



Newsletter

of the INFORMS Computing Society

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Modeling Language Report

Michael Bussieck, Steve Dirkse, Robert Fourer, Alex Meeraus, James Tebbboth, Pierre Trudeau, Mark Wiley, David L. Woodruff

Modeling languages revolutionized the way optimization can be applied to a broad spectrum of problems. To keep up with the evolution in this important field at the intersection of computer science and operations research, we checked in with some of the major players.

A new company, AMPL Optimization LLC, has been formed to take over AMPL development and support. AMPL itself will continue to be available through a variety of vendors as it has been.

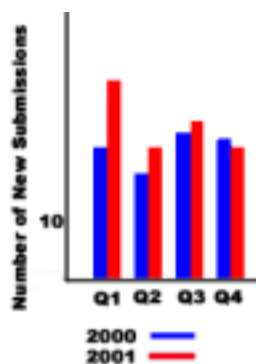
A second edition of the AMPL book is planned for publication late this year. It will incorporate revisions and new chapters that present the many features that have been added to AMPL in the past 10 years but that are currently described only on the AMPL website.

Before discussing the new products and features at GAMS, it is useful to consider the philosophy behind its development, a philosophy that goes back 25 years. There are different approaches one can take to a modeling system. On one extreme, a model could be an extension to an existing programming or data environment (e.g. Excel, Matlab). At another, a model requires not only an algebraic description, but also definitions of (potentially different) data input streams, access control mechanisms, and views of the output. In this case, the model forms a static core which is tightly integrated with a complete development and deployment environment specialized to the needs of optimization. GAMS takes a more

Report on the INFORMS Journal on Computing

-by W. David Kelton

The year-end statistics for calendar year 2001 are: 103 new papers were submitted, we accepted 30 papers, 54 papers were rejected or withdrawn, and at the end of the year there were 98 papers in process. Compared to calendar year 2000, this is an 18% increase in the number of submissions, a 7% increase in the number of acceptances,



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The ICS Newsletter is published semiannually by the INFORMS Computing Society (ICS). Manuscripts, news articles, advertisements and correspondence should be addressed to the Editors. Manuscripts submitted for publication will be reviewed and should be received by the Editor three months prior to the publication date. Requests for ICS membership information, orders for back issues of this Newsletter, and address changes should be addressed to:

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Message from the Chair and the Editor

David L. Woodruff

Dinosaurs roamed the earth and Dick Barr was chair of ICS the last time the chair was acting editor as well. In fact, Dick was chair of the Computer Science Technical Section rather than the INFORMS Computing Society. Regardless of the name, the membership remains very engaged, which makes the ICS successful.



We had over 20 invited sessions volunteered for the annual meeting of INFORMS in San Jose in November. This is a sharp increase over Miami, which I attribute to a couple of factors. First, I think that the move to an annual meeting is having an effect. People who didn't go to Miami haven't been to an INFORMS meeting in a long time and people who did go to Miami realize that if they don't go to San Jose, they won't attend an INFORMS meeting for a long time. Second, San Jose is a good location for Computing Society constituencies. Finally, we have an energized membership that is working on some of the hottest areas in Operations Research, Management Science and Computer Science.

One of the most important activities of the Society is our biannual meeting, which will be held in January in Phoenix. This has always been a very good meeting because it always seems to have just the right mix of focus and breadth. It is much smaller than an INFORMS meeting, so there is a chance to talk with people between sessions and during social events. Hemant Bhargava and Nong Ye have organized the meeting in a great location. John Hooker, who has done very interesting work in a number of areas including cooperating solvers, will give the plenary address.

I want to particularly thank the members who have contributed to the Newsletter. It was gratifying to put out a call to the modeling language industry for assistance and receive a lot of good material. Almost everyone who I contacted concerning the Newsletter pitched in. Tom Wiggen and S. Raghavan did a very professional job putting together a template for the newsletter, which gave us a great boost in editing the newsletter for the first time.

IFORS 2002, University of Edinburgh

July 8-12, 2002

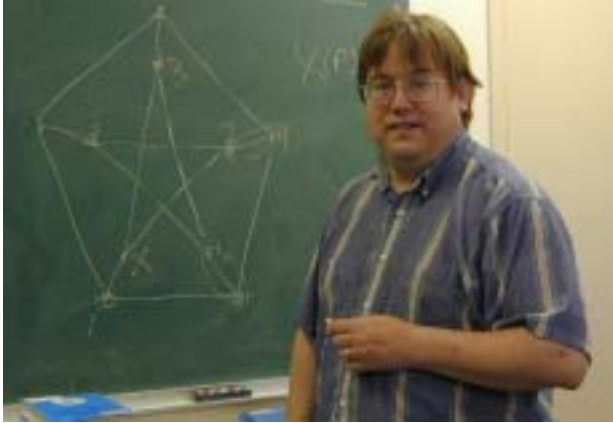
The conference will feature an eclectic mix of plenary sessions, and invited and contributed talks from practitioners and academics. We hope to have a substantial practitioner contribution, generating a strong interaction between those who have to address the real problems of industry and commerce and those who have knowledge of the techniques and methodologies of Operational Research.

<http://www.orsoc.org.uk/conf/ifors/welcome.htm>



Member Profile: *Brian Borchers*

Brian Borchers has been a member of ORSA and later INFORMS since 1989. He is a member of the INFORMS information technology committee and the deputy editor of the INFORMS Online web site. He



was elected to the ICS board in the fall of 2001. He is currently an associate professor and chairman of the department of mathematics at New Mexico Tech (NMT) in Socorro, New Mexico.

As an undergraduate at Rensselaer Polytechnic Institute (RPI), Brian majored in computer science but also took many courses in mathematics. After graduation he went to work for RPI as system administrator in the academic computing center. This job gave him the opportunity to take a few courses as a part time student. During this period he took a sequence of courses in operations research from Joe Ecker that sparked his later interest in optimization.

In 1986, he moved on to a position at Motorola where he developed software for packet switches and multiplexors. "I really enjoyed software development for a while, but the challenge wore thin, and I decided that I really wanted to do more than programming."

In 1988, he took a leave from Motorola and returned to graduate study at RPI. "My intention at the time was to get an MS in operations research and then return to industry and work in R&D." However, he soon turned in a different direction. "This was the period when interior point methods were very exciting. Within weeks of starting graduate school I had decided that I wanted to learn about interior point methods and get my PhD. I started working with John Mitchell." His research focused on applications of interior point methods for linear programming within branch and bound and cutting plane algorithms for integer programming. Brian completed his PhD in 1992.

He moved on to a tenure track position in the mathematics department at New Mexico Tech. At NMT he has continued his research in interior point methods and become involved in semidefinite programming (SDP). He assembled SDPLIB, a collection of semidefinite programming test problems and wrote an SDP solver, CSDP. He has taught a wide range of courses from linear and nonlinear programming to discrete event simulation, time series analysis, and stochastic processes. "I'm in a very small department, so I have to be a jack of all trades. This applies to both teaching and research. I find that the variety of courses that I teach has motivated me to work on a broader range of research topics."

As an "isolated academic," Brian found that the internet was a very important resource. At about this time, Ramesh Sharda at Oklahoma State started the ORCS-L mailing list for discussion of topics at the boundary between operations research and computer science. There was also an ongoing discussion of operations research topics in the usenet discussion group sci.op-research. Unfortunately, many readers of ORCS-L had no access to usenet. Brian began to edit a weekly digest of the sci.op-research postings that was forwarded to the ORCS-L mailing list. The digest is lightly edited to remove off topic postings but is otherwise a complete record of the news group. The "sci.op-research digest" has now been running for 9 years. Although every internet user now has access to usenet news through services such as google, many

readers still prefer to read the the digest.

In 1995, Brian was recruited as an associate editor for the new INFORMS web site, INFORMS Online. "In the beginning, the web site was very small, and we didn't get many hits. We focused on providing really useful information to INFORMS members, including conference programs, the membership directory, and the annual comprehensive index." As the world wide web exploded in 1995 and 1996, usage of INFORMS Online also grew quickly. "Today, INFORMS Online gets about 20,000 hits per day, with higher peaks just before national meetings. I'm very proud of the services that we provide to INFORMS members."

Optimization and Computation in the Network Era

Operations research and the management sciences (OR/MS) have always stood in close relation to computer science and artificial intelligence (CS/AI). Cross-fertilization between these fields has made possible advances that could have not been achieved in isolation. The aim of the INFORMS Computing Society, and of its research conferences, is to invigorate and further develop the interface of OR/MS and CS/AI.

We invite you to the Eighth ICS conference which highlights research on the conference theme Optimization and Computation in the Network Era. We solicit papers with either a theoretical, computational, or applied focus on the conference theme as well as topics of general interest to the INFORMS Computing Society. The conference will consist of a plenary talk, tutorials on advanced topics, and research presentations covering two categories of papers: peer-review papers that will be compiled into a book published by Kluwer, and unrefereed, shorter, papers.



The conference will be held in Phoenix, Arizona from January 8-10, 2003, at the Sheraton San Marcos Resort and Convention Center. We invite you to experience the beauty of the Southwest desert, warm sunny weather, and beautiful mountains and golf courses.

The conference is sponsored in part by the eBusiness Research Center at Penn State University.

<http://www.ebrc.psu.edu/ics2003/>

Conference Co-Chairs:

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Email: bhargava@computer.org

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MODELING: continued from page 1

balanced approach, where a model exists as an independent entity but there are no predefined rules for how data can be entered or how the results of the model can be used. In this way, a model can be added to an existing application with minimum disruption or embedded in any rapid development professional with an advanced degree and several environment. For the typical GAMS user (a years of experience in the area of application, but not necessarily in OR) this is often a crucial requirement.

To fit well into an existing application or development environment, a model must have a flexible data interchange format. The GAMS Data eXchange (GDX) API provides this, allowing for a seamless name space mapping between different data sources and the model itself. This open interface places few limits on the source of the model data, or on how it can be used. This philosophy also extends to our model format. We have recently made available a model translation service (<http://www.gamsworld.org/translate.htm>), whereby a GAMS model can be converted into a number of different forms (e.g. AMPL, LINGO, MPS). A number of application areas benefit from new technology. For example, stochastic models can be built on an event tree. If these trees become too large, the model becomes too large to solve. A new scenario reduction tool [1] allows the event tree to be analyzed and reduced, via the deletion of unimportant nodes, so that a solvable model results. The introduction of conic programs [2] narrows the gap between LP and NLP: efficient barrier algorithms quickly solve specially structured nonlinear convex problems. In economics, general equilibrium models are commonly implemented in GAMS/MPSGE [3], a de-facto standard. This has been reworked to allow for more flexible functional forms in specifying the equilibrium constraints. Certain problems in data reconciliation result in large NLP models that cannot be solved by current NLP solvers. Using the GAMS second derivative facilities, a new NLP solver link PATHNLP was implemented that solves large problem instances in

seconds. Finally, using the translation service mentioned above with a reformulation tool [4], MPEC models can be solved using the GAMS NLP solvers. Of course, GAMS maintains its commitment to develop and support bullet-proof links to state-of-the-art solvers. This includes our links to well-established LP/MIP, NLP, and MCP solvers as well as newer links to methods for mixed-integer NLP models and to global solvers for NLP and MINLP problems. Whether you have a new application or one that's been running for 10 years, the solver technology employed will be the taken from the best available.

Xpress-IVE & Xpress-Mosel from Dash Optimization

Xpress-IVE and Xpress-Mosel from Dash Optimization represent the next generation of optimization and modeling software.

Xpress-Mosel introduces a new purpose built modeling and optimization programming language, with direct access to the Xpress-Optimizer. The model programs you write are compiled, and can be run interactively or embedded within your application. Once compiled, the model programs are ready to be distributed directly with your application, and the compiled models are fast to run and protect the intellectual property within the model.

The Mosel language makes it easy to develop optimization problems from scratch, understand and audit problems that other people have written, and modify and maintain problems over time. A visual development environment, Xpress-IVE (see below), makes the process even easier. Full support for arbitrary ranges, index sets, and sparse objects means even the largest and most sophisticated problem can be expressed clearly and concisely, and completely independently of a particular data instance. The language includes extension libraries, including ones giving you direct control of the

Xpress-Optimizer and ODBC data transfer, through statements in the Mosel program.

Xpress-IVE is the development environment, a Visual Studio for optimization modeling. It features a Mosel model program editor, debugger and execution environment. The user can browse the objects, including all decision variables and constraints, within their model program through an entity tree. It allows the solution values of all optimization objects to be viewed when available. Mosel source files and data files can be organized into projects. Graphs and other visualization aids allow the performance of the Optimizer and the solutions it finds to be analyzed at runtime.

ILOG OPL

ILOG OPL Studio is a complete platform for the rapid development and deployment of optimization applications. Using OPL Studio is the fastest way to develop models for solution with the powerful CPLEX linear and mixed integer optimizers.

The integrated development environment gives interactive control over the optimization process. It shows data and solutions graphically and includes Gantt charts for scheduling problems. OPL Studio benefits from a modern and powerful language that has special syntax for scheduling problems and that features OPLScript to build decomposition algorithms by combining results from smaller optimization models.

ILOG OPL Studio is based on OPL (Optimization Programming Language), the only optimization modeling language that supports both Mathematical Programming (MP), using ILOG CPLEX, and Constraint Programming (CP). CP has recently generated a lot of interest among optimization professionals and OPL Studio provides the best introduction to this technique, especially for those who don't know C++. Interactive graphics can animate the CP algorithms and now the search tree can be graphically displayed to ease debugging and provide useful insights. One can also develop

algorithms combining the strengths of both MP and CP.

With respect to rapid deployment, the OPL Component Libraries preserve your data connections and take you immediately from analysis and testing to implementation. Your OPL model can be directly embedded into an application with easy integration with MS Visual Basic, MS VBA, C++ and now Java and Microsoft .NET.

Lingo 7

The integer solver has been completely rewritten and is much faster on most models with integer variables. The user has many additional options for tuning the integer solver to exploit specific features of the model at hand.

The barrier solver available with LINGO is the most robust one available for solving linear programs.

The user may now input a database user-id and password at the start of the session. LINGO does not require subsequent reentry of this information for subsequent accesses of the database.

Obvious sequences of names for members of a set can be entered in the obvious way, e.g.

Days = Mon..Fri;

Months = Feb..Oct;

Quarters = Q1..Q16;

List = L0..L20;

Models are easier to debug because the LINGO editor is syntax aware. Comments are colored green, LINGO language reserved words are colored blue, and remaining user input is colored black.

Another debugging aid provided by the editor is parenthesis matching. If the cursor is

positioned next to a parenthesis, the parenthesis and its twin will be colored red temporarily.

Quasi-random numbers can be generated via the QRAND function. For models that contain stochastic elements, this provides much more accurate answers without introducing any bias.

LINGO 7 recognizes and accurately implements a wide range of functions. These include most of the popular probability distributions, math functions, and financial functions such as present value. These functions can be used in integer and nonlinear models.

It is now easier than ever to use the LINGO.DLL with Visual Basic. LINGO has long had a very simple to use yet powerful mechanism for retrieving and returning data from and to spreadsheets and databases. The documentation and error handling for this feature have been improved further.

The documentation on how to interface LINGO with the Oracle database has been expanded. For ease of maintenance of models, especially by unsophisticated users, it is important to have the data describing a specific instance of the use of the model (e.g., doing this month's production plan) separated completely from the model equations. LINGO 7 has improved support for this style of modeling.

A number of improvements have been made in how LINGO solves models that have both nonlinearities and integer variables. LINGO has always had automatic solver requirement recognition, e.g., the user does not have to tell LINGO which solver to use. The most appropriate solver for the type of model presented, e.g., linear vs. nonlinear, is automatically selected.

- [1] Römisch group at Humboldt University, Berlin
- [2] MOSEK Conic Solver
- [3] Tom Rutherford, UC Boulder
- [4] <http://www.gamsworld.org/mpec>

Member News

-Recently Professor **Robert G. Sargent** and **Richard E. Nance** have co-authored an invited paper for the special 50th Anniversary Issue of Operations Research (Jan-Feb 2002) entitled, "Perspectives on the Evolution of Simulation." This paper details the topic of influence that computing technology had on the evolution of discrete event simulation.

-At recent ceremonies celebrating the 50th anniversary of the Operations Research program at the Naval Postgraduate School, officiated by the Secretaries of the Air Force and Army (both graduates of the program), **Gerald Brown** was appointed Distinguished Professor of Operations Research.

Performance 2002

International Symposium on Computer Performance Modeling, Measurement and Evaluation

Webpage:

<http://www.uniroma2.it/eventi/Performance2002>

Conference Dates: September 22-27, 2002

Synopsis: The Performance2002 conference solicits superior papers on the development and application of state-of-the-art analytic, simulation, and measurement-based performance evaluation techniques. Of particular interest this year is work that derives new methodologies or creatively applies existing methods to model, design, evaluate, and optimize performance trade-offs/issues in areas such as: Internet and Web performance, content distribution networks, network and server quality of service (QoS), active networks, and security. Papers that advance the state-of-the-art in formal evaluation methods or that creatively apply evaluation methods to computer/communication system design trade-offs/issues are also solicited.

a 23% percent increase in the number of rejections/withdrawals, and a 13% increase in the number of papers in process at year's end. Our acceptance rate for 2001 (number of accepts + number of rejects/withdrawals) was 36%, down from 39% for calendar year 2000. So overall, we have experienced a good increase in the number of submissions, and the acceptance rate has fallen a bit.

All four issues of 2001 (Volume 13) were published on time, as was the first issue of 2002; the second 2002 issue is now in final production, on schedule. There were a total of 392 pages published in Volume 13, of which 367 were numbered pages.

At this point, the first issue of 2002 has appeared and the second issue is in production. Beyond that, we have a backlog of 26 accepted papers, which is a significant increase over last year. While a backlog can be too large and delay timely publication of papers, I feel that we're now at a safe, comfortable, and appropriate level for our backlog.

In addition to our regular issues in development, two Special Issues of *JOC* are in the works. "The Merging of Mathematical Programming and Constraint Programming," developed and guest-edited by Area Editor John Chinneck, is nearly complete and will appear in late 2002 or early 2003. "Mining Web-based Data for e-Business Applications" is being put together by Associate Editors Louiqa Raschid and Alex Tuzhilin, and has several papers accepted at this point.

Moreover, we published a new kind of "special" paper in the first 2001 issue, dubbed "Research Perspective," and a full Feature Article (with accompanying Commentaries and Rejoinder) is now in production.

Our electronic-file-based production system continues to run extremely well. We ask that authors conform closely to our style and standards for file preparation, with the result that page proofs are in most cases literally perfect, and in the remainder of cases nearly so.

The website has continued to be useful for authors and researchers alike. We now have three entries housed permanently in our Online Supplements section. We keep the website up to date with changes in Area and Associate Editors, Forthcoming Papers, Subscribing, and Online Supplements.

There have been several changes in Associate Editorships, as reflected on the website and noted as they occur in my "From the Editor" column at the beginning of each issue.

Based on the 6/30/01 budget (the most recent one I've received from INFORMS), we seem to be tracking well in terms of subscriptions, revenue, and expenses:

- Subscriptions are up across the board, compared to a year before. Non-IPOL subscriptions are at 555, up from 531. IPOL is at 1004, up from 940. And institutional subscriptions are at 292 compared to 291 the year before.
- Revenues to mid-2001 were \$52.4K, including \$4500 from Institutional Sponsors.
- Expenses to mid-2001 were \$37.6K, including what I feel will turn out to be an overestimate for Office of the Editor.

Given the recent economic downturn, I feel satisfied that we have retained eight Institutional Sponsors from the union of our past rosters.

Overall, I feel that *JOC* is in a healthy state, and I continue to be grateful and truly honored for the opportunity to serve.

ICS Prize

The ICS Prize is an Annual award for best English language paper on the OR/CS interface. The award is accompanied by a certificate and a \$1,000 honorarium.

Objectives:

1. To promote the development of high-quality work advancing the state of the art in operations research/computer science interface.
2. To publicize and reward the contributions of those authors/researchers who have advanced the state of the art.
3. To increase the visibility of excellent work in the field.

Application Process:

To be eligible, a nominated work must be:

1. Published in the open literature,
2. Pertinent to the operations research/computer science interface, and
3. Written in English.

The prize committee for 2002 is chaired by Kevin Wood. This prize will be awarded November 18, 2002, at the INFORMS Fall Meeting in San Jose, California. The award is accompanied by a certificate and a \$1,000 honorarium.

Nominations must include: the title, author's name, place and date of publication, and a copy of each nominated work (in quadruplicate, please, if it is not both easy and legal to photocopy). If you wish the nomination materials to be returned after the review process, so indicate.

Whom to contact:

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kwood@nps.navy.mil

Timeline (application - selection date - award date) for 2002 Call for nominations - 2002. Deadline for nominations - August 15, 2002.

Most Recent Winner(s): Renato D.C. Monteiro and Yin Zhang were awarded "The 2001 INFORMS Computing Society Prize for Research Excellence In The Interface Between Operations Research And Computer Science" for their paper: "A unified analysis for a class of long-step primal-dual path-following interior-point algorithms for semidefinite programming" which appeared in Mathematical Programming 81 (1998) 281-299. The prize was awarded at the National Meeting of INFORMS (Institute for Operations Research and the Management Sciences), held November 4-7, 2001, in Miami FL, USA.

Year Winner(s)

2001 Renato D.C. Monteiro, Yin Zhang
2000 János Pintér
1999 Yair Censor, Stavros A. Zenios
1998 Ding-Zhu Du, Frank K. Hwang
1997 Dimitri P. Bertsekas, John N. Tsitsiklis
1996 Warren Adams, Hanif Sherali
1995 John Forrest, Donald Goldfarb
1994 Fred Glover
1993 Robert Fourer, David Gay, Brian Kernighan
1992 Irvin Lustig, Roy Marsten, Nimrod Megiddo, David Shanno
1991 John Hooker
1988 Alex Meeraus
1987 Fred Glover, Darwin Klingman, Marcel Neuts
1986 Harvey Greenberg



From l-r: David Shanno (Chair of Prize Committee), Yin Zhang, Renato D.C. Monteiro, Irvin Lustig (Chair of ICS)

First Call for Papers

The Fifth International Conference on Electronic Commerce Research (ICECR-5) Montreal, Canada

October 23-27, 2002

<http://tecom.cox.smu.edu/icecr5/>

The Fifth International Conference on Electronic Commerce Research ICECR-5 will provide a high quality forum for the presentation of results, the exchange of ideas, and scientific discussions on methodological, computational, deployment, and policy issues and challenges in electronic business. We invite participants from all relevant fields, telecommunications, computer science, information technologies, management, marketing, finance, operations research, economy, human-machine interfaces, psychology, legal and policy studies, in particular.

The conference will combine technical presentations grouped in research sessions, with industry and research plenary speakers, as well as industry-lead panels. Presentations on innovative and advanced applications to, for example, market design, logistics, value chain management, distribution, finance and banking, telecommunications, transport, privatization of services, are welcome.

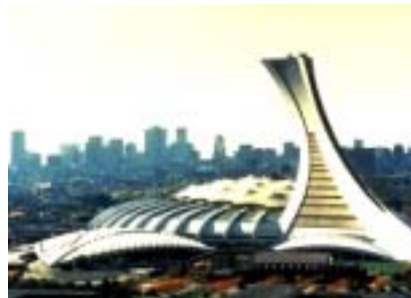
Following the 2001 successful meeting held at the Cox School of Business at Southern Methodist University in Dallas, the International Conference on Electronic Commerce Research moves for its fifth edition to HEC - Montreal in the city of Montreal, Canada.

Montreal is an ideal location for a conference that has the ambition to bring together researchers from all over the world and, in particular, from Europe and North America. Montreal blends the best of the two continents to offer a unique "atmosphère" and "joie de vivre" that the social program will deliver in full.

Paper submission

Papers submitted for presentation at the conference will be selected on the basis of an extended abstract of 5 to 10 pages. All selected papers will be published in the conference proceedings. Refereed full papers will be published after the conference. Further information and instructions will be announced at a later date and will be posted on the conference web site:

<http://tecom.cox.smu.edu/icecr5/>



Important dates:

May 15, 2002: Deadline for abstract submission

July 5, 2002: Notification of acceptance of communications

July 31, 2002: Deadline for early registration

September 1st, 2002: Deadline for reception of
final manuscripts and session descriptions

October 23-27, 2001: Conference dates

Conference information

Conference web site: <http://tecom.cox.smu.edu/icecr5>

Conference email: icecr5@crt.umontreal.ca

Conference co-chairs:

Professor Teodor Gabriel Crainic
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U.Q.A.M. and Director,
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Computational Global Optimization in Nonlinear Systems — An Interactive Tutorial

by János D. Pintér

This e-book presents a concise, practical (and inexpensive) introduction to models and algorithms that enable the analysis and solution of nonlinear decision problems in the presence of multiple optima. Such problems arise in many areas of engineering, economics and the sciences.

A special emphasis is placed upon computational aspects. First, a brief review of frequently used global optimization models and methods is provided, then software development and performance testing issues are highlighted. This is followed by a discussion of several illustrative examples which are based on real-world applications. The LGO integrated modeling and solver system is introduced and used to solve these examples.

The corresponding demonstration program files are also made available.

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Preface

Acknowledgments

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7. Concluding Remarks

References

Appendix 1. Sample LGO Files

Appendix 2. Installation and Use of the Demonstration Programs

For more information, please visit: <http://www.lionhrtpub.com/books/globaloptimization.html>

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SPEC CPU Benchmark Program Opportunities

So, you'd like to see some improvements made to the SPEC CPU benchmarks? Maybe you think that an important application area is not represented. Maybe you would like to see the benchmarks spend more time accessing main memory, or do more complex calculations. Maybe you'd like to see more benchmarks written in C++.

Whatever improvement you'd like to see, here is your opportunity: submit a program for consideration for the next version of the SPEC CPU suite (tentatively titled "SPEC CPU2004"). SPEC will award up to \$5000 for accepted programs.



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