***

Integration of new technologies and systems into an effective organization is a constant challenge. We examine the implications of fielding new generations of attack helicopters into the parent system and examine their impact at multiple levels utilizing a factorial design and response surface methodology. Alternative structures are tested using combat simulation and other methods...

3) Landfill Dilemma at Aberdeen Proving Grounds, ***Gregory Brouillette***, US Military Academy, Dept. of Systems Eng., Mahan Hall, West Point, NY 10996, fg9930@trotter.usma.edu www.se. usma.edu, ***James E. Armstrong, Jr., Jeffery K. Joles***

Aberdeen Proving Grounds, Maryland, currently operates 2 landfills to deal with their rubble waste from building construction and demolition. State regulations require landfills to be equipped with a liner by the year 2002 in order to contain hazardous wastes and to prevent pollution of the ground water supply. We will discuss how we determined the most cost-effective, feasible and environmentally sound alternative to handle the rubble waste at APG.

WD32 Quality Control

Contributed Session

Chair: Shreevardhan Lele, Univ. of MD, Sch. of Bus., College Park, MD 20742, slele@mbs.umd.edu

1) Issues in the Economic Design of a Bayesian Quality Control Chart, ***Shreevardhan Lele***, Univ. of MD, Sch. of Bus., College Park, MD 20742, slele@mbs.umd.edu

Use of a Bayesian quality control chart entails plotting the posterior out-of-control probability, and ensuring that it is below a predetermined threshold. The threshold probability is estimated and analyzed with respect to the cost structure and the process parameters of the production system.

2) Optimal Inspection Policies for 2-Stage Deteriorating Manufacturing Processes, ***Elkafi Hassini***, Univ. of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, ehassini@uwaterloo.ca, ***Ray G. Vickson***

We investigate optimal policies for inspecting 2-stage manufacturing processes that randomly deteriorate over time and begin to produce defective items. Optimal inspection intervals are determined by studying the trade-off between the cost and time spent in inspection and rework.

3) Components of Variability in Bituminous Pavement Construction, ***Samir A. Ahmed***, OK State Univ., Sch. of Civil Eng., 207 Engineering South, Stillwater, OK 74078, samir.ahmed@okway.okstate.edu

Knowledge of the variability in acceptable bituminous pavement materials and construction is a prerequisite for developing successful quality assurance of specifications. We summarize results of statistical analyses performed on more than 11,000 measurements of quality characteristics to assess the overall variability and its components due to materials, sampling and testing.

WD33 Accounting

Contributed Session

Chair: Paul P. Hoppe, Golden Gate Univ., 536 Mission St., San Francisco, CA 94105, phoppe@ggu.edu

1) Estimating with Length Biased Accounting Data, ***Paul P. Hoppe***, Golden Gate Univ., 536 Mission St., San Francisco, CA 94105, phoppe@ggu.edu

When statistical auditing, certain audit evidence can become available which is not from the statistical sample. This arrival is modeled as a length biased process. Building on the work of Vardi, using superpopulations, we extended the results to finite populations. Several estimation strategies are developed and tested using simulations of several superpopulation models.

2) Why Should We Pay an Agent for Bad News?, ***Susan I. Cohen***, Univ. of IL, 96 Commerce West, 1206 S Sixth St., Champaign, IL 61820, s-cohen3@uiuc.edu, ***Jennjung Wu***

We consider a model in which an agent provides efforts that improve the accuracy of information available to the principal. In standard models, working harder means higher expected output; in our model, it means more accurate information. We characterize the optimal contracts between the principal and the agent.

3) The Real Plan & the Brazilian Economy, ***Silvio R. B. de Gouvea***, Billiton Metais SA, Praia de Botafogo 228, 4th Fl., Rio de Janeiro, 22359-900, Brazil, silviogouvea@montreal.com.br, ***Joao Theodorico Gayva, David Benarroch***

The real plan brought the Brazilian inflation from 2800% pa to 5% pa in less than 4 years. We analyze the role of the exchange control policy in this process. Also analyzed is the behavior of the derivative markets in Brazil during this period.

WD34 Genetic Algorithms & Applications

Sponsor: College on Artificial Intelligence

Sponsored Session

Chair: Riyaz Sikora, Univ. of IL, Urbana, IL

1) Genetic Algorithm-Based Intelligent Fault Diagnosis Systems for Robotic Machines, ***Wong Rong***, Univ. of MI, Dearborn, MI 48128, ***Riyaz Sikora, Ali K. Kamrani***

We will look at the problem of diagnosing faults or failures in a robotic machine in terms of the failure of its motors or encoders. We will present a GA-based system for the above task and compare its performance with some the traditional machine learning approaches.

2) A Generalized Bound for the Behavior of Genetic Algorithms, ***Haldun S. Aytug***, Univ. of NC, Belk Coll. of Bus. Admin., IOM Dept., Charlotte, NC 28223, haytug@email.uncc.edu, ***Gary J. Koehler***

This paper models iterates of a GA as the iterates of a Markov chain. A model on the first passage time of Markov chain is built and the terminiation criteria of an equivalent GA is derived based on the model. We make no assumptions on crossover distribution and the cardinality of the alphabet used by the GA. Results show that the worst case performance of a GA is a function of mutation and the poopulation sizes.

3) The Use of Genetic Algorithms to Solve the Economic Lot Size Scheduling Problems, ***Moutaz J. Khouja***, Univ. of NC, Info. & Op. Mgmt. Dept., Charlotte, NC 28223, mjkhouja@email.uncc.edu, ***Zbigniew Michalewicz, Michael Wilmot***

We investigate the use of GAs for solving the ELSP. The ELSP is formulated using the basic period approach which results in a problem having one continuous decision variable and a number of integer decision variables equal to the number of products. This formulation is ideally suited for using GAs.

WD35 Networks & Graphs III

Contributed Session

Chair: Abraham Punnen, Univ. of New Brunswick, Dept. of Math. Stats. & CS, Saint John, NB, E2L 4L5, Canada, punnen@unbsj.ca

1) A k-Shortest Path Column Generator for the Pairing Problem, ***Curt A. Hjorring***, Carmen Systems, Odinsgatan 9, Gothenburg, S-41103, Sweden, curt.hjorring.@carmen.se

The rules that define pairings are complex and were previously hard coded into

column generators. A more general solution is a rule system that returns a simple yes/no for a partial/complete pairing. We present results from a rule system-based column generator that uses a k-shortest path algorithm.

2) Minimal Spanning Trees with Sums of Ratios, ***Christopher C. Skiscim***, Orbital Sciences Corp., 20301 Century Blvd., Germantown, MD 20874, christopherskiscim@oscsystems.com, ***Susan W. Palocsay***

We present an algorithm for finding a minimal spanning tree where the costs are the sum of two linear ratios. We solve a sequence of constrained minimal spanning tree problems parametrically, using an equivalent form of the problem where each ratio is associated with a new variable in "image space".

3) Optimal Mosaicking of Aerial Photographic Maps, ***Robert S. Garfinkel***, Univ. of CT, Box U41P, Storrs, CT 06209, garfin@uconnvm.uconn.edu, ***Elena Fernandez***

The problem is to draw a seam so that 2 photographs can be mosaicked into a single photo and the seam is invisible. It is modeled and solved via bottleneck shortest paths. The algorithm has been implemented at the Cartographic Institute of Catolonia (Spain) with demonstrable impact on the company.

4) Bottleneck TSP & Its Variations on a Halin Graph, ***Abraham Punnen***, Univ. of New Brunswick, Dept. of Math. Stats. & CS, Saint John, NB, E2L 4L5, Canada, punnen@unbsj.ca, ***Santosh N. Kabadi, Jeff Phillips***

We consider the bottleneck TSP on a Halin graph and show that it can be solved in linear time. This improves the O(nlogn) time bound obtained using the threshold algorithm. Some variations of this problem are also considered.

WD37 Artificial Intelligence I

Contributed Session

Chair: Christiano Lyra, State Univ. of Campinas, FEEC/UNICAMP, CP 6101, Campinas SP, 13083-970, Brazil, chrlyra@densis.fee.unicamp.br

1) Artificial Neural Hidden Units for Knowledge Discovery, ***Wilmer R. Gonzalez***, Univ. Central de Venezuela, Ciudad Universitaria, Los Chaguaramos, Caracas, DF, 1053, Venezuela, wgonz@elecrisc.ing.ucv.ve neutron.ing.ucv.ve/Comunicaciones/gonzalez

We present a network that combines a hidden layer integrated by special Gaussian units, with an output composed by sigmoidal nodes. An algorithm is given in order to train the hidden units. An example of this neural network shows its capability to identify classes and exceptions.

2) Mathematical Programming & Electronic Networks, ***Phongi Mbika***, Univ. of Southern CO, ASET 261, 2200 Bonforte Blvd., Pueblo, CO 81001, mb0567ph@meteor.uscolo.edu, ***Thomas K. Keyser, Trevor S. Hale***

Generic mathematical optimization problems are implemented using electronic networks. Several mathematical models are solved using traditional solution methodologies. The equivalent electronic circuits/networks are developed and compared to the traditional solution methods. An artificial neural network is used to implement optimization problems.

3) Clustering User Groups to Optimize Software Resource Requirements, ***Rajesh Tyagi***, Southern AR Univ., Dept. of Acct. & CIS, Magnolia, AR 71753, rtyagi@saumag.edu

Given a number of user groups and their peak demand data - mean, variance and correlation of user requests for a particular software in a network, the problem is to create clusters of groups to minimize the number of software units needed for given service level. This problem is solved using Genetic Algorithms.

4) Parallel Intelligent Search Strategies to Minimize Losses in Electric Distribution Systems, ***Christiano Lyra***, State Univ. of Campinas, FEEC/UNICAMP, CP 6101, Campinas SP, 13083-970, Brazil, chrlyra@densis.fee.unicamp.br, ***Welfane K. Tao, Celso Cavellucci***

The problem of obtaining a network topology with minimum energy losses for electric power distribution systems is a generalization of the minimum spanning tree problem. Search strategies from the field of artificial intelligence, parallel processing techniques and nonlinear network flow algorithms are teamed to cope with computation intractability.

WD38 Telecommunications III

Contributed Session

Chair: Natarajan Gautam, PA State Univ., 207 Hammond Bldg., Dept. of IME, University Park, PA 16802, mxg11@psu.edu

1) Admission Control for Multiclass Traffic in High-Speed Networks, ***Natarajan Gautam***, PA State Univ., 207 Hammond Bldg., Dept. of IME, University Park, PA 16802, mxg11@psu.edu, ***Vidyadhar G. Kulkarni***

We consider 3 different service scheduling policies, static priority service policy, timed round-robin policy and leaky bucket policing with statistical multiplexing, to multiplex multiclass traffic onto a single output channel. We solve call-admission-control problems for the different service scheduling policies such that the QoS requirements are met.

2) Analysis of Clustered Servers in a Local Area Network, ***Hsing K. Cheng***, Coll. of William & Mary, Sch. of Bus., PO Box 8795, Williamsburg, VA 23187-8795, cheng@cs.wm.edu

We analyze the performance of clustered computer servers in a LAN and examine the impact of failures resulting from both the servers and the network.

3) Error Probability in MQAM Modulation Systems: A General Approach, ***Jose R. Coll***, Univ. Central de Venezuela, Apt. 81080, Caracas, 1080-A, Venezuela, jcoll@elecrisc.ing.ucv.ve

The probability of error in M-order quadrature amplitude modulation systems affected by intersymbol interference and additive noise is calculated in an efficient and general way, without considering any direct or indirect simplifying action and using numerical computation of a Laplace integral along a contour in the complex plane.

Wednesday 16:00-17:30

WE01 Railway Applications II

Contributed Session

Chair: Knut Alicke, Univ. Karlsruhe, Hertzstr. 16, Karlsruhe, 76187, Germany, knut.alicke@mach.uni-karlsruhe.de

1) Optimization of an Intermodal Terminal Using Constraint Logic Programming, ***Knut Alicke***, Univ. Karlsruhe, Hertzstr. 16, Karlsruhe, 76187, Germany, knut.alicke@mach.uni-karlsruhe.de, ***Dieter Arnold***

One of the most challenging optimization problems of an intermodel terminal is finding an optimal container-sequence for the train-to-train-transshipment. We present a new approach based on constraint logic programming to solve this problem. We develop a framework to model the containter-terminal as a constraint satisfaction problem.

2) Scheduling Container Transfers at Multimodal Terminals, ***P. Preston***, Queensland Univ. of Tech., Sch. of Math. Sci., GPO Box 2434, Brisbane, Queensland, 4001, Australia, p.preston@fsc.qut.edu.au, ***Erhan Kozan***

Optimising container transfer schedule at the multimodal terminals is known to be NP-Hard which implies that the best solution becomes computational infeasible as problem sizes increase. Efficient heuristic techniques are used to reduce container handling/transfer times and ships; time in port by speeding up handling operations.

3) Optimizing Intermodal Operations Over the Rail (Linehaul) Segment of Truck-Rail Intermodal Transportation, ***Alexandra M. Newman***, Univ. of CA, 2773 Park St., Berkeley, CA 94702, newman@ieor.berkeley.edu, ***Candace A. Yano***

Althrough rail intermodal transportation has been gaining popularity in recent years, a significant number of shippers complain about lengthy transit times. We present a formulation for minimizing rail (linehaul) operations while ensuring timeliness of deliveries and briefly discuss our solution procedure. We illustrate our model with numerical results.

WE02 Aviation Applications II

Contributed Session

Chair: Kathleen L. McFadden, Northern IL Univ., OP & IS Dept., McMurry Hall 205, DeKalb, IL 60115-2854, kmcfadden@niu.edu

1) A Risk Model for Analyzing Airline Safety, ***Kathleen L. McFadden***, Northern IL Univ., OP & IS Dept., McMurry Hall 205, DeKalb, IL 60115-2854, kmcfadden@niu.edu

It has been argued that different safety levels exist among the various U.S. Airlines. The purpose of this study is to develop a risk model to analyze U.S. airlines on the basis of safety. The findings hold several implications for the Federal Aviation Administration and for the airlines.

2) withdrawn - author request of 2/16, ***John E. Kobza***, VA Polytech. Inst., Dept. of ISE, 250 NEB, Blacksburg, VA 24061-0118, jkobza@vt.edu, ***Sheldon H. Jacobson***

WE05 Flexible Manufacturing Systems II

Contributed Session

Chair: Claude Olivier, Univ. of Quebec, Ecole of Tech. Suprieure, 1100 rue Notre-Dame W, Montreal, Quebec, H3C 1K3, Canada, olivier@gpa.etsmtl.ca

1) Agile Manufacturing: Quantitative Evaluation of Layouts, ***Claude Olivier***, Univ. of Quebec, Ecole of Tech. Suprieure, 1100 rue Notre-Dame W, Montreal, Quebec, H3C 1K3, Canada, olivier@gpa.etsmtl.ca, ***Benoit Montreuil***

Agile manufacturing has deeply changed the traditional production environment. Factory design, operation and control approaches, often based on aggregated information, have to be refined to correctly characterize these new manufacturing systems. In this particular context, we present an approach, using LP and Monte Carlo simulation, to quantitatively evaluate these layouts.

2) A Comparative Evaluation of an Operational Flexibility Measure, ***Yasemin Kahyaoglu***, Middle East Tech. Univ., 137 St. Pierre, Apt. 102, Montreal, Quebec, H2Y 3T5, Canada, ats@vax2.concordia.ca, ***John A. Buzacott, Sinan Kayaligil***

Based on our perspective that flexibility contributes to the achievement of performance targets by a company, an operational measure of a manufacturing system is proposed and tested. By comparing performance outcomes, our measure is evaluated in comparison with other measures of flexibility from the flexibility literature.

3) withdrawn - author request of 2/16, ***Anita Y. Lee-Post***, Univ. of KY, 425 Bus. & Econ. Bldg., Lexington, KY 40506-0034, dsianita@ukcc.uky.edu

WE06 Service Industry II

Contributed Session

Chair: Aaron P. Blossom, Grand Valley State Univ., 6579 Gran Via Dr. NE, Rockford, MI 49341, blossomp@river.it.gvsu.edu

1) A Taxonomy of Service Organizations & its Implications for Service Quality, ***Jayant V. Saraph***, MN State Univ., 730 Hennepin Ave. S, Rm. 724, Minneapolis, MN 55403, jsaraph@msusl.msus.edu

This paper develops a pragamatic, unified taxonomy of service organizations based on the service classification frameworks found in the service business literature. Further, the paper analyzes the implications of this taxanomy on several important service quality factors. The conceptual framework developed is empirically applied to two service industries. In addition,...

2) Labor Scheduling in the Trenches, ***Aaron P. Blossom***, Grand Valley State Univ., 6579 Gran Via Dr. NE, Rockford, MI 49341, blossomp@river.it.gvsu.edu

Results from open-ended interviews of 25 restaurants and retail stores show the labor scheduling methods used in small business. The steps used for scheduling, the time required and the quality of schedules produced are presented. Additional results indicate that additional algorithm work is desirable.

WE07 Planning

Contributed Session

Chair: Dung Nguyen, Univ. of Pittsburgh, Grad. Sch. of Bus., 240 Mervis Hall, Pittsburgh, PA 15260, nguyen+@pitt.edu

1) A Meta-Framework Which Links Recent Approaches to Strategy, ***James N. Vedder***, Syracuse Univ., Sch. of Mgmt., Ste. 400, Syracuse, NY 13244, jvedder@som.syr.edu

A number of approaches to strategy have been presented in recent years by authors such as Hamal & Prahalad; Porter; and Mintzberg as well as cross functional approaches such as that by Hammer. We present a framework which facilitates the linking of all these approaches to sustainable competitive advantage.

2) Transportation Problems with Minimax Criterion, ***Vladimir I. Tsurkov***, Russian Academy of Sci., Computer Ctr., 40 Vavilov Str., Moscow, 117967, Russia, tsurkov@ccas.ru

In the classic transportation problem, the cost function of the minimization of transportation expenditure is substituted by minimax. We obtain the following problem to find the matrix with the fixed sums of the lines and columns where its maximal element would be minimal. An identity is offered which constructs the algorithm.

3) Capacity & Technology Selection with Program Delays, ***Rodney P. Parker***, Univ. of MI, Sch. of Bus. Admin., Ann Arbor, MI 48109-1234, rpparker@umich.edu, ***Kathryn E. Stecke***

An unknown factor in capacity planning problems is how optimal capacity and technology decisions are affected by the possibility of program delays. We present models which illustrate how these decisions differ from the usual decisions. Irrecoverable and recoverable program delays are considered.

4) On Equilibrium Distributions of Workers in Graded Manpower Systems, ***Dung Nguyen***, Univ. of Pittsburgh, Grad. Sch. of Bus., 240 Mervis Hall, Pittsburgh, PA 15260, nguyen+@pitt.edu

We examine large, aggregate graded manpower systems which strongly reflect heterogeneity in production processes inherent in different organizations and uncertainty in labor quality. When subjecting these organizations to competitive market forces for labor services, equilibrium grade distributions of workers yield import policy implications on wage differentials and labor productivity.

WE08 Production & Scheduling IV

Contributed Session

Chair: Eugeniusz Toczylowski, Politechnika Warszawska, Nowowiejska 15/19, Wydzial EiTl, ul., Warsaw, 00-665, Poland, toczylowski@ia.pw.edu.pl

1) On Aggregation Methods for Production Scheduling, ***Eugeniusz Toczylowski***, Politechnika Warszawska, Nowowiejska 15/19, Wydzial EiTl, ul., Warsaw, 00-665, Poland, toczylowski@ia.pw.edu.pl

Various aggregation and disaggregation techniques are discussed in the context of solving production scheduling problems. We present appropriate methods for aggregation and disaggregation of items, resources, jobs, time slots and elementary plans.

2) A Simple Approach to Splitting & Multiple Assignments, ***John Moussourakis***, Rider Univ., 2083 Lawrenceville Rd., Lawrenceville, NJ 08648-3099, moussourakis@rider.edu

A common approach to allocating facilities to tasks improperly omits splitting and/or multiple assignments when feasible. Unlike other proposed answers to the problem, we address this omission with no restrictive assumptions.

3) On the Destabilizing Effect of Blocking in Multi-Class Queueing Networks, ***Spyros A. Reveliotis***, GA Inst. of Tech., Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332, spyros@isye.gatech.edu

We shall show that blocking due to finite buffering capacity of the system workstations can be a destabilizing factor of distributed scheduling policies, in addition to the currently identified sources of instability. The issue is important since most real-life systems will operate under buffering capacity constraints.

4) Lead Time & Price Quotation in Congested Manufacturing Systems Subject to Random Disruptions, ***Mohsen El Hafsi***, Univ. of CA, Anderson Grad. Sch. of Mgmt., Riverside, CA 92521-0203, mohsen.elhafsi@ucr.edu

We study a manufacturing system consisting of several processing centers. The centers are subject to random failures. When an order is received, and because of lead time constraints, it is split among several centers. The splitting decision is based on the total operating cost that is to be minimized.

WE09 Scheduling II

Contributed Session

Chair: J. Scott Yeomans, York Univ., Sch. of Bus. SSB 333, 4700 Keele St., North York, Ontario, M3J 1P3, Canada, as000147@ioron.yorku.ca

1) Determination of Optimal Job Due Dates & Sequence to Minimize Earliness & Tardiness with Sequence Dependent Setup Times, ***Ghaith Rabadi***, Univ. of Central FL, 1617 Cricket Club, # 303, Orlando, FL 32828, gar31503@pegasus.cc.ucf.edu, ***Mansooreh Mollaghasemi***

Optimal due dates are determined to find optimal job sequence for the single-machine Early/Tardy problem with sequence-dependent setup times. Gas are applied to solve for large number of jobs. Mixed integer programming is used to verify the results of the GA for small numbers of jobs.

2) Stochastic Scheduling with Delivery Windows, ***Umar M. Al-Turki***, King Fahd Univ. of Petroleum & Minerals, Systems Eng. Dept., Dhahran, 31261, Saudi Arabia, alturki@ccse.kfupm.edu.sa

The problem of processing n jobs on a single machine subject to random breakdowns is considered. Processing times of jobs are known in advance. The performance measure is the expected deviation from a delivery window. The requirement is to assign delivery windows.

3) An Analysis & Design of a Real Time Scheduling, ***Semih Oguz***, Bosphorus Univ., Cinar Mah Emek Sok, No: 3/3 Kucukyali, Istanbul, 81580, Turkey, oguzsemi@boun.edu.tr, ***Ali T. Unal***

In this study, it is analysed and designed a real time scheduling system by using object oriented methodology. Basic scheduling algorithms and messaging mechanism between system modules are defined and implemented.

4) Computational Results of Product-Level Balanced Just-in-Time Optimization Algorithms, ***J. Scott Yeomans***, York Univ., Sch. of Bus. SSB 333, 4700 Keele St., North York, Ontario, M3J 1P3, Canada, as000147@ioron.yorku.ca

Over the past few years, several efficient optimization algorithms have appeared for product-level, mixed-model, JIT balanced schedule problems. In this paper, the results from a large computational analysis of these algorithms will be presented. Several open questions can be answered through the course of this computational study.

WE10 Scheduling Applications

Contributed Session

Chair: Charles H. Rosa, SABRE Tech. Solutions, 1 East Kirkwood Blvd., MD 7390, Southlake, TX 76092, charles_rosa@sabre.com

1) Formulating the American League Umpire Crew Scheduling Problem as ILP & Constraint Satisfaction Problems: A Comparative Study, ***Rene Leo E. Ordonez***, Southern OR Univ., 1250 Siskiyou Blvd., Ashland, OR 97520, ordonez@sou.edu

We present and compare two approaches - integer linear programming and constraint logic programming--to scheduling the umpire crews of the American Baseball League. The scheduling takes into consideration several league-imposed travel rules and restrictions, while at the same time minimizing travel costs, balancing crew/team exposure, and balancing crew loads...

2) IBM Education & Training Block Scheduling Program, ***Dwight W. Calkins***, IBM Mail Drop 16-06-01, 1507 LBJ Freeway, MD 16-06-01, Dallas, TX 75238, dcalkins@us.ibm.com

A block schedule is generated for IBM education in the US on a quarterly basis to optimally assign class requests to appropriate rooms and to qualified instructors. An MIP with 50,000 integer variables is solved in a reasonable time and the optimization is flexible enough to meet the needs of non-technical users.

3) An Application of Schedulig Optimization to the US Military's Joint Air Logistics Project, ***Charles H. Rosa***, SABRE Tech. Solutions, 1 East Kirkwood Blvd., MD 7390, Southlake, TX 76092, charles_rosa@sabre.com, ***Timothy L. Jacobs***, ***Barry C. Smith***, ***Ellis L. Johnson***

The U.S. military operates an extensive transportation network to relocate personnel for training and other non-deployment purposes. Organizing the operations of such a large network is a difficult multidimensional decision problem. This paper presents an approach for developing a detailed schedule for allocation of vehicles for the military's transport operations.

WE12 OR/MS in Forestry IV: Timber Harvest Scheduling

Sponsor: ENRE

Sponsored Session

Chair: Susan L. King, USDA Forest Service, 5 Radnor Corp. Ctr., Ste. 200, 100 Matsonford Rd., Radnor, PA 19087-4585, sking@hpl.nene.org

1) Forest Modeling & Spatial Optimization, ***Alan T. Murray***, Queensland Univ. of Tech., Fac. of Environ. & Eng., Brisbane Queensland, 4001, Australia, a.murray@qut.edu.au

Forest management planning involves the consideration of varied and complex issues. Mathematical models have been successful in assisting this process. We review a number of forest planning models and discuss their relationships within a broader class of spatial optimization models.

2) Combined GIS & Optimization Techniques for Simultaneous Spatial & Temporal Timber Harvest Planning, ***Denis J. Dean***, CO State Univ., Dept. of Forest Sciences, 113 Forestry Bldg., Ft. Collins, CO 80523, denis@cnr.colostate.edu

Traditional harvest scheduling models tend to consider the temporal and spatial components of the forest managment problem as separate issues. By combining optimization techniques and GIS technologies, new models are developed that consider both components simultaneously. Empirical evidence supports the hypothesis that combined models producr superior results to traditional models.

3) Harvest Planning: Which Period to Harvest Which Stands with What Road Network, ***Russell D. Meller***, Auburn Univ., Dept. of ISE, 308 Dunstan Hall, Auburn, AL 36849-5346, rmeller@eng.auburn.edu, ***Mark M. Clark***

We develop a heuristic approach for solving a tactical forest planning problem with spatial and temporal constraints. A solution is constructed by a greedy approach and then followed by efficient improvementalgorithms. The model is unique in its integration of an operational plan that includes landing and road placement.

4) Simulated Annealing vs Sequential Gaussian Conditional Simulation for Locating Trees oh High Commercial value in Pennsylvania, ***Susan L. King***, USDA Forest Service, 5 Radnor Corp. Ctr., Ste. 200, 100 Matsonford Rd., Radnor, PA 19087-4585, sking@hpl.nene.org

Geostatistics is a branch of applied statistics concerned with the description of spatial patterns and estimation of values at unsampled location. Two techniques of geostatistics, SA and sequential gaussian conditional simulation are compared for locating trees of high commercial value in Pennsylvania.

WE14 Integer Programming V

Contributed Session

Chair: Mark T. Bullock, IBM Corp., 1405 College Ave., Racine, WI 53403, mbullock@us.ibm.com

1) The Bear Canister Problem, ***Mark T. Bullock***, IBM Corp., 1405 College Ave., Racine, WI 53403, mbullock@us.ibm.com

Backcounty hiking provisions should be split equitably among all creatures on the trail - except bears. In recent years, the food protection scheme has shifted from bags hung in trees to secure canisters. This presentation offers a method to appropriately apportion the food between the hikers.

2) A Trade-Off Between Cycle Time Minimization & Workload Balance in Workforce Allocation Problems, ***Paulo Ghinato***, Kobe Univ., 1-1 Rokkodai-cho, Nada-ku, Kobe City, Hyogo, 657, Japan, ghinato@kaede.seg.kobe-u.ac.jp, ***Susumu Fujii***, ***Hiroshi Morita***

The worker assignment problem is usually formulated as a single objective optimization problem where the goal is minimizing either cycle time or number of workers. We present the worker assignment in U-shaped production lines formulated as a multiobjective optimization problem. We demonstrate that beside pursuing the minimization of the number of workers, it is important to keep a balance of workload distribution...

3) A Decision Support System for the Assignment of Faculty Academic Loads Under Accreditation Guidelines, ***Mario Norbis***, Quinnipiac Coll., Mt. Carmel Ave., Hamden, CT 06518, norbis@quinnipiac.edu, ***David Cadden***, ***Vincent Celeste***

Accreditation guidelines for schools of business set limits on the teaching load of faculty and on the ratio of adjunct to full time faculty, double constraining the administrators decision when assigning faculty. To support this process, a goal integer programming model was developed which is efficiently solved with available software.

4) withdrawn - author request of 3/11, ***Wilbert E. Wilhelm***, TX A&M Univ., Dept. of IE, 237-H Zachry Eng. Ctr., College Station, TX 77843, wilhelm@tamu.edu

WE15 Nonlinear Programming Algorithms & Applications

Cluster: Nonlinear Programming

Invited Session

Chair: Leon S. Lasdon, Univ. of TX, MSIS Dept., College of Bus. Admin., Austin, TX 78712-1175, lasdon@mail.utexas.edu

1) Quality Tolerancing & Conjugate Duality, ***Thomas R. Jefferson***, Sultan Qaboos Univ., Coll. of Commerce, PO Box 20, Al-Khod, Muscat, 123, Oman, tjeffers@squ.edu.om, ***Carlton H. Scott***

We study the relationship between product quality as defined by tolerances on the product to tolerances on the parts. It is extended to include quality loss functions. The conjugate duality analysis provides insight into the relationship between quality and tolerancing and can lead to efficient solution procedures.

2) New Possibilities of Using Linear & Quadradratic Programming in Solving Nonlinear Large-Scale Problems on Polyhedral Sets, ***A. Belenky***

Examples of practical nonlinear large-scale problems on polyhedral sets with linear-fractional, bilinear and the maximum functions are presented. Verifiable necessary and sufficient conditions of extrema and equilibrium points that enable one developing methods of finding the points using elements of linear and quadratic programming techniques are proposed.

3) Recent Computational Results Using SLP/GRG, ***Allan D. Waren***, Cleveland State Univ., Comp. Sci. Dept., Cleveland, OH 44115, waren@babbage.cba.csuohio.edu, ***Walter O. Rom***, ***Leon S. Lasdon***

SLP/GRG is an algorithm for solving large sparse NLPs which combines features of SLP and GRG algorithms. The current implementation uses IMB's

OSL LP code to solve the linearized subprobems. We present results on a set of GAMS models of moderate size, comparing with other GAMS solvers.

WE16 Linear Programming II

Contributed Session

Chair: D. M. Tulett, Memorial Univ. of Newfoundland, Fac. of Bus. Admin., St. John's, NF, A1B 3X5, Canada, dtulett@morgan.ucs.mun.ca

1) The Huang-Redlack Algorithm & Its Extensions, ***D. M. Tulett***, Memorial Univ. of Newfoundland, Fac. of Bus. Admin., St. John's, NF, A1B 3X5, Canada, dtulett@morgan.ucs.mun.ca, ***A. R. Redlack***

The original Huang-Redlack algorithm was designed as an alternative to the Hungarian algorithm for the assignment problem. It has been extended to the transportation and other network problems. Unlike the simplex algorithm, the Huang-Redlack algorithm is not affected by degeneracy. Consequently, it permits exact sensitivity analysis to be performed.

2) Primal & Dual Infeasible Linear Programs: Certificates, ***Erling D. Andersen***, Odense Univ., Dept. of Mgmt., Campusvej 55, Odense M, DK-5230, Denmark, eda@busieco.ou.dk http://www.busieco.ou.dk/~eda/

We will discuss what is an informative certificate of either primal or dual infeasibility of a linear program. Furthermore, we give a definition of what is an "optimal" basis to a primal or dual infeasible linear program. Finally, we present a procedure which computes such a basis in polynomial time.

3) Nonsymmetric Search Directions for Semidefinite Programming, ***Rongqin Sheng***, Argonne National Lab., Bldg. 203, Rm. C-241, 9700 S Cass Ave., Argonne, IL 60437, sheng@mcs.anl.gov, ***Florian A. Potra***

Two nonsymmetric search directions for semidefinite programming, the XZ and ZX search directions, are proposed. They are derived from a nonsymmetric formulation of the semidefinite programming problem. Numerical results show that the XZ/ZX method which uses the 2 directions alternately is competitive with the XZ+ZX (AHO) method.

4) No Title Supplied, ***A. Lisser***, France Telecom CNET, 38-40 Rue du General Leclerc, Issy-Les-Moulineaux, 92131, France, ***B. El Oujaji***, ***P. Chretienne***

Preprocessing approaches have been widely used in LP for the last 15 years. They mainly allow to reduce significantly the CPU time for the majority of the available commercial codes. One of these methods consists of extracting a network structure from a given LP. Such approaches were initialized by Bixby, who implements it in CPLEX Solver...

WE19 Location Modeling in the Public Sector

Sponsor: SOLA

Sponsored Session

Chair: Rajan Batta, SUNY, Dept. of IE, 342 Bell Hall, Buffalo, NY 14260, batta@acsu.buffalo.edu

1) Mathematical Models for Relocating Businesses in Inner City Neighborhoods, ***Alok Baveja***, Rutgers Univ., Sch. of Bus., Third & Penn Sts., Camden, NJ 08102, baveja@crab.rutgers.edu, ***Suneeta Ramaswami***

We consider the problem of revitalizing inner city neighborhoods using financial incentives for relocating businesses. We investigate various mathematical formulations from the location theory literature as well as from computational geometry. The hope is to develop a decision-making tool for policy makers.

2) A Chance Constrained Approach to Stochastic Location, ***Joy Bhadury***, Univ. of New Brunswick, Fac. of Admin., PO Box 4400, Fredericton, NB, E3B 5A3, Canada, bhadury@unb.ca

We consider the location of a facility in the presence of stochastic demand where the optimal location is determined by a formulation that resembles that of a chance constrained program. Applications are discussed, solution methods are presented for some simple cases and investigated for more complex ones.

3) Police District Design: A Simulated Annealing Approach, ***Shoou-Jiun Wang***, SUNY, Dept. of IE, Buffalo, NY 14260, ***Rajan Batta***, ***Christopher Rump***

We address the problem of locating police district boundaries with an eye towards balancing the maximum average response time to call for service. A search for an optimal design for the City of Buffalo is facilitated via SA.

WE22 Group Decisions

Contributed Session

Chair: Rose M. Shillito, Univ. of AZ, Ag. & Biosystems Eng.

1) Group Decisions Based on Rating Methods of Preference Ranking, ***Alexey L. Sadovski***, TX A&M Univ., 6300 Ocean Dr., Corpus Christi, TX 78412, sadovski@tamucc.edu

Our presentation deals with the axiomatic approach to rating methods of preference ranking. The author has proven an equivalency of consensus rankings for different rating systems, and inclusion of such consensus ranking into the Kemeny Median set.

2) Testing the Efficacy of Tournament Ranking Schemes, ***David J. Mendonca***, RPI, 100 8th St., CII 5th Fl., Troy, NY 12180, mendod@rpi.edu, ***Madabhushi Raghavachari***

We compare some well-known tournament ranking methods (such as Kendall's and Cook's) with regard to their efficacy in predicting the true rank order of the strengths of Players. We consider linear rankings as well as rankings derived from an inherent but unobservable probability structure.

3) Communication Training in Group Support Systems, ***Edward T. Chen***, Southeastern LA Univ., Dept. of Mgmt., Box 350, Hammond, LA 70402, echen@selu.edu

4) A Game Theoretic Approach to Water Conflicts in Arid Areas, ***Rose M. Shillito***, Univ. of AZ, Ag. & Biosystems Eng., ***Diana S. Yakowitz***

Human occupation of arid regions is often characterized by conflicts over limited water resources. Using a water-related conflict in the western U.S. involving Native Americans, the federal government, and local interests, we demonstrate the possibility of the settlement of seemingly conflicting claims to water using enhanced game theory elements.

WE23 Decision Analysis III

Contributed Session

Chair: Gregory S. Parnell, VA Commonwealth Univ., Oliver Hall, 1015 W Main St., PO 842014, Richmond, VA 23284-2014, gparnell@vcu.edu

1) New Techniques for Value Model Development: Gold & Silver Standards, ***Gregory S. Parnell***, VA Commonwealth Univ., Oliver Hall, 1015 W Main St., PO 842014, Richmond, VA 23284-2014, gparnell@vcu.edu, ***Jack A. Jackson***, ***Jack M. Kloeber***

We have used multiattribute utility for several major studies. We developed two value model development techniques-- gold and silver standard. The gold standard method uses objectives identified in organizational policy or legal documents for the value hierachy. The silver standard method uses affinity diagrams to develop a value hierarchy.

2) A Decision Model for Justification of Advanced Technology, ***Sharon M. Ordoobadi***, KS State Univ., Dept. of IE, 217 Durlan Hall, Manhattan, KS 66506-5101, share@ksu.edu

A phased decision model is introduced as a justification tool for investing in advanced technologies. The model incorporates system-wide benefits resulting from adoption of an advanced technology. Fuzzy set theory is used to convert linguistic expressions from decision makers regarding these benefits into crisp numbers for a go/no go decision.

3) Cultural Differences in Decision Making, ***Miguel A. Arrieta-Morales***, Inst. Para el Desarrollo Humano, PO Box 194929, San Juan, PR 00919-4929, maam@coqui.net

How will the cultural differences in decision making make business more effective? Different frames of mind from different cultural perspectives enhance the decision maker's vision so the scope of result is wider. There are risks involved and how to handle failure will be varied from the different views that depend on each culture.

4) Automated Framing of Decision Problems, ***Frank A. Kirschnick***, Stanford Univ., PO Box 8791, Stanford, CA 94309, frankir@leland.stanford.edu

Most DA software supports the quantitative evaluation of decision problems under the assumption they have already been framed. We will present research to automate qualitative framing dialogues with decision makers by backtracking of causality chains with question and answer templates. We will discuss results of these automated dialogues in practice.

WE24 Extended DEA Models

Cluster: Data Envelopment Analysis

Invited Session

Chair: Wade D. Cook, York Univ., Schulich Sch. of Bus., Office 345, 4700 Keele St., North York, Ontario, M6J 3P3, Canada, wcook@bus.yorku.ca

1) Selection of "Model" Bank Branches, *Claire Schaffnit*, Univ. of Toronto, Dept. of IE, 4 Taddle Creek Rd., Toronto, Ontario, M5S 3G9, Canada, schaffn@ie.utoronto.ca, ***Joseph C. Paradi***

We analyze all branches of a major Canadian bank, with the objective of selecting a few branches as candidates for a thorough on-site study. Several criteria are evaluated; one is branch efficiency, computed using input-oriented DEA models.

2) Target Marketing in Financial Services, ***Hans Tuenter***, York Univ., Schulich Sch. of Bus., North York, Ontario, M6J 3P3, Canada, htuenter@bus.yorku.ca, ***Wade D. Cook***

We examine the problem of selecting a set of customers for purposes of marketing financial services products. Using a data base for a previous product offering, a logistic regression model is developed for predicting the likelihood of customers taking up the offer. DEA is used as one of the independent variables in the model to capture "propensity to buy."

3) Setting Performance Targets for New Decision Making Units in DEA, ***Wade D. Cook***, York Univ., Schulich Sch. of Bus., Office 345, 4700 Keele St., North York, Ontario, M6J 3P3, Canada, wcook@bus.yorku.ca, ***Alex Kazakov***, ***Rodney H. Green***

We examine the problem of setting targets for a new decision making unit so that the efficiency of DMU relative to existing units will be at or better than some present floor performance level. While this problem can arise both on the input and output side, the development here pertains to only the case where outputs are given, while target inputs are to be determined...

WE29 Aircraft Scheduling

Sponsor: Aviation Applications Section
Sponsored Session

Chair: Irina Ioachim, TransQuest Inc., Hartsfield Intl. Airport, 1001 Intl. Blvd., Dept. 999, Atlanta, GA 30354, irina.ioachim@transquest.com

1) Impact of Fleet Assignment on the Crew Scheduling Problem, ***David C. Colwell***, Delta Air Lines, Hartsfield Intl. Airport, Dept. 017, PO Box 20706, Atlanta, GA 30269, USA

Mathematical models for the crew scheduling problem have been developed and are in widespread use today. However, the quality of the solution produced is still dependent on the initial fleet assignment provided to the model. We address the business issues involved with the interaction between fleet assignment and crew scheduling and suggest ways to more closely link the two problems.

2) Aircraft Rotation Problem, ***Qing Zhao***, Delta Tech Inc., 1001 International Blvd., Dept. 999, 10th fl., Atlanta, GA 30354, Qing. Zhao@transquest.com, ***Irina Ioachim***

The aircraft rotation problem is one of the most challenging problems faced by the schedulers in the airline industry. We discuss what a "good" rotation is by using multi-criteria analysis. We also present different strategies for building rotations.

3) Fleet Assignment & Related Problems, ***Weiguo Liu***, Delta Tech. Inc., 1001 Int. Blvd. Dept. 999, 10th fl. Hartsfield Intl. Aprt, Atlanta, GA 30354, ***Irina Ioachim***

The fleet assignment problem is a well-known large-scale integer programming problem. We will discuss a mathematical formulation of the problem and how various side constraints may be introduced in the model to improve the solution quality. Computational experiments based on real data will also be presented.

4) Impact of Forcasting Network Passengers & Revenue on Fleet Assignment, ***Shirley Arvey***, Delta Tech. Inc., 1001 Int'l Blvd. Dept. 999, 10th fl. Hartsfield Int'l Airp, Atlanta, GA 30354, ***Irina Ioachim***

The cost of assigning a fleet on a given leg is usually computed as a function of the passenger load and revenue forecasts. Moreover, these forecasts may also result in a series of required or optional hookups for aircraft which have to be addressed when solving the fleet assignment problem. We elaborate on the impact of these 2 forecasts on the solution of the fleet assignment problem.

WE31 Military Applications III

Contributed Session

Chair: Eric O. Schacht, US Military Academy, Dept. of Systems Eng., Mahan Hall, West Point, NY 10996, fe1648@trotter.usma.edu www.se.usma.edu

1) Alternatives to Land Mines for Area Denial, ***Eric O. Schacht***, US Military Academy, Dept. of Systems Eng., Mahan Hall, West Point, NY 10996, fe1648@trotter.usma.edu www.se.usma.edu, ***Donald Barr***

The conventional role played by land mines, known collectively as "area denial," involves control of movement of opposing forces. We present several alternatives to land mines for achieving area denial and give a summary of performance criteria developed to compare them. Models used to evaluate the criteria are described and a summary of comparisons is given.

2) Intelligent Agent Information Warfare Advisor, ***L. Miranda Moore***, US Army, US Army War College, Carlisle, PA 17013-5049, moorelm@cls-emnl.army.mil

The Intelligent Agent (IA) Information Warfare (IW) Advisor architecture simulates a subject matter expert (SME) during the Strategic Crisis Exercise. The students request information from the IW Advisor and the system provides feedback to the students using expert knowledge from an SME and IW databases using IA technology.

3) Taxonomy for Capturing Modeling & Simulation Capabilities, ***Harvey F. Graf***, The MITRE Corp., 1820 Dolley Madison Blvd., McLean, VA 22102-3481, graf@mitre.org, ***Russell Richards***

MITRE has developed a taxonomy and a tool to capture information about the capabilities of M&S applications. The tool facilitates collection of information currently unavailable in DoD M&S catalogs. In addition to general information, users can search for applications that match their requirements for objects, environments, functions and processes.

WE32 Service Statistics

Contributed Session

Chair: Layth C. Alwan, Univ. of WI, Sch. of Bus. Admin., PO Box 742, Milwaukee, WI 53201, lca@csd.uwm.edu

1) Chi-Square Method for Monitoring Intercorrelated Subgroups Means or Univariate Autocorrelated Processes, ***Layth C. Alwan***, Univ. of WI, Sch. of Bus. Admin., PO Box 742, Milwaukee, WI 53201, lca@csd.uwm.edu, ***Charles W. Champ***

The basic assumption underlying control chart criteria is that the process measurements are independent. However, autocorrelation occurs frequently in application undermining the performance of traditional methods. We propose that correlated observations can be mapped into a statistic which follows the chi-square distribution and is remarkable robust to level of correlation.

2) Attribute Monitoring: A Data Analysis Approach, ***A. J. Alwan***, DePaul Univ., Dept. of Mgmt., 1 E Jackson Blvd., Chicago, IL 60604-2287, aalwan@gsbalum.uchicago.edu, ***Layth C. Alwan***

For standard attribute charts, independence is assumed along with distributional assumptions of binomial or Poisson variability. However, time-series effects and/or distribution violations occur frequently in applications. We draw upon DA to broaden the scope of standard methods to improve process understanding and attribute monitoring.

3) Comparative Analysis of Taguchi's Method, Shainin's Variable Search Method & Classic Fractional Factorial Design of Experiments, ***Tomas Velasco***, Southern IL Univ., 112C Engineering Bldg. D, Carbondale, IL 62901-6603, velasco@siu.edu, ***Rhadeya Setiawan***

Recently, Shainin invented a new set of tools for D.O.E. Shainin claims that his techniques are better than any previous method, particularly if interactions among factors are present. This research clarifies Shainin's statements comparing his Variable-Search methods to Taguchi's methods and classical fractional factorial design. A real case-study was chosen to test the methods.

4) Modeling Unscheduled Emergency Landings of Commercial Aircraft, ***Leonard MacLean***, Dalhousie Univ., 6152 Coburg Rd., Halifax, NS, B3H 1Z5, Canada, ***Alex Richman***

This paper considers the patterns of Unscheduled Emergency Lands (UEL's) for commercial aircraft in North America. Using models for point processes we consider the factors determining the rate of UEL's.

WE33 Stochastic Processes

Contributed Session

Chair: Shau-Shiang Ja, Univ. of NC, Dept. of OR, CB 3180, Smith Bldg., Chapel Hill, NC 27599, ja@or.unc.edu

1) Computation of Warranty Reserve for Non-Stationary Sales Processes, ***Shau-Shiang Ja***, Univ. of NC, Dept. of OR, CB 3180, Smith Bldg., Chapel Hill, NC 27599, ja@or.unc.edu, ***Vidyadhar G. Kulkarni***

We derive the first and second moments of the producer's total discounted warranty cost of single sale under 4 different kinds of warranty policies. Then, we compute the mean and variance of the warranty cost of the aggregate sales. We use these quantities to derive the level of warranty reserve.

2) withdrawn - author request of 3/9, ***Alev Kaya***, Bilkent Univ., IE Dept., Ankara, 06533, Turkey, kalev@bilkent.edu.tr bilkent.edu.

tr/~kalev, *Ulku Gurler*

3) Evaluation of Performance Measures for Multi-Part, Single-Product Kanban Controlled Assembly Systems with Stochastic Acquisition, ***Xiaohang Yue***, Univ. of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, xyue@mansci.watstar.uwaterloo.ca, ***Okitsugu Fujiwara***, ***Luong Huynh Trung***

WE34 Organizational Theory III

Contributed Session

Chair: P. Robert Duimering, Univ. of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, rob@watmims.uwaterloo.ca

1) Applying Juran's Methodology to Improve the Education Process in Higher Education, ***Frederick B. Buoni***, FL Inst. of Tech., 150 W University Blvd., Melbourne, FL 32901-6988, buoni@zach.fit.edu cs.fit.edu/people/buoni.html, ***Gredy Garrido***

We investigate the application of Juran's Triprol and Trilogy methodology to model and improve the educational process at a technical university. We discuss progress in defining the quality system matrix within the context of the university, college, course, academic program and course levels and how, for each level, the quality categories, stakeholders, needs, product design and process designs are identified.

2) Walking the Talk: Living the Case Study in Organizational Learning, ***Tom S. Cockburn***, Univ. of Wales Inst., Bus. Sch., Colchester Ave. Campus, Cardiff, CF3 7XR, UK, tcockburn@uwic.ac.uk, ***Trefor G. Lewis***

This research evaluates multicultural, interactive, experiential learning in a live, group consultancy project of international MBA student cohorts in 1996-97. In collaboration with the Wales Quality Centre and a number of UK organizations, not only national but organizational cultures were spanned by means of the dialectics of relecting-in-practice.

3) Human Nature, Empowerment & Paradigms in Organization Studies, ***Carolyn W. Green***, Univ. of TX, Dept. of Bus. Admin., 80 Ft. Brown, Brownsville, TX 78520, cwgreen@utb1.utb.edu, ***Mary Jane Saxton***

We extend Burrell & Morgan's framework by focusing on sociological assumptions about conflict and optimum power distributions. Dimensions describing beliefs about human nature (altruisms/self- interest and homogeneity/heterogeneity) are added to define 4 distinct perspectives: pessimistic, optimistic, elitist and populist. Illustrations are drawn from philosophy, organizational theory and contemporary management consulting.

4) An Ethnographic Study of Language Use in Positive Hierarchical Reporting, ***P. Robert Duimering***, Univ. of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, rob@watmims.uwaterloo.ca, ***Frank Safayeni***

An ethnographic study examined language use in hierarchical reporting within a high-technology firm. Multi-level qualitative analyses suggest systematic positive bias in how organizational events are represented in language for hierarchical reporting. Two general forms of reporting bias are identified and discussed: category selection bias and within category bias.

WE35 Networks & Graphs IV

Contributed Session

Chair: Yash P. Aneja, Univ. of Windsor, 401 Sunset Ave., Windsor, Ontario, N9B 3P4, Canada, aneja@uwindsor.ca www.uwindsor.ca/faculty/busad/facpages/aneja/index.

1) Network Modification to Improve Dispersion Measures, ***Giri K. Tayi***, SUNY, Dept. of MSIS, Sch. of Bus., 1400 Washington Ave., Albany, NY 12222, gk952@cnsibm.albany.edu, ***S. S. Ravi***, ***Daniel J. Rosenkrantz***

We consider the problem of modifying a given network to improve dispersion measures. These modifications incur costs and a cost budget is given. In this paper, we formulate these budget constrained network improvement problems. The results include an efficient algorithm for the max-min measure and NP-completeness result for the max-average measure.

2) Preserving Chain Flows Under Arcs Destruction in Single Commodity Networks, ***Yash P. Aneja***, Univ. of Windsor, 401 Sunset Ave., Windsor, Ontario, N9B 3P4, Canada, aneja@uwindsor.ca www.uwindsor.ca/faculty/busad/facpages/aneja/index., ***R. Chandrasekaran***, ***K. P. K. Nair***

Given a feasible s-t flow, destroying any k arcs would destroy all the flow carried by chains containing one or more of these arcs. The objective is to find an arc-chain flow pattern with as large a feasible flow as possible which would minimize the maximum loss under arc destruction. We analyze the problem for different values of k.

3) withdrawn - author request of 3/17, ***Richard D. McBride***, Univ. of Southern CA, Marshall Sch. of Bus., Los Angeles, CA 90089-1421, mcbride@rcf.usc.edu, ***John W. Mamer***

WE37 Artificial Intelligence II

Contributed Session

Chair: Barin N. Nag, Towson State Univ., Dept. of Mgmt., Towson, MD 21252, bnag@towson.edu

1) Controlling Information Overload Using Intelligent Agents, ***Douglas M. Kline***, Sam Houston State Univ., PO Box 2556, Huntsville, TX 77341-2056, mgt_dmk@shsu.edu, ***Charlene G. Riggle***

We present research using a system of Intelligent Agents to control information overload. This system clusters documents by content, then presents the user with a summary of each cluster. The agents learn user preference by experience (and other techniques), thus becoming increasingly useful.

2) Building Intelligent Agents for Problem Structuring, ***Dolphy M. Abraham***, Loyola Marymount Univ., Coll. of Bus. Admin., 7900 Loyola Blvd., Los Angeles, CA 90045-8385, dabraham@lmumail.lmu.edu

Initial representations of problems are a starting point in the problem structuring process. We describe a process model of initial representation formation and how the model can be used to create an intelligent agent that will facilitate adaptation of a DSS to support the problem structuring process.

3) A Market Approach for Mass Customization Assembly Planning & Scheduling, ***Mitchell M. Tseng***, HSUST, Clear Water Bay, Kowloon, Hong Kong, tseng@uxmail.ust.hk

Future manufacturing systems need to be dynamically recomfigurable to produce customized products in small batches with fast turn-around times in a cost-efficient manner. Mass customization aims at meeting individual customer's needs with mass production efficiency. The objective of this paper is to develop a fundamental mechanism to...

4) Mining for Information in a Spacecraft Database, ***Barin N. Nag***, Towson State Univ., Dept. of Mgmt., Towson, MD 21252, bnag@towson.edu, ***David Weidow***, ***Aaron Katz***

Tracking data accumulated over 24-hour periods is used to determine orbit vector solutions for spacecraft. Operators adjust parameters intelligently to compensate for solar, atmospheric, and other environmental variations. This study is an open search for patterns and information in tracking databases to guide parameter adjustment and the tracking process.

WE38 Telecommunications IV

Contributed Session

Chair: Suresh Sridhar, Naval Postgraduate Sch., Dept. of Syst. Mgmt. Code SMSR, 555 Dyer Rd., Bldg. 330, Monterey, CA 93943, sridhar@nps.navy.mil

1) Challenges in Telecommunication Network Operations Planning, ***Kang Peng***, Lucent Tech., 480 Red Hill Rd., 2C261, Middletown, NJ 07748, kpeng@lucent.com

Network operations planning addresses comprehensive plans to coordinate Operations, Administration, and Maintenance processes with appropriate Operations Support Systems and Network Operations Centers. Privatization of telecommunications industry calls for rapid and flexible methods for generating and updating new operations plans. Experience and challenges of consulting in operations planning will be presented.

2) withdrawn - author request of 3/6, ***Suresh Sridhar***, Naval Postgraduate Sch., Dept. of Syst. Mgmt. Code SMSR, 555 Dyer Rd., Bldg. 330, Monterey, CA 93943, sridhar@nps.navy.mil, ***Giri K. Tayi***

Monday 08:00-09:30

MA01 Transportation Science in Chile
MA02 Modeling in Airline Industry
MA03 VRP
MA04 Supply Chain Management
MA05 The Bullwhip Effect
MA06 Design Issues in Manufacturing & Service
MA07 Development & Implementation of Manufacturing Systems: Problems & Research Directions
MA08 Panel: Publishing in IEEE Transactions in Envineering Management
MA09 Current Issues in New Product Development, Knowledge Transfer & Innovation
MA10 Solving Scheduling Problems
MA11 Just-in-Time Scheduling
MA12 Constraint Programming: Vehicle Routing
MA14 Dynamic Programming Approximation
MA15 Optimization
MA16 Semidefinite Programming & Its Applications
MA17 OR/MS in Sports
MA18 Building Reusable Software Components for Heuristic Search
MA19 Tutorial: Financial Models
MA20 Tutorial: Column Generation Methods
MA21 Decision Analysis/Bayesian Methods for Simulation
MA22 Decision Analysis I
MA23 Probability Forecasting: The Legacy of Allan Murphy
MA24 Multicriterion Decision Analysis I
MA25 Control of Queueing Systems I
MA26 Statistical Inference in Queues: A Tutorial
MA27 Queueing Issues I
MA28 Teaching OR/MS in Spreadsheets
MA30 Student Prize Competition
MA31 Concurrent Engineering
MA32 Metaheuristics for Location & Routing Problems
MA33 Finance I
MA35 Internet Applications
MA36 Network Flow Problems
MA37 Design of Survivable Networks
MA38 Telecommunications Network Design & Expansion

Monday 09:45-10:45

MW05 Welcoming Session & Awards

Monday 11:00-12:00

MO05 Omega Rho Distinguished Lecture: Beyond the Physics of Queueing

Monday 13:00-14:30

MC01 Travel Demand Models
MC02 Computer Science & Transportation Science I
MC03 Vehicle Routing I
MC04 Inventory Management I
MC05 Supply Chain Management
MC06 Operations Management in Health Services
MC07 Panel: Production Scheduling - Research Agendas that Bridge Theory & Practice
MC08 International Issues in Technology Management
MC09 Technology & Standards
MC10 New Scheduling Algorithms
MC11 Deterministic Machine Scheduling Models
MC12 Constraint Programming: Scheduling
MC14 Dynamic Programming
MC15 Complementarity
MC16 Properties of Some Algorithms for Linear Programming & Extensions
MC17 Timetabling
MC18 Metaheuristics
MC19 Bridging Continents & Cultures
MC20 Tutorial: Network Optimization - Learning from Recent Discoveries in Computer Science
MC21 Supply Chain Management
MC22 Random Utility Models
MC23 The Practice of Probability Assessment
MC24 Multicriterion Decision Analysis II
MC25 Control of Queueing Systems II
MC26 Input Modeling for Stochastic Analysis I
MC27 Queueing Issues II
MC28 Research Techniques & Project-Based Instruction
MC29 Topics in Airline Revenue Management
MC30 Session Withdrawn
MC31 Plant Location
MC32 Logistics-Supply Chains
MC33 Finance II
MC34 Software Demonstrations
MC35 Decision Support Systems I
MC37 Network Planning
MC38 Performance Evaluation & Design of Telecommunication Networks

Monday 14:45-16:15

MD01 Congestion Pricing & Continuous Time Models
MD02 Computer Science & Transportation Science II
MD03 Air Traffic Management
MD04 Inventory Management II
MD05 Supply Chain Management in the Computer Industry
MD06 Panel: Teaching Service Operations
MD07 Capacity Reservation & Pricing Systems
MD08 Some Product Development Issues
MD09 Information Processing & Knowledge Flows in New Product Development
MD10 Scheduling Models for Modern Manufacturing
MD11 Issues in Flexible Assembly Systems
MD12 Constraint Programming: Frameworks for Optimization
MD14 Tutorial: Modeling Stochastic Programs
MD15 Computation & Complementarity
MD16 Interior-Point Algorithms for Linear Programming & Its Extensions
MD17 Recent Advances in Plant Layout & Material Handling
MD19 Tutorial: Parallel Computing
MD20 Tutorial: Operations Research & AIDS Policy Modeling
MD21 Issues in Logistics
MD22 Equilibria of Noncooperative Games
MD23 Probability Modeling
MD24 Imprecise Preference Modeling
MD25 Using Probability to Model Risks
MD26 Input Modeling for Stochastic Analysis II
MD27 Queueing Issues III
MD28 Undergraduate Project Showcase: Military Service Academies
MD29 Revenue Management O&D Issues
MD30 Evaluating Benefits of Government Aviation Technology Programs I
MD31 Crew Scheduling Problems
MD32 Logistics
MD33 Finance III
MD34 Software Demonstrations
MD35 Decision Support Systems II
MD36 Network Flow Algorithms
MD37 Frequency Assignment
MD38 Design & Restoration Problems in Optical

Monday 16:30-18:00

ME01 Network Models
ME02 Applications of Travel Forecasting Models
ME03 Optimization for Air Transportation
ME04 Operations Management I

ME05 Panel: New Books in Supply Chain Management
ME06 Advances in Flexible Manufacturing Systems Design
ME07 Economic Models of Operations Strategy
ME08 Models & Methodologies in Technology Management
ME09 Knowing & Knowledge in Product & Service Innovation
ME10 Scheduling: Computational Developments & New Directions
ME11 FMS Planning
ME12 Data Envelopment Analysis: Health Care Applications I
ME14 Panel: Modeling Risk in Stochastic Programs
ME15 Applications of Optimization
ME16 Interior Point Methods for Mathematical Programming
ME17 Information Technologies in Networked Manufacturing
ME19 Tutorial: Lift & Project Methods for Mixed-Integer Programs
ME20 Panel: Managing Transitions - Grad School to First Job, Academia to Industry, Industry to Academia
ME21 Simulation Methodology
ME22 The Value of Information
ME23 Creating Value Using Decision Analysis
ME24 Dynamic Multicriteria
ME25 Applied Probability in Finance
ME26 Stochastic Models in Manufacturing Systems
ME27 Inventory Management I
ME28 Innovative Software for OR/MS
ME29 New Aspects of Revenue Management
ME30 Evaluating Benefits of Government Aviation Technology Programs II
ME31 Arc Routing
ME32 Managing Schools
ME33 Resource Allocation
ME34 Software Demonstrations
ME35 Decision Support Systems III
ME36 Minimum Cut Algorithms
ME37 Constraint-Based Programming: Algorithmic Analytics
ME38 Financing Major Telecommunications Projects in Canada

Tuesday 08:00-09:30

TA01 Traffic Network Origin-Destination Demand Estimation
TA02 TSP
TA03 Hazardous Materials Transportation Planning
TA04 Operations Management II
TA05 Cooperation, Pricing, Flexibility & Transportation Problems in Supply Chains
TA06 Modeling & Analysis of Agile Workforces
TA08 Panel: Issues in Technology Management Education
TA09 Managing the Interactions Between New Peoduct Development, Operations & Marketing
TA10 Scheduling with Uncertainty
TA11 Other FMS Issues
TA12 Data Envelopment Analysis: Health Care Applications II
TA13 Discrete Multiple Objective Programming & Decision Making
TA14 Multistage Stochastic Programming
TA15 Interior Point Methods & Variational Inequalities
TA16 Convex Optimization: Cutting Plane Algorithms & Applications
TA17 Applications of DEA to the Service Sector
TA18 Tabu Search Applications
TA19 Tutorial: Intelligent Transportation Systems
TA20 Tutorial: Strategic Operations Research/Management Science
TA21 Web- & JAVA-Based Simulation Modeling Environments
TA22 Frameworks for Group Decision & Negotiation: Multicriteria Methods
TA23 Perspectives on Experienced Utility
TA24 Multicriterion Decision Analysis III
TA25 Stochastic Optimization in Queues & Manufacturing
TA26 Computational Methods in Queues & Applied Probability
TA27 Inventory Management II
TA28 New Realities of Teaching: Resources, Pulling Teeth & Reengineering
TA29 Passenger Choice Modeling
TA30 Management of Operations in Air Transport
TA31 Facility Layout & Warehouse Design
TA32 Operations Research in Public Systems
TA33 Innovation
TA34 Software Demonstrations
TA35 Decision Support Systems IV
TA36 Multicommodity Flows
TA37 Constraint-Based Programming: Fielded Applications
TA38 Wireless Communication/Channel Assignment

Tuesday 09:45-11:15

TB01 Network-Level ATIS I: Analysis & Algorithms
TB02 Heuristic Approaches to Practical Vehicle Routing Problems with Time Windows
TB03 HAZMAT Logistics
TB04 Operations Management III
TB05 Pricing Issues in Supply Chain Management
TB06 Production Systems Modeling in Industry
TB07 Panel: Publishing in Manufacturing & Operations Management
TB08 Management of Technological Hazards
TB09 Modular Product & Knowledge Architecture in New Product Development
TB10 Practical Scheduling Algorithms
TB11 Human Factors in Planning, Scheduling & Supply Chain Management I
TB12 Health Care Scheduling
TB13 Innovations from Industry
TB14 Global Optimization I
TB15 Complementarity & Variational Problems I
TB16 Linear Programming
TB17 Assembly Line Balancing
TB18 Improving Decision Trees Using Tabu Search
TB20 Tutorial: Branch & Cut & Price
TB21 Advances in Simulation Methodology
TB22 Frameworks for Group Decision & Negotiation: Group Composition, Relationships & Task Performance
TB23 Implications of Recent Psychological Results for DA Practice
TB24 Multicriteria Decision Making I
TB25 Stochastic Models in Manufacturing
TB26 Priority Queues
TB27 Inventory Management III
TB28 The WWW for Classroom Teaching & for Distance Learning
TB29 Airline Cargo Revenue Management
TB30 Military OR Programming in the UK, US & Canada
TB31 EUGENE: An Optimization Model for Integrated solid Waste Management Planning: Model & Results
TB32 Threats to Life & Limb
TB33 Facility Planning & Design
TB34 Software Demonstrations
TB35 Object-Oriented Approaches
TB36 Multicommodity Flow & Related Issues
TB37 Pre-Solution Analysis of Mathematical Programs
TB38 Wireless Networks

Tuesday 11:30-12:30

TK05 Keynote: SABRE's Practical Business Applications Solving Complex Business Problems Using OR, IE & IT
TK20 CORS/SCRO

Tuesday 13:30-15:00

TC01 Network-Level ATIS II: Effect of Information
TC02 Real-Time Vehicle Dispatching

TC03 Operating to a Plan: On Target for a Scheduled Railway
TC04 Operations Management IV
TC05 Retail Assortment & Inventory Planning
TC06 Production/Inventory Planning & Control Under Uncertainty
TC07 Technology Management Issues
TC08 Knowledge for Development: Management & Policy Initiatives
TC09 Managing Technology Networks
TC10 New Developments in Scheduling I
TC11 Human Factors in Planning, Scheduling & Supply Chain Management II
TC12 Health Care Management
TC13 Industrial Applications of Integer Programming
TC14 Global Optimization II
TC15 Complementarity & Variational Problems II
TC16 Theoretical Complexity Issues in Linear & Convex Optimization
TC17 Network Optimization & Simulation
TC18 No Title Supplied
TC19 Tutorial: Software for Linear & Integer Programming
TC20 Tutorial: An Introduction to Tabu Search
TC21 Regenerative Simulation & Variance Reduction
TC22 Frameworks for Group Decision & Negotiation: Intercultural Negotiation
TC23 A Tutorial on Life & Death Decision Making
TC24 Multicriteria Decision Making II
TC25 Statistical & Warranty Models for Reliability Analysis
TC26 Telecommunication & Applied Probability
TC27 Electricity Market Design Issues
TC28 Industry Views of OR/MS Education
TC29 Cargo
TC30 Aggregation & Disaggregating in Combat Modeling
TC31 New Technologies in Logistics
TC32 Location Modeling & Public Policy
TC33 Strategic Sizing Issues
TC34 Software Demonstrations
TC35 Dynamic Network Models
TC36 Hyperpaths & Hyperflows
TC37 Integer Programming Models with Industrial Applications
TC38 Analysis & Synthesis of Multiservice Networks

Tuesday 15:15-16:45

TD01 Dynamic Traffic Assignment I: Algorithms
TD02 Vehicle Routing II
TD03 Fleet Assignment
TD04 Manufacturing I
TD05 Managing the Demand/Supply Interface
TD06 Policy Issues in Manufacturing
TD07 Technology & Market Dynamics
TD08 Strategic Mgmt. of Largescale Engineering Projects: Findings from Intl. Research Program on Mgmt. of Eng. & Construction
TD09 Learning & Transforming the Organization
TD10 New Developments in Scheduling II
TD11 Factors in Planning, Scheduling & Supply Chain Management III
TD12 Analyzing Telemedicine Networking
TD13 Innovations & Applications of Integer Programming
TD14 Global Optimization I
TD15 Variational Inequalities & Projected Dynamical Systems with Applications
TD16 Semidefinite Programming & Applications
TD17 Current Issues in Operations Management
TD18 Applications of Metaheuristics
TD19 Tutorial: An Introduction to Stochastic Programming
TD21 Advances in Microscopic Traffic Simulation I
TD22 Frameworks for Group Decision & Negotiation: Group Support Systems
TD23 Innovative Applications
TD24 Analytical Hierarchy Process
TD25 Linear & Nonlinear Approaches to Reliability Analysis
TD26 Multidimensional Queueing Systems
TD27 Electricity System Design Issues
TD28 Panel: Integrating OR/MS into the MBA Program
TD29 Aviation Modeling & Simulation
TD30 Military Operations I
TD31 Tutorial: Supply Contracts - Analysis & Mechanism Design
TD32 Public Programs
TD33 From Chaos to Innovation
TD34 Software Demonstrations
TD35 Network Training & Applications
TD36 The K Shortest Paths Problem
TD37 Automatic Graph Drawing
TD38 ATM Networks

Tuesday 17:00-18:30

TE01 Dynamic Traffic Assignment II: Operational Issues
TE02 Dynamic Models in Logistics
TE03 Models for Network & Terminal Planning
TE04 Manufacturing II
TE05 Stochastic Inventory Models
TE06 Project Management
TE07 Information Systems Management Issues
TE08 University Programs in Technological Entrepreneurship & Commercialization: US, Canadian & Mexican Showcases
TE09 Profiting from the Natural Environment: Perspectives on Technology
TE10 Production Scheduling in the Supply Chain Environments
TE11 Quality Management
TE12 Health Applications
TE13 Integer Programming, Modeling & Applications
TE14 Global Optimization II
TE15 Advances in Nonlinear Programming
TE16 Large-Scale Nonlinear Optimization
TE17 Supply Chain Planning: A Software Perspective
TE18 Tutorial: Parallel Metaheuristics
TE19 Machine Scheduling Problems
TE21 Advances in Microscopic Traffic Advances II
TE22 Frameworks for Group Decision & Negotiation: Negotiating Prices for Internet Services
TE23 Strategy Modeling & Analysis
TE24 DEA I
TE25 Stochastic Modeling in Water Resources
TE26 Stochastic Models: Analysis & Approximation
TE27 Electricity Generator Competition Issues
TE28 Enhancing Research & Teaching with Visual Basic for Applications
TE29 Airline Operations
TE30 Operations Other than War & Information Warfare
TE31 SABRE Group Activities in Logistics
TE32 Forecasting
TE33 Marketing I
TE34 Software Demonstrations
TE35 Network Design Problems
TE36 Spanning & Steiner Tree Models
TE37 Tutorial: The Integration of Constraint Programming & LP-Based Mathematical Programming
TE38 Issues & Methodology in Network Planning

Wednesday 08:00-09:30

WA01 Network Traffic Control
WA02 Intermodal Military Logistics
WA03 Transportation I
WA04 Material Management
WA05 Practical Issues in Supply Chain Management
WA06 Energy

WA07 Quality Management & Benchmarking
WA08 Global Network Entrepreneurship for the 21st Century: Linking Talent, Technology, Capital & Know-How
WA09 North-South Technology Alliances
WA10 Manufacturing Scheduling
WA11 Services Management
WA12 Health Applications: Resource Allocation
WA13 The US Navy Affordability Initiative: Discreet Optimization Models & Methods
WA14 Integer Programming I
WA15 Mathematical Programming
WA16 Advances in Linear Programming & Related Problems
WA17 Metaheuristics I
WA18 Metaheuristics I
WA19 Locational Optimization with Imprecise Data
WA20 Continuous Location Problems
WA21 Advances in Microscopic Traffic Simulation III
WA22 Frameworks for Group Decision & Negotiation: Decision Support for Negotiators
WA23 Implementing Decision Analysis in Large Organizations
WA24 DEA II
WA25 Applied Probability I
WA26 Spatial Stochastics
WA27 Large-Scale Energy Models
WA28 Education Programs in Manufacturing
WA29 Crew Planning & Management
WA31 New Technologies in Logistics
WA32 Reliability I
WA33 Marketing II
WA34 Advanced Concepts in Information Systems
WA35 Routing In Communication Networks
WA36 Nonlinear Networks Problems
WA37 Neural Networks
WA38 Resource Management in ATM Networks
eA30 Defense Enterprise Management

Wednesday 09:45-11:15

WB01 Dynamic Traffic Network Modeling with Applications I
WB02 Multimodal, Multicommodity Transportation Systems I
WB03 Transportation II
WB04 New Product Development I
WB05 Cellular Manufacturing I
WB06 Industry
WB07 Lot Sizing
WB08 Production & Scheduling I
WB09 Flowshop Scheduling
WB10 Advances in Project Management: From Traditional to Virtual Organizations
WB11 In-Process Quality Improvement Methodologies: Fusion of Engineering Knowledge with Advanced Statistics
WB12 OR/MS in Forestry I: Nature Reserve Design
WB13 Discrete Optimization
WB14 Integer Programming II
WB15 Nonlinear Programming I
WB16 Structured Nonlinear Optimization
WB17 Metaheuristics II
WB18 Metaheuristics II
WB19 Integrated Models in Location Theory
WB21 Simulation
WB22 Frameworks for Group Decision & Negotiation: Game Theory
WB23 Modeling Flexibility in the Energy Markets
WB24 Session Withdrawn
WB25 Applied Probability II
WB26 Rare Events in a Network
WB27 Marine Logistics in the Petroleum Industry
WB28 Education Tutorial: Case Teaching 101 or "How Do I Get Started Teaching with Cases?"
WB30 Military Operations II
WB31 Panel: A Society's Perspective on the Future of INFORMS
WB32 Reliability II
WB33 Organization Theory I
WB34 AI Applications
WB35 Networks & Graphs I
WB36 Quadratic Assignment Problems I
WB37 Data Management Systems
WB38 Telecommunications I

Wednesday 12:30-14:00

WC01 Dynamic Traffic Network Modeling with Applications II
WC02 Multimodal, Multicommodity Transportation Systems II
WC03 Transportation III
WC04 New Product Development II
WC05 Cellular Manufacturing II
WC06 Semiconductor Industry Applications
WC07 Scheduling for Assembly Lines
WC08 Production & Scheduling II
WC09 Flow Shop & Job Shop Scheduling
WC10 New Approaches in Solving Scheduling Problems
WC11 In-Process Quality Improvement Methodologies: Multivariate Statistical Analysis & Quality Improvements
WC12 OR/MS in Forestry II: Nature Reserve Design
WC13 Mixed Integer Programming
WC14 Integer Programming II
WC15 Nonlinear Programming II
WC16 Topics in Semidefinite Programming
WC17 Metaheuristics III
WC18 Metaheuristics III
WC19 Hub Location
WC21 Simulation Applications
WC22 Frameworks for Group Decision & Negotiation: Negotiating Agents on the Web
WC23 No Title Supplied
WC24 DEA Applications
WC25 Economics
WC26 Heavy Traffic Analysis of Processing Networks
WC27 Natural Resources
WC28 The Best OR/MS Cases
WC29 Aircraft Maintenance & Materials Management
WC30 Military Issues I
WC31 Military Applications I
WC32 Risk Analysis
WC33 Organization Theory II
WC34 Experimental Evaluation of Heuristic Optimization Algorithms: A Tutorial
WC35 Networks & Graphs 2
WC36 Quadratic Assignment Problems II
WC37 Data Mining in the Financial Industry
WC38 Telecommunications II

Wednesday 14:15-15:45

WD01 Railway Applications I
WD02 Aviation Applications I
WD04 Global Manufacturing
WD05 Flexible Manufacturing Systems I
WD06 Service Industry I
WD07 Scheduling with Setup Times
WD08 Production & Scheduling III
WD09 Scheduling I
WD10 Workforce Scheduling
WD11 In-Process Quality Improvement Methodologies: Multivariate Statistical Analysis & Process Monitoring
WD12 OR/MS in Forestry III: Endangered Species Management
WD13 Combinatorial Optimization & Applications
WD14 Integer Programming IV
WD15 Nonlinear Programming III
WD16 Linear Programming I
WD17 Metaheuristics IV

WD18 Neural Networks
WD19 Geographical Information Systems & Location Theory
WD21 Advances in Microscopic Traffic Simulation IV
WD22 Frameworks for Group Decision & Negotiation: Negotiation Agents in Business
WD23 Decision Analysis II
WD24 Service Sector Performance Analysis Using DEA
WD29 Aviation Operations Research Roundtable
WD30 Military Issues II
WD31 Military Applications II
WD32 Quality Control
WD33 Accounting
WD34 Genetic Algorithms & Applications
WD35 Networks & Graphs III
WD37 Artificial Intelligence I
WD38 Telecommunications III

Wednesday 16:00-17:30

WE01 Railway Applications II
WE02 Aviation Applications II
WE05 Flexible Manufacturing Systems II
WE06 Service Industry II
WE07 Planning
WE08 Production & Scheduling IV
WE09 Scheduling II
WE10 Scheduling Applications
WE12 OR/MS in Forestry IV: Timber Harvest Scheduling
WE14 Integer Programming V
WE15 Nonlinear Programming Algorithms & Applications
WE16 Linear Programming II
WE19 Location Modeling in the Public Sector
WE22 Group Decisions
WE23 Decision Analysis III
WE24 Extended DEA Models
WE29 Aircraft Scheduling
WE31 Military Applications III
WE32 Service Statistics
WE33 Stochastic Processes
WE34 Organizational Theory III
WE35 Networks & Graphs IV
WE37 Artificial Intelligence II
WE38 Telecommunications IV

Abboud, Nadim MC27
Abdel-Aal, Mounir M. MC01
Abernathy, Frederick H. ME33
Aboud, Julio MA01
Abrache, Jawad TC17
Abraham, Dolphy M. WE37
Abrams, Robert A. ME01
Adamo, V. MD01
Adams, Michael TE11
Adams, Warren WA13
Adamsson, J. WC30
Adelman, Daniel MA14
Adjakple, Pascal TB38
Adler, Ilan MC33
Adler, Jeffrey TB01, TC01
Adu, Lily M. TE24
Adyanthaya, Surain MC29
Afkhamie, Kaywan WC38
Agger-Gupta, Niels TC07, WA07
Agnihothri, Sal R. WA11
Agrawal, Naren TC05
Agrawal, Vipul MD07, TB05
Ahmed, Samir A. WD32
Ahuja, Ravindra K. MA36, MC20
Akgun, Vedat TA03
Akkiraju, Rama WD07
Aksoy, Yasemin MC32
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Al-Hammad, Ahmad A. WD02
Al-Khayyal, Faiz A. TB33, WC15
Al-Turki, Umar M. WE09
Aladwani, Adel M. TE07
Alaoui, Younes TC34
Aldowaisan, Tariq WD07
Alevras, Dimitris TD13
Alexander, Suraj Mammen WB11
Alexopoulos, Christos TB21
Alfa, Attahiru S. ME26, TB26
Alfakih, Abdo Y. TD16
Alicke, Knut WE01
Alidaee, Bahram TA18
Alirezaei, Mohammad R. WA24, WB24
Alizadeh, Farid MD16
Allah, Dounya Taqa WC03
Allahverdi, Ali WD07
Allan, Benjamin A. TB37
Allard, C. TC30
Alvarez, Roberto R. TD04
Alwan, A. J. WE32
Alwan, Layth C. WE32
Amaldi, Edoardo TD35
Amar, A. D. TD33
Amato, Henry TC31
Ambrose, Paul WB34
Amini, Mohammad M. TA18, TC04, WD14
Amiouny, Samir V. WB05
Amirkhalkhali, Sal WB03
Ammar, Salwa MA28
Amos, Jeffrey W. TC08
Amouzegar, Mahyar A. TC14
Amram, Martha WC23
Amrani, Faiza TE13
Anandalingam, G. TC24
Andersen, Erling D. WE16
Andersen, Kim Allan TC36
Anderson, Edward G. ME04
Anderson, John C. WB04
Anderson, Timothy R. MD08, ME08
Andrade, Cynthia S. WA06
Andradottir, Sigrun TC21
Andreatta, Alexandre TC18
Aneja, Yash P. WE35
Angelopulos, Nicos MD12
Anily, Shoshana TA02
Anstreicher, Kurt M. MD16
Antunes, Jr., Jose Antonio V. TD04
Anupindi, Ravi TC05, TD31
Anwar, Muhammad F. WA10
Apley, Daniel WC11
Argote, Linda MA09
Arguello, Michael F. TE29
Ariyawansa, K. A. TA16
Armacost, Andrew P. TC35
Armacost, Robert L. WC04, WD09
Armoni, Aviad WD18
Armstrong, Jr., James E. MD35, ME35, WD31
Armstrong, Ronald MD36, TD10
Arnold, Dieter WE01
Arocha, Jose TD12
Arrieta-Morales, Miguel A. WE23
Arthur, Jeffrey L. WB12
Arunapuram, Sundararajan MC03
Arvey, Shirley WE29
Ash, Daniel I. WA23
Assad, Arjang A. WC36
Assen, Marcel F. WD08
Astarita, Vittorio MD01
Asthana, Ajay K. TB05
Atamturk, Alper WC14
Atwood, J. William MC37, TD36
Audet, Charles MD22, TC14
Avenhaus, Rudolf WC30
Averbakh, Igor WA19
Aviolat, Frederic TD35
Ayanoglu, Ender MD38
Aye, Marcellin TD12
Ayhan, Hayriye MC14, TB25
Aykin, Turgut TC10
Aytug, Haldun S. TB17, WD34
Babayev, Djangir A. TC37
Bach, Faycal WB18
Bachelet, V. TD18
Badawy, Michael K. MA09, TA08
Baganha, Manuel Pedro MA05
Bai, Sherman X. TC06, WC10
Baker, Art WB11
Baker, Kenneth R. MA10, TD28
Baker, Tom ME34
Bakkalbasi, Omer TB06
Bakuli, David L. MA35
Balachandra, R. MA08
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