Newsletter 19 of EUROPT

EUROPT - The Continuous Optimization Working Group of EURO

http://www.iam.metu.edu.tr/EUROPT/

March 2010

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Words from the chair

Dear Members of EUROPT, dear Friends,

It is a great pleasure to address you some salutation words through this Newsletter. In our Newsletter 14 (March 2009) I informed you about a Spanish research project, called *i-MATH* (2006-2011), which consists of a large-scale activity research program oriented to increase the presence of mathematics in our national system of science, technology and business. Detailed information about *i-MATH* can be found in http://www.i-math.org/?q=en.

Since its start, the project development has been monitored by the *i-MATH* Advisory Board, that I have the great honor of coordinate since July of 2008. The different areas of the project activity are the following:

1.- Funding of research and transfer activities (including those related to consulting, computing, education, intensive monothematic research, scientific meetings, exploratory workshops, doc-courses, etc.) by means of competitive calls (five so far) among the members of the project. Activity statistics can be found at http://www.i-math.org/charts/stats.php. The overall number of activities already funded by *i-MATH* is 361, with a total expenditure close to 5 millions of euros.
2.- Funding of Top-Down activities arising from the direct initiative of the *i-MATH* Advisory Board and by the Project Nodes, through their annual Activity Plans.
3.- Post-doctoral thematic research contracts for doing research in some emerging areas for doing research at prestigious centers/institutes in Spain and abroad.
4.- Updating and publication of the Map of *i-MATH Technological Offer* (TransMATH Offer), which enables the capacity of researchers and their experience in mathematical technology transfer to be estimated, as well as providing synergies of about 50 research groups involved in the project, with the aim of setting new initiatives in motion.
5.- Development and publication of the Map of *i-MATH Technological Demand* (TransMATH Demand) to enable detection of the requirements and problems in different Spanish business sectors where mathematics are, or can be, a fundamental or complementary tool.
6.- Development of a program of visits to companies with the purpose of presenting the *i-MATH* Project and its reports concerning Technological Supply and Demand, with the aim of stimulating an increase in the demand for mathematical technology.

Perhaps, the most important Top-Down activity carried out by *i-MATH* is the report about **TransMATH Demand**. This report has been considered of special interest in Europe by the ESF Forward Look Mathematics and Industry Working Group, which strengthens the objective of increasing participation of Spanish mathematics in the European context.

The *i-MATH* Node in charge of this initiative was CESGA (Santiago de Compostela). CESGA performed the study of the companies from a telephonic survey to the set of the Spanish companies. They interviewed to **6.716 companies** with more than 10 employees, and to the practical totality of the business sectors. I would like to resume here some of the most relevant features of this report, since they turn out to be **very stimulating for statisticians and operations researchers, and so, for the community of optimizers**. The complete report can be found (in Spanish) at http://www.i-math.org/mapa_demanda/ .

The distribution of the sample by company size is shown in the following graphic:
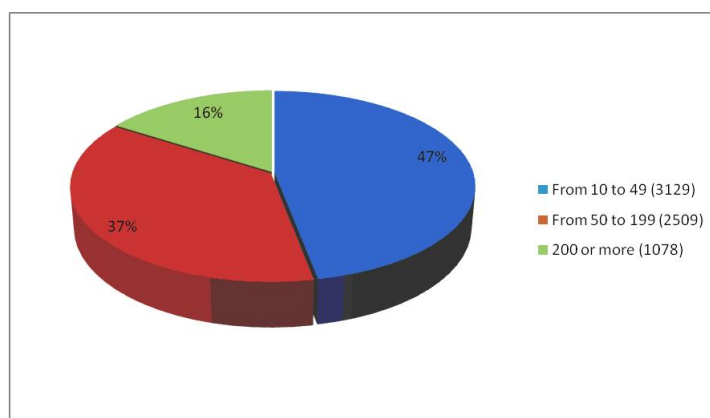
It was a weighted sample where some activity sectors had a higher weight. This is the case of companies devoted to construction (brick industry), commerce, consulting, etc.

From the graphic below we see the use of the mathematical techniques in the companies.
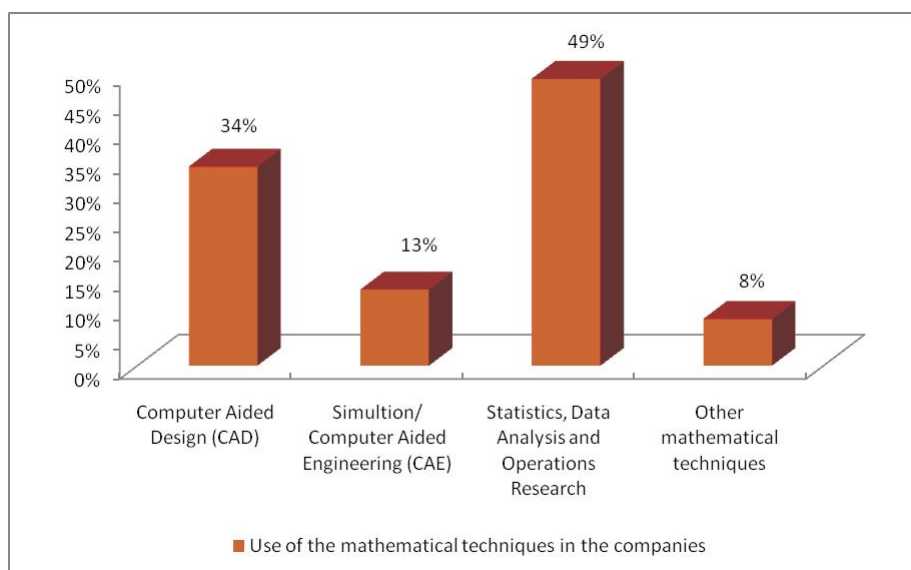
The use of mathematical techniques by company size is summarized in the following graphic, where the reader may realize the unexpected fact that a remarkable proportion of small companies apply mathematical techniques. In particular, the leadership corresponds to **statistics and operations research**, since they are **applied by the 42% of the small firms** included in the survey.

The most extensive use of statistical techniques, data analysis, and operations research is recorded for commerce, consulting, food and energy companies. Widely used techniques are marketing research (positioning of products, segmentation of target populations), quality control, strategic and logistics studies, production and stocks, etc.
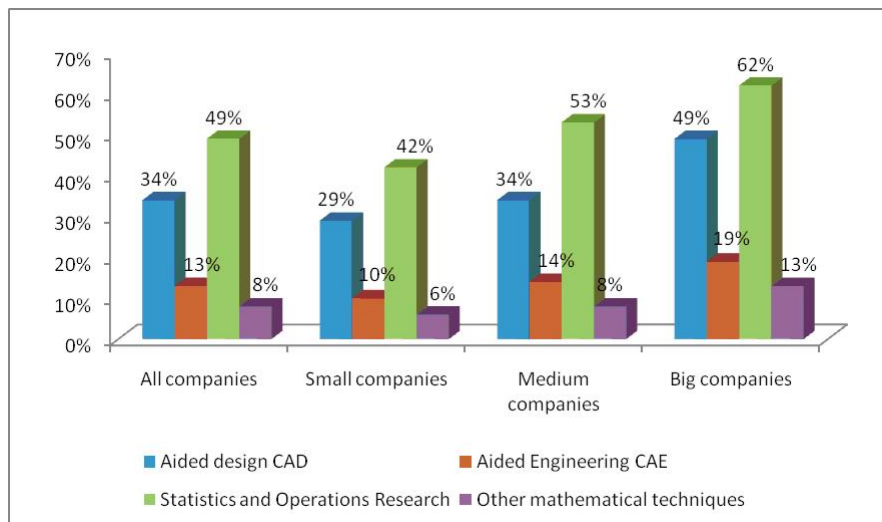
Let me finish by remembering that we are approaching in time to our 8th EUROPT Workshop "Advances in Continuous Optimization" (http://www.europt2010.com/), to be held in University of Aveiro, Portugal, in July 9-10, the days previous to EURO XXIV 2010, in Lisbon (http://euro2010lisbon.org/). This is going to be a very important event, both from scientific and social points of view, because we shall celebrate there the Ten Anniversary of EUROPT. Please do not forget that the deadline for abstract submissions is the 10th of May.

With my best wishes, Yours sincerely,

Marco A. López, Chair of EUROPT

Forthcoming Events

- ## 74th European Study Group with Industry
  ### Aveiro, Portugal
  ### April 26 - 30, 2010

  http://esgi.web.ua.pt/

Scope. The 74th European Study Group with Industry will be held at the Department of Mathematics, University of Aveiro, Portugal. This meeting is part of the series of European Study Groups and will count with the participation of several European experts with a large experience in this type of events. The purpose of these meetings is to strengthen the links between Mathematics and Industry by using Mathematics to tackle industrial problems which are proposed by industrial partners. More information on study groups and related aspects is available at the International Study Groups website (http://www.maths-in-industry.org/), the Smith Institute (http://www.smithinst.ac.uk/) and the European Consortium for Mathematics in Industry (http://www.ecmi-indmath.org/info/events.php).

Study group. On the first day of the meeting, a representative from each company presents the industrial problem to the participants. The academic participants, who are a diverse group of people with expertise in the mathematical sciences, including PhD students, postdoctoral fellows and professors, allocate themselves to a group, each of which works in one of the proposed problems with the industrial partner. The work will be developed on full-time basis over the remainder days of the meeting. On the last day however, each group will give a presentation of their results and/or findings with possible suggestions for subsequent work in a future collaboration. Afterwards, a report on each problem will be sent to the corresponding industrial company.

Special Issue. The International Journal of Mathematical Modelling and Numerical Optimization (http://www.inderscience.com/browse/index.php?journalID=352) invites the working groups to submit extended versions of their reports for a special issue on Mathematics and Industry.

Organizers. Agostinho Agra (University of Aveiro), Cláudia Neves (University of Aveiro), João Nuno Tavares (University of Porto), João Santos (University of Aveiro), José Miguel Urbano (University of Coimbra) and Pedro Freitas (Technical University of Lisbon).

IMPORTANT DAYS

Deadline for registration: April 10, 2010
Work of Study Group: April 26-30, 2010

- ## 1st REGIONAL CONFERENCE OF THE EUROPEAN DSI
  ### Barcelona, Spain
  ### July 2 - 3, 2010

http://www.iese.edu/conferences/edsi2010/

Aims and scope. The 1st International Conference of the European Decision Sciences Institute will be held on July 2 and 3, 2010 at IESE Business School in Barcelona, Spain. The theme of the conference is European Decision Sciences: Recent Trends and Future Directions.

We invite basic, applied, theory, and case study research in all disciplines related to decision making. EDSI welcomes European as well as international researchers and practitioners who are connected to topics related to decision sciences. The conference is a great chance to activate a network on truly European research.

For the first conference of the EDSI both DSI's Immediate Past President, Ram Narasimhan (Michigan State University), and current President, Keong Leong (University of Nevada, Las Vegas), have confirmed their participation.

Tracks.

As the Conference fosters interdisciplinary research we invite all disciplines to participate in the following tracks: Corporate Social Responsibility Sustainability, Risk Management, Performance Measurement, International Management, The Financial and Economic Crises, Innovations, Behavioral approaches

A special focus will be given to topics related to the use of decision sciences in the realm of retailing.

IMPORTANT DAYS
Deadline for submission of extended abstracts: April 15, 2010
Notification of accepted papers: May 15, 2010
Deadline for early bird conference registration (EUR380): June 2, 2010
Deadline for submission of accepted papers: June 15, 2010

- ## 52th Workshop "Nonlinear Optimization, Variational Inequalities and Equilibrium Problems"
  ### Erice, Italy
  ### July 2 - 10, 2010

www.dis.uniroma1.it/∼erice2010

(SECOND ANNOUNCEMENT)

All the information can be found in the conference web site and in EUROPT Newsletter N.17: http://www.iam.metu.edu.tr/EUROPT/Newsletter17-EUROPT.pdf

Poster of the Workshop: http://www.dis.uniroma1.it/∼erice2010/poster.pdf

• 8th EUROPT Workshop
ADVANCES IN CONTINUOUS OPTIMIZATION
Aveiro, Portugal
July 9 - 10, 2010

http://www.europt2010.org

(SECOND ANNOUNCEMENT)

Aims and scope: This meeting continues in the line of the EUROPT workshops, the first held in 2000 in Budapest, followed by the workshops in Rotterdam in 2001, Istanbul in 2003, Rhodes in 2004, Reykjavik in 2006, Prague in 2007, and Remagen in 2009.

The workshop aims to provide a forum for researchers and practitioners in continuous optimization and related fields to discuss and exchange their latest works.

Invited Speakers: Immanuel Bomze, University of Vienna; Mirjam Duer, University of Groningen; Alexander Shapiro, Georgia Tech; Tamas Terlaky, Lehigh University; Luis Nunes Vicente, University of Coimbra; Henry Wolkowicz, University of Waterloo.

Topics: the topics include, but are not limited to, the following:

- applications of continuous optimization to combinatorial problems
- complexity and efficiency of optimization algorithms
- convex and nonsmooth optimization
- complementarity and variational problems
- derivative-free optimization
- global optimization
- linear and nonlinear optimization
- optimal control
- multiobjective optimization
- robust optimization
- semi-definite programming
- semi-infinite programming
- stochastic optimization
- large-scale optimization

Program Committee: Marco Lopez (*Chair*), Universidad de Alicante; Domingos M Cardoso, Universidade de Aveiro; Emilio Carrizosa, Universidad de Sevilla; Joaquim João Júdice, Universidade de Coimbra; Diethard Klatte, Universitat Zurich; Olga Kostyukova, Institute of Mathematics, Belarusian Academy of Sciences; Marco Locatelli, Universita di Torino; Florian Potra, University of Maryland, Baltimore County; Franz Rendl, Universitat Klagenfurt; Claudia Sagastizabal, CEPEL (Research Center for Electric Energy); Oliver Stein, Karlsruhe Institute of Technology; Georg Still, University of Twente.

Organizing Committee: Domingos M Cardoso (*Chair*), Universidade de Aveiro; Tatiana Tchemisova (*co-Chair*), Universidade de Aveiro; Miguel Anjos, University of Waterloo; Edite Fernandes, Universidade do Minho; Vicente Novo, UNED (Spain); Juan Parra, Universidad Miguel Hernández de Elche; Gerhard-Wilhelm Weber, Middle East Technical University.

Local Committee (Universidade de Aveiro): Paula Carvalho; João Pedro Cruz; Jorge Manuel Esteves; Carlos Luz (Politécnico de Setubal); Agnieszka Malinowska; Enide Andrade Martins; António Pereira; Paula Rama.

Secretariat: Agnieszka Malinowska (e-mail: europt2010@europt2010.com)

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IMPORTANT DAYS
Abstract submission: May 10, 2010
Notification of acceptance: May 20, 2010
Deadline for early Registration: May 31, 2010

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• **DSS 2010**
the 15th IFIP WG 8.3 International Conference on Decision Support Systems "Bridging the socio-technical gap in DSS - Challenges for the next decade"
University of Lisbon, Lisbon, Portugal
July 7-10, 2010

http://dss2010.di.fc.ul.pt

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Aims and Scope. In recent years, bridging the socio-technical gap has been a challenge in many areas of research. The socio-technical gap is the great division between the social aspects aimed to be supported and those that are actually supported, due in part to technical limitations and in part to the complexity of the contexts where decision support must be provided. In Decision Support Systems, this challenge has raised several important questions concerned with the account and encapsulation of social aspects of managerial decision making as well as with the representation of certain human cognitive aspects, such as intuition or insights within computational systems. The 2010 International Conference of the IFIP WG 8.3 will focus on the theme "Bridging the socio-technical gap in DSS - Challenges for the next decade".

The IFIP TC8/Working Group 8.3 conferences present the latest innovations and achievements of academic communities on Decision Support Systems (DSS). These advances include theory, systems, computer aided methods, algorithms, techniques, applications and technologies supporting decision making.

Sponsors. DSS 2010 is sponsored by the International Federation for Information Processing (IFIP), the Faculty of Sciences at University of Lisbon, Operations Research Center-UL and FCT.

Topics. Suggested research topics include, but are not limited to: Affect and emotion in Decision Support Systems; Decision Models in the real-world; Executive Information

Systems; Negotiation Support Systems; Knowledge Management; Knowledge and Re-source Discovery; Business Intelligence and Data Warehousing; Group Support Systems; Collaborative Decision Making; Socio-technical aspects for DM in Geographic Information Systems; Rich language for Decision Support; Web 2.0 Systems in Decision Support; Incorporating Complex Factors in Decision Support.

Proceedings. All accepted papers will be published in conference proceedings. Papers will be considered for publication as chapters of a book with the conference theme, published and distributed by IOSPress, in the FAIA series. Submitted manuscripts must be original contributions which have not been previously published or submitted for publication elsewhere. Accepted papers will be published only if at least one of the authors is registered to attend the conference in due time.

Special Issues. Following the tradition of IFIP WG 8.3 conferences, authors of the best papers will be invited to submit extended versions to special issues of such international scientific journals as Group Decision and Negotiation (GDN), Intelligent Decision Technologies International Journal (IDTJ), International Journal of Decision Support System Technology (IJDSST), and the Journal of Decision Systems (JDS).

Submissions categories. The submission categories are the following:

- Full papers 8-12 pages

- Short papers maximum of 6 pages

- Posters maximum of 4 pages

- Workshop proposals 2 pages

Keynote Speakers. Omar El Sawy, University of Southern California, USA;

Liam Bannon, University of Limerick, Ireland;

Carlos Bana e Costa, Technical University of Lisbon, Portugal, and London School of Economics and Political Science, UK

Conference Chair. Ana Respicio, University of Lisbon, Portugal

Steering Committee. Frederic Adam, University College Cork, Ireland; Frada Burstein, Monash University, Australia; Sven Carlsson, Lund University, Sweden; Patrick Humphreys, London School of Economics, UK; Piero Migliarese, University of Calabria, Italy; Gloria Philips-Wren, Loyola University Maryland, USA; José Alberto Pino, University of Chile, Chile; Ana Respicio, University of Lisbon, Portugal; Pascale Zaraté, IRIT-ENSIACET-INPT, Toulouse, France.

Program Committee Chairs. Ana Respicio, University of Lisbon, Portugal; Frederic Adam, University College Cork, Ireland; Gloria Philips-Wren, Loyola University Maryland, USA.

Doctoral Consortium Chair. Frada Burstein, Monash University, Australia

Organising Committee. Joao Telhada, Faculty of Sciences, University of Lisbon, Portugal; Carlos Teixeira, Faculty of Sciences, University of Lisbon, Portugal; Rita Almeida Ribeiro, Uninova-CA3, New University of Lisbon, Portugal; Ana Respicio, Faculty of Sciences, University of Lisbon, Portugal

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Secretariat. Rodrigo de Oliveira Marques, OR Center, University of Lisbon, Portugal

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Fax (+351) 217 500 022

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IMPORTANT DAYS

Paper submission (closed) : January 30, 2010
Poster submission due: April 1, 2010
Doctoral Consortium submission due: April 1st, 2010
Main Conference: July 8th-10th, 2010
Doctoral Consortium: July 7th, 2010
Workshops: July 7th, 2010

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- **24TH EUROPEAN CONFERENCE ON OPERATIONAL RESEARCH (EURO XXIV)**
  Lisbon, Portugal
  July 11-14, 2010

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www.euro2010lisbon.org

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(3rd ANNOUNCEMENT, AND EXTENSION OF THE SUBMISSION DEADLINE)

Aims and scope. The 24th European Conference on Operational Research, EURO XXIV, will be held at the Faculty of Sciences of the University of Lisbon, FCUL.

This large conference is organized by EURO (The Association of European OR Societies) and APDIO (The Portuguese OR Society), with the support of FCUL and CIO (Operational Research Centre, Portugal).

The Programme and Organizing Committees, chaired by Silvano Martello and Jose Paixao, respectively, are preparing a high quality scientific programme and an exciting social programme for the Conference.

We hope that the unique yet heterogeneous character of seductive Lisbon will tempt you to come, and help turning this into a memorable event, both scientifically and socially

PLENARY SPEAKERS. John F. Nash, Jr., Harold W. Kuhn.

INVITED SPEAKERS. Fran Ackermann, Noga Alon, James Cochran, Elena Fernandez, Pierre Hansen, Martine Labbe, Nelson Maculan, Michel Minoux, Arkadi Nemirovski, Stefan Reichelstein, Alexander Shapiro, Stef Tijs.

CALL FOR PAPERS AND SESSIONS. We invite all researchers, academicians, practitioners, as well as students interested in any branch of operational research, mathematical modelling or economic analysis to participate in the conference and to present their papers.

Invited and contributed papers will be organized in parallel sessions, with three or four papers in each session. In general, sessions will be a part of conference streams, and streams are grouped by areas.

Researchers who want to organize an invited session or contribute a paper within an invited session should contact the PC member in charge of the interested area.

No participant can present more than one paper at the Conference. Abstract submission and registration are done online, via the Conference web page.

AREAS and PC MEMBERS in CHARGE.

- Continuous Optimization » GW Weber,

- Control Theory System Dynamics » GW Weber,

- Data Mining, Knowledge Discovery Artificial Intelligence » D Bouyssou,

- DEA and Performance Measurement » EK Burke,

- Decision Analysis, Decision Support Systems » D Bouyssou,

- Discrete Optimization, Geometry Graphs » J Blazewicz,

- Emerging Applications of OR » G Woeginger,

- Energy, Environment and Climate » G Woeginger,

- Financial Modelling Risk Management » GW Weber,

- Fuzzy Systems and Soft Computing » D Pisinger,

- Game Theory, Mathematical Economics » GW Weber,

- Location, Logistics, Transportation Traffic » S Nickel,

- Metaheuristics » D Pisinger,

- Multiple Criteria Decision Making and Optimization » D Bouyssou,

- OR Education, History, Ethics » JF Oliveira,

- OR for Development and Developing Countries » GW Weber,

- OR in Health Life Sciences » J Blazewicz,

- OR in Industry, and Software for OR » S Nickel,

- OR in Natural Resources » GW Weber,

- Production Management Supply Chain Management » S Nickel,

- Revenue Management Managerial Accounting » EK Burke,

- Scheduling, Timetabling Project Management » J Blazewicz,

- Simulation Stochastic Programming and Modelling » G Woeginger,

- Soft OR and Problem Structuring Methods » D Bouyssou,

- Telecommunication Networks » JF Oliveira.

PROGRAMME COMMITTEE.

Chair: Silvano Martello, Italy (silvano.martello@euro2010lisbon.org),

Jose Paixao (**OC Chair**), Portugal (jose.paixao@euro2010lisbon.org),

Jacek Blazewicz, Poland (jacek.blazewicz@euro2010lisbon.org),

Denis Bouyssou, France (denis.bouyssou@euro2010lisbon.org),

Edmund K. Burke, UK (edmund.burke@euro2010lisbon.org),

Marielle Christiansen, Norway (marielle.christiansen@euro2010lisbon.org),

Stefan Nickel, Germany (stefan.nickel@euro2010lisbon.org),

Jose Fernando Oliveira, Portugal (jose.fernando.oliveira@euro2010lisbon.org),

David Pisinger, Denmark (david.pisinger@euro2010lisbon.org),

Gerhard Wäscher, Germany (gerhard.waescher@euro2010lisbon.org),

Gerhard-Wilhelm Weber, Turkey (gerhard.wilhelm.weber@euro2010lisbon.org),

Gerhard Woeginger, The Netherlands (gerhard.woeginger@euro2010lisbon.org).

ORGANIZING COMMITTEE.

Chair: Jose Paixao, Portugal (PT),

Silvano Martello (**PC Chair**), Italy, Gerhard Wäscher (EURO VP), Germany, Joaquim Borges Gouveia, PT, Maria Eugenia Captivo, PT, Domingos Cardoso, PT, Manuel Furtado Martins, PT, Joao Chambel Leitao, PT, Jose Fernando Oliveira, PT, Joao Patricio, PT, Ana Paula Povoa, PT, Antonio Proenca, PT, Antonio Rodrigues, PT, Joao Miguel Telhada, PT, Jose Valerio de Carvalho, PT, Margarida Vaz Pato, PT.

AWARDS. During the EURO XXIV conference the following prizes will be awarded:

- The EURO Gold Medal 2010,

- The EURO Distinguished Service Medal (EDSM 2010),

- The EURO Management Science Strategic Innovation Prize (MSSIP 2010),

- The EURO Doctoral Dissertation Award (EDDA 2010),

- The EURO Excellence in Practice Award (EPA 2010).

THE PROGRAMME IN BRIEF. The Conference starts July 11 (Sunday), 5pm, with the Opening Session, including the awards ceremony.

This will be followed by the Welcome Reception at 7pm. Meanwhile, inveterate football fans will have the opportunity to follow the World Cup final (starting 7:30 pm) in a large screen.

The working sessions will occupy most of the 3 following days, July 12-14 (Mon-Tue-Wed), and will start, on Monday morning, with a plenary session with the keynote by Nobel laureate John Nash.

The Conference Dinner will be held on July 13, at Sala Tejo, adjacent to Pavilhao Atlantico – an intriguing and emblematic venue of contemporary Lisbon, near the river

estuary (www.pavilhaoatlantico.pt). The Conference ends with another social event, not to be missed: the Farewell boat trip, on Tagus River, on the late afternoon of July 14.

FURTHER INFORMATION.

We recommend participants: 1. to book their flights through the official air transport operator, TAP Portugal: discounts are applicable for the Conference; and, 2. to book accommodation through the Conference webpage: our official travel agency, Abreu, has secured a large number of rooms in a variety of hotels in Lisbon at specially negotiated rates.

For more details, consult the conference site, www.euro2010lisbon.org, where all relevant information will progressively be included.

Further proposals for Book or Software Exhibitions, Workshops, and the edition of special issues of Journals are welcome.

CONTACTS.

- prog@euro2010lisbon.org (Programme),

- registration@euro2010lisbon.org (Registration, travel accommodation),

- info@euro2010lisbon.org (General enquiries).

IMPORTANT DAYS(extended)

Deadline for abstract submission: March 22, 2010
Notification of acceptance: March 31, 2010
Deadline for early registration: April 15, 2010
Deadline for author registration (for inclusion in the programme): May 7, 2010.

- **Minisymposium on Continuous Optimization**
of the 2nd International Conference on Engineering Optimization (EngOpt 2010)
Lisbon, Portugal
September 6-9, 2010

http://www.engopt2010.org/

ANNOUNCEMENT OF THE SYMPOSIUM AND EXTENDED DATES FOR THE CONFERENCE

Aims and scope. Continuous Optimization belongs to the oldest disciplines within mathematics and, by that, in the history of science at all. For instance, the classical optimization problem of Heron of Alenxandria about the determination of a point C in

a straight line such that the sum of its distance from two given points A and B on the same side of the straight line is minimum is known since the first century AC. In fact, many real world problems can be represented by Continuous Optimization models and the modern developed techniques and tools usually allow good approximate solutions for most of these problems. Nowadays the Continuous Optimization plays central role in a tremendous variety of application areas in the natural sciences, in the sectors of economy, finance, operational research and in the key technologies of modern Engineering. Furthermore, the solid theoretical foundations of Continuous Optimization as well as its refined methods have made it an important tool in the realms of discrete mathematics and applied probability. Nowadays, we cannot imagine Civil, Chemical or Computer Engineering, Electrical or Mechanical Engineering, Aerospace or Financial Engineering, Food Engineering, Material Sciences and the sectors of Sustainable Development, etc., without the results, algorithms and softwares provided by Continuous Optimization, together with the related domain of Optimal Control. To this service of Continuous Optimization, among its modern and vibrant areas we may emphasize: Linear and Nonlinear Optimization, Global and Nonsmooth Optimization, Convex and Conic Optimization, Stochastic Optimization, Portfolio Optimization and Risk Management, Structural Optimization, Semi-Infinite Optimization, Optimization in Statistics and Data Mining, Calculus of Variations and the Optimization of various kinds of Differential Equations. During all the centuries and, especially, in recent years, Continuous Optimization has been receiving a lot of stimuli from the applied sciences which it conveyed as research challenges to the other disciplines of mathematics, the theoretical ones included. Herewith, Continuous Optimization has proven to be a source of aid and enrichment and, eventually, a means for the improvement of living conditions on earth. In the millennium year of 2000, EURO Working Group on Continuous Optimization (EUROPT) was established (http://www.iam.metu.edu.tr/EUROPT/). From that time on it served in the European and international community of national OR societies and EURO working groups, by scientific advice, events of all formats and a spirit of encouragement. The scientific involvement of us from EUROPT into the EngOpt Conference Series and, in particular, EngOpt 2010 means a great honor for our group. We kindly invite our members and friends to take part in our Mini Symposium, and would be very glad if we could welcome conference participants from other backgrounds such as state-of-the-art engineering, for vivid conversation and, why not, the preparation of future collaborations.

Organizers. Domingos Cardoso (University of Aveiro, Portugal), Edite Fernandes (University of Minho, Portugal) and Gerhard-Wilhelm Weber (Middle East Technical University, Turkey)

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IMPORTANT DAYS

Deadline for abstract submission(extended): March 26, 2010
Notification of Acceptance: April 2, 2010
Full Paper Submission: June 4, 2010

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• ICOCO 2010
International Conference on Optimization and Control
Guiyang, China
July 18-23, 2010

http://icoco2010.cqnu.edu.cn/

Theme and Scope. The purpose of the conference is to provide an international forum for scientists, engineers, researchers, and practitioners to exchange ideas and approaches, to present research findings and state-of-the-art solutions, to share experiences on potentials and limits, and to open new avenues of research and developments, on all issues and topics related to optimization and control theory. The conference is dedicated to the 65th birthday of Professors Kok Lay Teo and Jie Sun who have made fundamental contributions to optimization, optimal control, and their computational methods and applications. We expect that many scholars working in optimization and control from different countries and regions will participate in the ICOCO2010 and present state-of-the-art lectures in optimization and control theory.

The ICOCO2010 will include keynote lectures, invited lectures and contributed papers. All submitted papers will be peer-reviewed. The accepted papers presented in the conference will be included in the conference CD. High quality papers will be invited to submit their expanded versions to be considered for publication in one of the following journals:

(i) Nonlinear Dynamics and Systems Theory;

(ii) Dynamics of Continuous, Discrete and Impulsive Systems, Series B;

(iii) Journal of Industrial and Management Optimization;

(iv) Discrete and Continuous Dynamical Systems, Series B;

(v) Int. Journal of Innovational Computing and Information Control.

Tentative Plenary Speakers.

Nasir Uddin Ahmed, University of Ottawa, Canada; Shu-Cherng Fang, North Carolina State University, USA; Masao Fukushima, Kyoto University, Japan; Hans-Jacob Luthi, ETH, Switzerland; Jiongmin Yong, University of Central Florida, USA

Organizing Committee Co-chairs.

Shuping Chen, Guizhou University, Guizhou

Xinmin Yang, Chongqing Normal University, Chongqing

International Programme Committee Co-chairs.

Louis Caccetta, Curtin University of Technology, Australia

Guangren Duan, Harbin Institute of Technology, Heilongjiang

Conference Secretary. Dr. Honglei Xu, Guizhou University, Guizhou and Curtin University of Technology, Australia

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Tel: +618 9266 4961, Fax: +618 9266 3197

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IMPORTANT DAYS

Full-length Paper Submission: March 10, 2010
Notification of Acceptance: April 25, 2010
Submission of Final Manuscript: May 15, 2010

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- **AIMMS/MOPTA International Optimization Modeling Competition for students**
Lehigh University, Bethlehem, PA, USA
August 18-20, 2010

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(CALL FOR PARTICIPATION)

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It is with great pleasure and anticipation that we announce the second AIMMS/MOPTA Optimization Modeling Competition for students. The competition is organized jointly by the conference organizers of MOPTA and Paragon Decision Technology (the developers of AIMMS):
(http://www.aimms.com)

The problem involves optimizing a financial portfolio in the presence of different tax rules. The teams have to model and solve the optimization problem using AIMMS (provided to the participants free of charge). The best teams will compete in the final, taking place at the 2010 MOPTA conference, August 18-20 at Lehigh University, Bethlehem, PA, USA.

Teams of at most three students can participate. Each member of the team must be registered as a full-time student at a recognized educational institution during the spring term of the 2008-2009 academic year. Students with a background in operations research, regardless of their actual field of study are eligible. Teams from all over the world can participate, as long as at least one team member can come to the conference, should the team make it to the final. All teams have to register at the MOPTA competition WEB site. The official language of the competition is English.

For more details and registration visit the conference website: http://mopta.ie.lehigh.edu and follow the link to the competition. For questions about the competition please contact Imre Polik (mopta@lehigh.edu)

For more details about MOPTA 2010 conference, see EUROPT Newsletter 18

http://www.iam.metu.edu.tr/EUROPT/Newsletter18-EUROPT.pdf

• International Conference on OPERATIONS RESEARCH
"Mastering Complexity" MUNICH 2010
Munich, Germany
September 1-3, 2010

http://www.or2010.de

Aims and scope. This conference is the 2010 edition of the annual International OR conference organized by the German OR society (https://www.gor-online.org). In 2010, the overall theme is "Mastering Complexity". Complexity is a natural component of the globalization process. Financial markets, traffic systems, network topologies and, last but not least, energy resource management, all contain complex behavior and economic interdependencies which necessitate a scientific solution. Operations Research is one of the key instruments to model, simulate and analyze such systems. In the process of developing optimal solutions, suitable heuristics and efficient procedures are some of the challenges which will be discussed at this conference. The conference is organized together with this year's partner, the Italian OR society (http://www.airo.org).

Topics.

I.1 Forecasting, Data Mining and Machine Learning - *Renato de Leone*

I.2 Game Theory and Experimental Economics - *Karl Morasch*

I.3 Managerial Accounting - *Matthias Amen*

I.4 Financial Modelling and Numerical Methods - *Daniel Rösch*

I.5 Pricing and Revenue Management - *Alf Kimms*

I.6 Quantitative Models for Performance and Dependability - *Markus Siegle*

I.7 Business Informatics and Artificial Intelligence - *Andreas Fink*

II.1 Traffic, Transportation and Logistics - *M. Grazia Speranza*

II.2 Discrete Optimization, Graphs Networks - *Sven Oliver Krumke*

II.3 Stochastic Programming - *Rüdiger Schultz*

II.4 Continuous Optimization - *Oliver Stein*

II.5 Production and Service Management - *Marion Steven*

II.6 Supply Chain Management Inventory - *Herbert Meyr*

II.7 Scheduling and Project Management - *Rainer Kolisch*

III.1 Environmental Management - *Paola Zuddas*

III.2 Energy Markets - *Hans-Georg Zimmermann*

III.3 Health Care - *Teresa Melo*

III.4 Multiple Criteria Decision Making - *Jutta Geldermann*

III.5 Systems Modeling and Simulation - *Grit Walther*

III.6 OR in Life Sciences and Education - Trends, History and Ethics - *Gerhard-Wilhelm Weber*

III.7 Young Scientist´s Session: First results of on-going PhD-projects - *Stefan Pickl*

Invited speakers. Roland Bulirsch (TU Munich, Bay. Akademie der Wissenschaften), Thomas Reiter (Dt. Zentrum für Luft- und Raumfahrt), Dirk Taubner (msg systems), Wolfgang Achtziger (TU Dortmund), Wolfgang Bein (Univ. of Nevada), Simon Benninga (Tel Aviv Univ. and Wharton), Marielle Christiansen (Norwegian Univ. of Science and Technology), Robert Fourer (Northwestern Univ.), Erwin Hans (Univ. of Twente), Boudewijn Haverkort (Univ. of Twente and ESI Eindhoven), Ulrike Leopold-Wildburger (Univ. Graz), Winfried Matthes (Univ. Wuppertal), Mike Pidd (Lancaster Univ.), Georg Pflug (Univ. Vienna), Karim Sadrieh (Univ. Magdeburg), Ahti Salo (Helsinki Univ. of Technology), Carlo Vercellis (Politecnico Di Milano)

Book of abstracts and Proceedings. There will be an on-site book of abstracts. Post-conference proceedings of selected papers will be published by Springer.

Venue. The conference will take place on the campus of the University of the German Armed Forces in Munich. This University was founded in 1973 with the aim of providing officers and officer candidates with a university education that would also prepare them for civilian careers. Since its founding, the number of students has been rising steadily: today there are around 3,700 registered students, including 360 women, 50 civilians, and 150 international students and officers.

Program committee.

Chairs. Stefan Pickl (Universität der Bundeswehr München) and Markus Siegle (Universität der Bundeswehr München)

Co-chairs. Bernhard Fleischmann (U Augsburg), Renato de Leone (U Camerino / Italy), Hans-Jakob Lüthi (ETH Zürich / Switzerland), Stefan Nickel (U Karlsruhe TH), Erwin Pesch (U Siegen), Gerhard-Wilhelm Weber (METU Ankara / Turkey), Brigitte Werners (U Bochum)

Organizing committee.

Chairs. Bo Hu (Universität der Bundeswehr München) and Karl Morasch (Universität der Bundeswehr München)

Co-chairs. Stefan Pickl (Universität der Bundeswehr München), Markus Siegle (Universität der Bundeswehr München), Gerhard-Wilhelm Weber (METU Ankara / Turkey)

Contacts. *Conference secretariat:* Annemarie Fischaleck, Gabriela Karasz, Phone +49-89-6004-4766 Fax +49-89-6004-3561

Administration: Tino Krug, Phone +49-89-6004-2252

Address: Werner-Heisenberg-Weg 39, 85577 Neubiberg

e.mail: contact@OR2010.de

IMPORTANT DAYS

Abstract submission (max 1800 characters): April 30, 2010
Extended Abstract submission (6 pages): July 15, 2010
Abstracts for post-conference proceedings (6 pages): October 15, 2010

- # 28th International Scientific Conference on Mathematical Methods in Economics 2010
  ## MME 2010
  ## *È*esk*é* Bud*ì*jovice, Czech Republic
  ## September 8 - 10, 2010

http://mme2010.ef.jcu.cz/

Aims and Scope. The conference Mathematical Methods in Economics is a traditional meeting of professionals from universities and business who are interested in the theory and applications of operations research and econometrics. Main Themes are Operational Research, Econometrics, Quantitative Management Methods, Simulations, Mathematical Modelling, Process Optimisation.

Topics of interest. Operational Research, Econometrics, Quantitative Management Methods, Simulations, Mathematical Modelling, Process Optimisation

Organizers.

University of South Bohemia, Faculty of Economics, *È*eské Bud*ì*jovice, Czech Republic;

Czech Society of Operations Research, Prague, Czech Republic;

Czech Econometric Society, Prague, Czech Republic

Programme committee.

Helena Brožová(University of Life Science, Prague), Petr Fiala (University of Economics, Prague), Jana Han*è*lov*á* (Technical University of Ostrava), Josef Jablonsk*ý* (University of Economics, Prague), Ladislav Luk*á*ž (University of West Bohemia, Pilsen), Jan Pelik*á*n (University of Economics, Prague), Karel Sladk*ý* (Academy of Sciences of CR, Prague), Tom*á*š Šubrt (University of Life Science, Prague), Osvald Va*š*á*è*ek (Masaryk University, Brno), Karel Zimmermann (Charles University, Prague), Marek Biskup (University of South Bohemia,Ceské Budejovice)

Local organizing committee.

Jana Friebelov*á* (head)

Jana Klicnarov*á*, Ludvík Friebel, Martin Pech, Zuzana Strachotov*á*, Michael Rost, Monika Boezinov*á*, Michal Houda.

IMPORTANT DAYS(extended)

Submission of extended abstracts: March 31, 2010
Abstract acceptance information: April 15, 2010
Submission of full papers: May 15, 2010
Paper acceptance information: June 15, 2010
Registration and early payment: June 25, 2010

- ## 11th Workshop on Optimization and Inverse Problems in Electromagnetism
Sofia, Bulgaria
September 14 - 18, 2010
oipe.tu-sofia.bg

OIPE Workshop Series. The aim of the workshop is to discuss recent developments in optimization and inverse methodologies and their applications to the design and operation of electromagnetic devices. It is intended to establish with the workshop an occasion when experts in electromagnetics and other areas (e.g. engineering, mathematics, physics, etc.), involved in research or industrial activities, can discuss on the theoretical aspects and on the technical relevance of optimization and inverse problems, in the general framework of the innovation in electromagnetic methods and applications.

Previous editions were held in Pavia, Italy (1989), Warsaw, Poland (1992), Geneva, Switzerland (1994), Brno, Czech Republic (1996), Jyvaskyla, Finland (1998), Torino, Italy (2000), Lodz, Poland (2002), Grenoble, France (2004) Sorrento, Italy (2006), and Ilmenau, Germany (2008).

International Steering Committee. R. Martone, Italy (*Chairman*), H. Brauer, Germany K. Miettinen, Finland, P. Brochet, France K. Miya, Japan, J.-L. Coulomb, France G. Molinari, Italy, K. Deb, India P. Neittaanmaki, Finland, P. Di Barba, Italy M. Repetto, Italy, A. Formisano, Italy E. Ritchie, Denmark, L. Gerbaud, France M. Rudnicki, Poland, A. Gottvald, Czech Republic S. Russenschuck, Switzerland, S. Hahn, Korea B. Sareni, France, J. Haueisen, Germany A. Savini, Italy, L. Kraehenbuhl, France P. Szczepaniak, Poland, D. Lowther, Canada S. Wiak, Poland, C. Magele, Austria F. Wurtz, France, I. Marinova, Bulgaria I. Yatchev, Bulgaria

Local Steering Committee. Kostadin Brandisky, Peter Dineff, Vasil Gospodinov, Stefcho Guninski, Krastio Hinov, Ilona Iatcheva, Maria Kaneva, Nikola Kaloyanov, Vladimir Lazarov, Angel Pachamanov, Petko Petkov, Rumena Stancheva, Georgy Todorov, Raina Tzeneva, Hristo Vassilev

Scientific Topics.

1. Theoretical Aspects and Fundamentals: Mathematical theory and formulation of inverse and optimization problems, Regularization techniques, Order reduction, Identification problems, Sensitivity analysis, New approaches.

2. Algorithms: Deterministic, stochastic, and hybrid techniques, Reconstruction techniques, Multi-objective and multi-level optimization, Heuristic approaches, Design of experiment, Constraints, Robust optimization, optimization under uncertainty, Objective functions and direct problems, Numerical efficiency, Numerical problems, New techniques.

3. Applications: Optimal design in electrical and electronic engineering, Optimization in information and communication systems, Non-destructive evaluation, Industrial and biomedical tomography, Optimization in measurement systems, Optimization and inverse problems in biomedical engineering, Control systems, Large scale systems, Mechatronics, nano- and microsystems, Benchmark problems, Other applications.

4. Software Methodologies: Software environments, Software interfaces, Parallel and distributed computing, Soft computing and artificial intelligence, New methodologies.

Submission of Contributions. The authors are encouraged to submit a two-page digest due by March 31, 2010. Online submission is required and facilities are provided on the website. The digest should be submitted together with the author´s information including full mailing address, fax number and e-mail address. The conference will feature oral and poster presentations. The conference language is English.

All contributed papers will undergo a peer reviewing procedure to determine their suitability for publication. Notification of the acceptance of the contribution will be given after May 31, 2010. A template of the digest is available on the workshop website. Digest of contributions included in the conference program will be part of the conference proceedings.

Publication of Selected Papers. Authors of accepted contributions are invited to submit a full paper, that, depending on the content, will be considered for publication in one of the following three international scientific journals: COMPEL, IJAEM or IPSE journal. A selection of papers, dealing with computational electromagnetics, will be published in a special issue of The International Journal for Computation and Mathematics in Electrical and Electronic Engineering (COMPEL).

A selection of papers, dealing with applications of optimization and inverse problems methodologies in electromagnetics, will be published in a special issue of the International Journal of Applied Electromagnetics and Mechanics (IJAEM). Authors of those papers that deal with any aspects of inverse problems concepts, mathematical modeling or numerical solution are encouraged to have their papers reviewed and, if accepted, published in a special issue of Inverse Problems in Science and Engineering (IPSE) journal dedicated to OIPE 2010.

Young Investigator Award.

Young investigators, i.e., students not older than 35, are invited to take part in the young investigators competition. To enter the competition students must provide a letter by their supervising professor as indicated above.

International PhD Seminar. Just prior to the OIPE an International PhD Seminar Computational Electromagnetics and Optimization in Electrical Engineering will take place.

Contact Details.

Chairman of OIPE 2010. Prof. DSc. Ivan Yatchev, Dept. of Electrical Apparatus, Technical University of Sofia, Kliment Ohridski, No. 8, Sofia 1000, Bulgaria

Phone: +359 2 965 3639 Fax: +359 2 962 4196

of OIPE 2010. Prof. Dr. Iliana Marinova, Dept. of Electrical Apparatus, Technical University of Sofia, Kliment Ohridski, No. 8, Sofia 1000, Bulgaria

Phone: +359 2 965 3639 Fax: +359 2 962 4196

E-mail: oipe@tu-sofia.bg

Venue. The OIPE 2010 conference will be held on the campus of the Faculty of Electrical Engineering at the Technical University of Sofia. The address of the congress venue is:

Faculty of Electrical Engineering, bl. 12, Technical University of Sofia, Kliment Ohridski No. 8, Sofia 1000, Bulgaria

IMPORTANT DAYS(extended)

Submission of two-page digest: May 31, 2010
Notification of acceptance: May 31, 2010
Early registration: June 30, 2010
Conference: September 15, 2010
Full paper submission: September 17, 2010

• 10th International Conference
on PARAMETRIC OPTIMIZATION AND RELATED TOPICS
(paraoptX)
Karlsruhe, Germany
September 20 - 24, 2010

www.ior.kit.edu/paraoptX.php

(SECOND CALL FOR PAPERS)

The international conference series "Parametric Optimization and Related Topics" was founded in 1985 and, since then, took place each 2-3 years in different places: the latter six conferences were held in Enschede (1995), Tokyo (1997), Dubrovnik (1999), Puebla (2002), Cairo (2005), and Cienfuegos (2007). From September 20 to 24, 2010, the Karlsruhe Institute of Technology will host the conference paraoptX.

Parametric optimization is a part of mathematical programming and has emerged as an exciting research area in theory, numerics and applications. It investigates the properties of solutions to optimization problems under data perturbations or uncertainty. Many relations to other disciplines of operations research, like stochastic programming, complementarity problems, mixed-integer problems, model-building, numerical methods, multi-objective optimization and optimal control, originate from these properties.

ParaoptX welcomes papers as well as proposals for special sessions on any area in parametric optimization or related topics. We hope that the conference will continue to help link researchers and practitioners from different areas of mathematical programming from around the world.

Invited speakers:

o Christodoulos A. Floudas (Princeton University, Princeton, USA)

o Sven Leyffer (Argonne National Laboratory, Argonne IL, USA)

o Boris Mordukhovich (Wayne State University, Detroit MI, USA)

o Jiri Outrata (Charles University, Prague, Czech Republic)

o Teemu Pennanen (Helsinki University of Technology, Helsinki, Finland)

o Andreas Waechter (IBM Watson Research Center, Yorktown Heights NY, USA)

Programm committee:

Chairs: Jan-J. Rueckmann (University of Birmingham, United Kingdom), Oliver Stein (Karlsruhe Institute of Technology, Germany)

*Members:*Wolfgang Achtziger (Technische Universitaet Dortmund, Germany), Roberto Cominetti (Universidad de Chile, Santiago, Chile), Asen Dontchev (National Science Foundation, Ann Arbor, USA), Miguel Goberna (Universidad de Alicante, Spain), Andreas Griewank (Humboldt-Universitaet zu Berlin, Germany), Juergen Guddat (Humboldt-Universitaet zu Berlin, Germany), Francisco Guerra (Universidad de las Americas, Puebla, Mexico), Alfredo Iusem (IMPA, Rio de Janeiro, Brazil), Florian Jarre (Heinrich-Heine-Universitaet Duesseldorf, Germany), Hubertus Th. Jongen (RWTH Aachen, Germany), Christian Kanzow (Universitaet Wuerzburg, Germany), Diethard Klatte (Universtiaet Zuerich, Switzerland), Michal Kocvara (University of Birmingham, United Kingdom), Marco Lopez (Universidad de Alicante, Spain), Juan Enrique Martinez Legaz (Universitat de Barcelona, Spain), Diethard Pallaschke (Karlsruhe Institute of Technology, Germany), Panos Pardalos (University of Florida, Gainesville FL, USA), Werner Roemisch (Humboldt-Universitaet zu Berlin, Germany), Ruediger Schultz (Universitaet Duisburg-Essen, Germany), Alexander Shapiro (Georgia Tech, Atlanta, USA), Georg Still (Universiteit Twente, The Netherlands), Jie Sun (National University of Singapore, Republic of Singapore), Kok Lay Teo (Curtin University of Technology, Perth, Australia), Tamas Terlaky (Lehigh University, Bethlehem PA, USA), Michel Thera (Universite de Limoges, France), Jane Ye (University of Victoria, Canada)

Organizing committee:

Chair: Oliver Stein (Karlsruhe Institute of Technology, Germany)

Members: Stefan Nickel (Karlsruhe Institute of Technology, Germany), Jan-J. Rueckmann (University of Birmingham, United Kingdom), Marcel Sinske (Karlsruhe Institute of Technology, Germany), Paul Steuermann (Karlsruhe Institute of Technology, Germany), Karl-Heinz Waldmann (Karlsruhe Institute of Technology, Germany)

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IMPORTANT DAYS

Abstract submission: May 21, 2010

Notification of acceptance: June 4, 2010

Early Registration: June 18, 2010

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- **ORSEA (6th Annual International Conference)**
  Kampala, Uganda
  October 14 - 15, 2010

Call for papers. The 6th Annual International ORSEA Conference will be held at the Makerere University Business School in Kampala, Uganda on October 14 and 15, 2010. The theme for the conference is 'Innovation in OR and Economic Transformation.' The organizers hope the exciting opportunity to interact with researchers from around the world and enjoy Lake Victoria, the Kasubi Tombs, the Uganda Museum, Bujagali falls, and several nearby game reserves and eco-tourism sites will entice you to attend this conference.

For more information contact Conference Chair Musa Moya of the Makerere University Business School at mmoya@mubs.ac.ug or +256-772-564-130.

The eastern African group appears to be improving their organizational skills (and getting information such as this out in a more timely manner).

- ## ORM2010 – VI Moscow International Conference on Operational Research
  ### Moscow, Russia
  ### October 20-25, 2010

http://io.cs.msu.su/

General information. The conference will bring together scientists from all over the world to discuss theoretical aspects and various applications of operation research. Dorodnicyn Computing Center of RAS (CC of RAS), Lomonosov Moscow State University and Russian Scientific Operation Research Society will organize the VIth Conference in October 2010 in Moscow. Working languages of the conference are English and Russian.

Topics of the conference and coordinators.

1.New models and methods (V.V. Morozov).

2.Optimization methods (A.F. Izmailov, Yu. Nesterov).

3.Multiple objective decision making (A.V. Lotov, V.V. Podinovskiy).

4.OR in economics (I.G. Pospelov, A.A. Shananin).

5.OR in military science (Yu.N. Pavlovsky).

6.OR in finance and insurance (F.I. Ereshko, D.V. Denisov).

7.OR in medicine, biology and ecology (A.A. Belolipetckiy, M.G. Kreines).

8.Computer-aided design (Yu. A. Flerov).

9.Game-theoretic models (E.Z. Mokhonko, N.S. Kukushkin).

10.Analysis of political processes and corruption (F.T. Aleskerov, A.A. Vasin)

11.Markets and auctions: analysis and design (A.A. Vasin, V.V. Morozov).

We gratefully acknowledge that M. Jacimovic (University of Montenegro), Yu. Nesterov (CORE, Universite Catholique de Louvain, Belgium), A. Shapiro (GaTech, the USA), G.-W. Weber and I. Dolgopolova (Middle East Technical University, Ankara, Turkey) have joined the team of organizers.

Program Committee.

Chair. A. A. Petrov (CC of RAS), F.T. Aleskerov (HSE), Yu.G. Evtushenko (CC of RAS), M. Jacimovic (University of Montenegro), Yu. Nesterov (CORE, Universite Catholique de Louvain) Yu.N. Pavlovsky (CC of RAS), I.G. Pospelov (CC of RAS), K.V. Rudakov (CC of RAS), G.I. Savin (Joint Supercomputer Center), A. Shapiro (GaTech), Yu. I. Zhuravlev (CC of RAS).

Organizing Committee.

Conference Chair. P.S. Krasnoschekov (CC of RAS), Yu.A. Flerov (co-chair, CC of RAS), A.A. Vasin (co-chair, MSU), A.A. Belolipetckiy (CC of RAS), N.M. Novikova (CC of RAS), A.V. Lotov (CC of RAS), Yu.E. Malashenko (CC of RAS), D.V. Denisov (MSU), A.F. Izmailov (MSU), E.Z. Mokhonko (CC of RAS), A.A. Shananin (MFTI), V.V. Morozov (MSU), F.I. Ereshko (CC of RAS), I. Dolgopolova and G.-W. Weber (METU, Ankara, Turkey).

Secretariat. The secretary of the Conference Irina I. Pospelova, deputy secretary – Marina Dolmatova.

Information on important dates, registration, submission of abstracts. Abstracts should be presented as a MS Word file, size a 2 pages, according to the attached template. Abstracts should be sent as a file attached to the letter to the following email address: io@cs.msu.su. Letter should have "ORM2010 abstract" in subject field and contain the name of the paper and authors in it.

No obligatory registration fees. Conference dinner and cultural program are up to the participants and can be paid at the registration.

Visas. The organizing committee provides visa support (if necessary) for all participants of the conference.

IMPORTANT DAYS

Abstract Submission: April 1, 2010
Notification of Acceptance: June 1, 2010

• RIVF 2010
The 2010 IEE-RIVF International Conference on Computing and Communication Technologies
Hanoi, Vietnam
November 2010

www.rifv.org

(FIRST ANNOUNCEMENT)

Evolving from a French speaking conference on computer sciences in its early stage, RIVF has become a major scientific event for researchers in the field of Computing and Communication Technologies, not only in Vietnam but also worldwide. RIVF 2009, held in Danang City, had received submissions coming from 23 countries across all the continents. RIVF 2010, during the celebration of 1000 years of Hanoi, is hosted by Hanoi University of Science of VNU-HN and Institute of Information Technology of VAST. RIVF 2010 continues to offer an opportunity for researchers and innovators to discuss problems, share results, identify emerging issues, and establish academic collaborations in various disciplines of computing and communications.

Conference Topics. The conference solicits submission of research papers in major areas of computing and communications, organized into the following seven tracks. Relevant topics of each track include, but are not limited to:

⋄ Information Management Track: Integrated information systems, decision support systems, information security, multimedia systems, e-commerce and business integration solutions, architecture, security performance of information systems, public health informatics, knowledge management.

Co-Chairs: Ralf-Detlef Kutsche, TU Berlin Bich-Thuy Dong, HCM University of Sciences

⋄ Computational Intelligence Track: Language and speech processing, soft computing, knowledge discovery and data mining, machine learning, computational biology, agent-based systems, semantic web, information extraction and retrieval.

Co-Chairs: Vincenzo Piuri, Milan University Gary G. Yen, Oklahoma State University

⋄ Communications and Networking Track: Network architecture, network protocols and security, parallel and distributed computing, grid computing, mobile and ubiquitous computing, quantum networks and communications.

Co-Chairs: Francine Krief, University of Bordeaux Anne Wei, University of Toulouse

⋄ Modeling and Computer Simulation Track: Data visualization, virtual reality, behaviour simulation, scientific computing.

Chair: Vu Duong, Eurocontrol

⋄ Applied Operational Research and Optimization Track: Linear programming, integer programming, dynamic programming, constraint propagation, heuristics, applications in control, production, and scheduling.

Chair: Vu Ngoc Phat, Institute of Mathematics-VAST

⋄ Software Engineering and Embedded Systems Track: Agile methods, component-based, modeldriven, grid-based software engineering, open source software development, product lines, software process, software testing and verification, embedded system testing and verification, integration and test; multi-core programming, real-time systems, web services.

Co-Chairs: Dang Van Hung, Coltech-VNUHN Tomasz Janowski, UNU-IIST

⋄ Human Machine Interface and Imaging Technologies: human-computer interface and interaction, multi media, image processing, imaging in chemistry, medicine, biology, geography, etc.

Chair: Yo-Sung Ho, Gwangju Institute of Science and Technology Minh Do, UIUC

Honorary Chairs. Hoang Van Phong Minister of Science and Technology, John Vig 2009 IEEE President

General Chairs. Patrick Bellot Telecom ParisTech, France, Tru Cao VNU-HCMUT, Vietnam

Program Chairs. Tu Bao Ho JAIST, Japan, Doug Zuckerman Telcordia IEEE ComSoc, USA, Pierre Kuonen HES-SO/EIA-FR, Switzerland

Organizing Chairs. Luong Chi Mai VAST, Vietnam. Nguyen Thi Minh Huyen VNU-HN, Vietnam, Bich-Thuy T. Dong VNU-HCMUS, Vietnam

Tutorial Chairs. Huynh Quyet Thang HUT, Vietnam, Richard Nguyen SPAWAR System Center, USA

Workshop Chairs. Nguyen Viet Ha VNU-HN, Vietnam, Pham Hi Duc ECE, France

Publication Chairs. Akim Demaille EPITA, France, Ralf-Detlef Kutsche TU Berlin, Germany

Finance Chair. Marc Bui EPHE, France

Local Organising Committee. Ngo Cao Son VAST, Vietnam, Le Vinh Trong VNU-HN, Vietnam, Nguyen Duc Dung VAST, Vietnam

International Advisory Committee. Nim Cheung ASTRI, China, George Donohue GMU, USA, Janina Mazierska Massey Uni., NZ Dinh-Tri Nguyen IFI, Vietnam, Jung-Uck Seo Academy of Science, Korea, Jean-Marc Steyeart Polytechnique, France, Anders Ynnerman Linkoping Uni., Sweden

Contacts.

Tu Bao Ho, Japan Advanced Institute of Science and Technology, PhoneFax: 81-761511730, e.mailbao@jaist.ac.jp

Nguyen Thi Minh Huyen, Hanoi Univ. of Science, VNU-HN, Phone: 84-4-38581530, e.mail huyenntm@hus.edu.vn

Conference Organizers. IEEE Vietnam Section, RIVF Association, France, Institute of Information Technology, VAST, Vietnam, Hanoi University of Science, VNU-HN, Vietnam

Paper Submission: Authors are invited to submit papers up to 6 pages, in English, describing the results of their research, or of their innovative, practical applications relevant to the conference topics. All papers must be original contributions and not previously published, nor currently under consideration, for publication elsewhere. All papers will be submitted on-line, in PDF format using IEEE standard template, to the conference website. Each paper will be reviewed by the program committee for its originality, relevance, and clarity. Accepted papers will be published in the main conference proceedings registered with IEEE Xplore and referenced in international libraries.

Call for Tutorials: The conference will be started with one day of tutorials on its topics. Tutorial proposals are invited and should be submitted by May 14, 2010, to the Tutorial Chair at ThangHQ@it-hut.edu.vn. Each proposal should include one page of a sketch biography of the instructor, outline of the tutorial, and pre-requisites for the intended audience.

Call for Workshops: The conference will be started with one day of invited workshops. Workshop proposals are invited and should be submitted by May 14, 2010, to the Workshop Chair at hanv@vnu.edu.vn. Each proposal should include one page of a sketch biography of the instructor, outline of the workshop.

IMPORTANT DAYS

Paper submission deadline: May 22, 2010
Acceptance notification: July 19, 2010
Camera-ready paper submission and author registration: August 12, 2010
Tutorials and Workshops: November 1, 2010

• LAGOS'11 - VI Latin-American Algorithms, Graphs, and Optimization Symposium
Bariloche, Argentina
April 4-8, 2011

http://www-2.dc.uba.ar/lagos2011 - lagos2011@dc.uba.ar

Aims and scope. LAGOS - Latin-American Algorithms, Graphs, and Optimization Symposium, is the union of two Latin-American Conferences on these subjects: the GRACO - Brazilian Symposium on Graphs, Algorithms, and Combinatorics and the LACGA - Latin-American Conference on Combinatorics, Graphs, and Applications.

The previous editions were held in Fortaleza, Brazil (2001), Santiago, Chile (2004), Angra dos Reis, Brazil (2005), Puerto Varas, Chile (2007), and Gramado, Brazil (2009). The proceedings of the accepted papers were published in Electronic Notes in Discrete Mathematics, and special editions of Discrete Applied Mathematics were dedicated to refereed full papers from these events.

Celebrating 30 years from the publication of M. Grötschel, L. Lovász, and A. Schrijver "The Ellipsoid Method and its Consequences in Combinatorial Optimization" fundamental article.

Organization.

- Computer Science Department, School of Natural and Exact Sciences, University of Buenos Aires, Argentina

- Sciences Institute, National University of General Sarmiento, Argentina

- Laboratoire d'Informatique, Paris-Nord University, France

Conference themes. Themes include, but are not limited to, the following AMS classification: Algorithms: analysis of algorithms; approximation algorithms; randomized algorithms; Operations Research and Mathematical Programming: combinatorial optimization; integer programming; polyhedral combinatorics; operations research and management science; Graph Theory: cliques, dominating and independent sets; coloring of graphs and hypergraphs; covering and packing, factorization, matching; digraphs, tournaments; graph algorithms; graphs and matrices; hypergraphs; perfect graphs; random graphs; structural characterization of types of graphs.

Invited speakers.

- Martin Grötschel (ZIB Berlin, Technische Universität Berlin, and DFG-Forschungszentrum Matheon, Germany)

- László Lovász (U. Eötvös Loránd, Hungary)

- Maria Chudnovsky (Columbia University, USA)

- Guillermo Durán (UBA, Argentina and U. Chile, Chile)

- Abílio Lucena (UFRJ, Brazil)

- Martín Matamala (U. Chile, Chile)

- Gianpaolo Oriolo (U. Tor Vergata, Italy)

- Gautier Stauffer (U. Bordeaux 1, France)

Submissions. Instructions for submission preparation may be obtained in the ENDM web page (www.elsevier.com/locate/endm). Submission instructions can be found at the symposium web page.

<p align="center">IMPORTANT DAYS</p>

<p align="center">**Deadline for Submissions:** November 1, 2010
Acceptance notification: January 31, 2011</p>

- **19th Triennial Conference of the International Federation of Operational Research Societies**
  World OR: Global Economy and Sustainable Environment
  Melbourne, Australia
  10th - 15th July, 2011

<p align="center">http://www.ifors2011.org</p>

<p align="center">(SECOND CALL FOR PAPERS)</p>

Recent natural catastrophes and man-made crises have underscored the inter-connectedness of our world. Any upheaval leads to momentous reverberations across the globe with impacts well into the future. Now more than ever, Operational Research is of strategic importance to address problems critical to the economy and the environment.

Academics and practitioners are invited to share their knowledge, experience and insights on theory, methodology and application of operational research to issues of vital concern to the global community.

Call for Papers. Papers on all aspects of Operational Research are invited. Authors wishing to present are requested to submit an abstract of not more than 100 words by 15 December, 2010.

Conference Organizing Committee.

Chair: Dr Patrick Tobin, School of Arts and Sciences (Vic), Australian Catholic University, Melbourne Campus (St Patrick's), e.mail: Patrick.Tobin@acu.edu.au, Phone: +61 3 9953 3199, Fax: +61 3 9495 6141

Secretary: Ms. Kaye Marion, Senior lecturer in Operations Research and Statistics, RMIT University, e.mail: k.marion@rmit.edu.au, Phone: +61 3 9925 3162

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Invited Streams. Airline Applications, Analytic Hierarchy Process, Applied Probability, Approximation algorithms, Bioinformatics, Combinatorial Optimization, Constraint programming (CP-AI), Continuous optimisation, Cutting and Packing, Data Envelopment Analysis, Discrete Optimisation, Economics of Operations, Education, Emergency Evacuation and Response, Forestry applications, Fuzzy Logic, Health Care Applications, Integer Programming, Knowledge Management and Data Mining, Learning and Intelligent Optimisation, Marine Transportation and Ports, Marketing and OM Interface, Meta-heuristics, Mining Applications, Multi-criteria Decision Analysis, Multiple Criteria Decision Support, Network optimisation, Non-linear discrete optimisation, Non-linear optimisation, Non-smooth optimisation, Operations Management, OR and Energy Markets, OR and Marketing, OR and Real Implementation, OR and Sports, OR and Sustainable Development, OR Applications in Energy, OR Practice, OR software, Production, Public Transit, Revenue Management, Scheduling, Service Health Care Operations, Software Engineering, Stochastic optimisation and applications, Stochastic programming, Submodular Structures and Optimization, Supply Chain Management, Supply Chain Management in China, Telecommunications, Time-Definite Logistics, Transportation, Travel Behaviour, Vehicle Routing

Contacts. For enquiries, please contact the Programme Committee Chair Prof. Janny M.Y. Leung Department of Systems Engineering and Engineering Management The Chinese University of Hong Kong Shatin, New Territories, Hong Kong, Phone: +(852) 2609-8238, E-mail: jleung@se.cuhk.edu.hk

Awards. IFORS Prize for OR in Development:

Submissions are invited of papers describing a practical OR application in a developing country, related to education, health, water, technology, resource use, infrastructure, agriculture, environmental concerns, etc.

Enquiries should be sent to the Prize Committee Chair. Dr. Subhash Datta, Director Jaipuria Institute of Management 1 Bambala Institutional Area, Pratap Nagar, Jaipur - 302033 India, e-mail: subhash.datta@gmail.com or sdatta@jimj.ac.in

Software and Book Exhibition. Companies are invited to exhibit their books, products and software that have relevance to Operational Research. Potential exhibitors should contact the Conference Secretariat.

IMPORTANT DAYS

Deadline for contributed abstracts: December 15, 2010
Deadline for invited abstracts: January 15, 2011

Awards and Nominations

- ## SIAM/Optimization Prize 2011

Principal Guideline. The SIAM Activity Group on Optimization (SIAG/OPT) Prize, established in 1992, is awarded to the author(s) of the most outstanding paper, as determined by the prize committee, on a topic in optimization published in English in a peer-reviewed journal. The award is to be made at the 2011 SIAM Conference on Optimization 15th - 19th May in Darmstadt, Germany.

Deadline. Deadline for the nomination: November 15, 2010.

Applications. Nominations, together with a pdf version of the paper, should be submitted via email to one of the members of the Prize Committee before the deadline.

Prize Committee.

Yinyu Ye, Stanford University (*Chair*),

Shabbir Ahmed, Georgia Tech, Philip Gill, University of California - San Diego, Etienne de Klerk, Tilburg University, The Netherlands, Jean Philippe Richard, the University of Florida

Selection Procedures.

Eligibility. Candidate papers must be published in English in a peer-reviewed journal bearing a publication date within the award period. They must contain significant research contributions to the field of optimization, as commonly defined in the mathematical literature, with direct or potential applications. The chair of the SIAG, the vice chair of the SIAG, and the members of the nominating committee are not eligible to receive the prize.

Committee's Nomination. The prize committee will notify the SIAM President of its selection at least five months prior to the award date. The prize committee must select one paper that determines the prize winner(s). The notification must be accompanied by a written justification and a citation not exceeding 25 words that can be used for a certificate and read at award time. The SIAM President will accept or reject the nomination at least four months prior to the award date; the advice of the SIAM Council, its Executive Committee, and the SIAG/OPT Chairperson may be solicited.

If the nomination is accepted, the award presentation will be made according to the procedure below. If the nomination is not accepted, the President and the Chairperson of the Prize Committee will select an acceptable paper at least three months prior to the award date.

Notification of Award. The Chairperson of the Prize Committee will notify the recipient(s) of the award at least three months in advance of the award date. An invitation will also be extended to the recipient(s) to attend the award ceremony to receive the award and to present the paper.

Description of the Award. The award will consist of a plaque and a certificate containing the citation. If the selected paper has multiple authors, each author will receive a plaque and certificate. There will be no cash award associated with the prize.

Award Date and Period. Beginning in 1995, the prize will be awarded every third year at the triennial SIAM Conference on Optimization. The award period will be the four calendar years preceding the year of the meeting. The overlap in award periods is intended to ensure that no paper will fail to be considered because of differences between the official publication date of the journal issue containing the paper and the actual time when that issue reaches its subscribers or because of the requirements that the committee notify the SIAM President at least five months prior to the awarding of the prize.

Obligations of Recipient. At least one of the awardees is expected to attend the award ceremony and to present the paper at the meeting. Travel expenses are not normally available to reimburse the recipient(s) for expenses incurred in attending the award ceremony.

The Prize Fund. Since there is no cash award and minimal expenses associated with the prize, there will be no prize fund. The cost of the plaque and certificate will be financed by the SIAG/OPT membership dues.

The Award Presentation. The Chairperson of the SIAG/OPT will announce the award at the chosen meeting and present the award to the recipient(s) who is present. The co-author recipient(s) is not required to be present to receive the award.

Announcement. An announcement of the award recipient(s) will appear in SIAM News and the SIAG/OPT Newsletter.

Prize History.

Previous recipients of the SIAM Activity Group on Optimization Prize:

1996 Dimitris J. Bertsimas and Michel X. Goemans

1999 Michel X. Goemans and David P. Williamson

2002 Kurt Anstreicher, Nathan Brixius, Jean-Pierre Goux, and Jeff Linderoth

2005 Raphael Hauser

2008 Alexandre d'Aspremont, Laurent El Ghaoui, Michael I. Jordan, and Gert R.G.

Job opportunities

- **Predoctoral Researcher Derivative-Free Optimization of Complex Systems**

The Mathematics and Computer Science (MCS) Division at Argonne National Laboratory invites outstanding candidates to apply for a predoctoral position focusing on research in optimization algorithms and software for complex scientific simulations.

The successful applicant will be working with a multidisciplinary group on basic research on algorithms and software for applications that typically run on high-performance architectures such as Argonne's 26-teraflop Fusion cluster or the 557-teraflop IBM Blue Gene/P system.

Applicants must have recently received a B.S. or M.S. in mathematics, computer science or a related discipline. Candidates should have a strong background in scientific computing

and numerical analysis, and considerable experience programming with MATLAB and C/C++ or Fortran. Experience in parallel programming (MPI) is highly desirable.

The appointment will be in the MCS Division (www.mcs.anl.gov), which has strong programs in computational mathematics, scientific computing and software tools. Argonne is located in the southwestern Chicago suburbs, offering the advantages of affordable housing, good schools, and easy access to the cultural attractions of the city.

Applications must include a curriculum vitae with a description of the candidate's qualifications for the position, and the names of at least two references who can attest to the candidate's ability. Send applications to Jorge More' (more@mcs.anl.gov) or Stefan Wild (wild@mcs.anl.gov).

A U.S. Department of Energy laboratory managed by UChicago Argonne, LLC, Argonne is an equal opportunity employer, and we value diversity in our workforce.

International Research Centres on Optimization

- ## OPTEC - Optimization in Engineering Center - Belgium

Description

The **Optimization in Engineering Center (OPTEC)** was created in 2005 as one of the twelve Centers of Excellence at the Katholieke Universiteit Leuven (Belgium). OPTEC is a center of interdisciplinary research on engineering applications of mathematical optimization, emerging from five different engineering fields: computer science, as well as chemical, mechanical, civil and electrical engineering. The main OPTEC objective is to shift the international state of the art by developing new and efficient formulations of the application-specific optimization problems that arise in each of the considered domains. Such new formulations will be the result of synergetic cooperation between experts in both mathematical programming and each of the application domains, who are brought together within the OPTEC framework.

Research structure

The OPTEC center consists of 15 faculty members, 20 post-docs and about 60 doctoral students. All research at OPTEC is guided by the idea that method development and real world engineering applications should go closely hand in hand. Consequently, research is structured within six **Working Groups** (WGs), where mathematical programming and application oriented experts meet.

- *WG1 Dynamic and embedded optimization* concerns fast (non)linear model predictive control algorithms and their implementation on low-level hardware to be used in, e.g., power generating kites and robotics.

- *WG2 Data-driven modeling* involves system identification and pattern recognition for massive data sets generated by, e.g., medical or chemical applications.

- *WG3 Parameter and state estimation* relates to the fast online and/or reliable offline estimation of states and parameters in first-principles models for, e.g., bioreactor processes, as well as to optimal experiment design approaches,

- *WG4 Shape and topology optimization* involves the optimal design of structures in civil and mechanical engineering such as bridges and weaving machines.

- *WG5 Advanced linear systems analysis and control* focuses on the control of linear infinite-dimensional and parameter varying systems such as pick and place robots.

- *WG6 PDE-constrained optimization*, concentrates on the optimization of multi-disciplinary applications governed by multi-scale PDE systems such as wind farms.

Illustration of engineering applications studied in the different Working Groups.
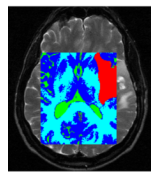
(a) Robot   (b)   NMR-image   (c) Bioreactor   (d) Footbridge   (e)   Pick&place robot   (f) Wind farm

Events

OPTEC is involved in the organization of a number of events:
(*i*) undergraduate and graduate courses in mathematical programming, (*ii*) summer courses and courses within the ATHENS framework, (*iii*) bi-weekly seminars given by researchers from inside and outside K.U.Leuven, and (*iv*) the *Simon Stevin Lecture Series on Optimization in Engineering*. This series was set up in order to promote optimization in engineering and is called after Simon Stevin (1548-1620) a Flemish mathematician and engineer. For this aim, every quarter of the year an outstanding international scholar is invited to report on latest progress in the development of optimization algorithms and their applications in engineering. Within this series OPTEC was happy to welcome Dominique Bonvin (EPFL, Switzerland), Tamas Terlaky (Lehigh University, US), Lieven Vandenberghe (UCLA, US), Georg Bock (Heidelberg University, Germany), Martin Bendsøe (Technical University of Denmark, Denmark), Aharon Ben-Tal (Technion, Israel), Michael Overton (New York University, US), Julio Banga (Spanish Council for Scientific Research, Spain), David Mayne (Imperial College London, UK), Manfred Morari (ETH Zurich, Switzerland), Stephen Wright (University of Wisconsin-Madison, US), Stephen Boyd (Stanford, US) and Lorenz Biegler (Carnegie Mellon, US).

Contact

More detailed information, upcoming and past events, software, collaborations and job offers can be obtained from the website: www.kuleuven.be/optec or by contacting:

- Moritz Diehl moritz.diehl@esat.kuleuven.be (Principal Investigator)

- Joos Vandewalle joos.vandewalle@esat.kuleuven.be (Coordinator until October 2010)

- Jan Van Impe jan.vanimpe@cit.kuleuven.be (Coordinator from November 2010 on)

Invited Short Note

The material of this section is proposed by Adil M. Bagirov and Julien Ugon, the Centre for Informatics and Applied Optimization, Graduate School of Information Technology and Mathematical Sciences, University of Ballarat, Australia.

"An efficient heuristic algorithm for solving large scale clustering problems"
by Adil M. Bagirov and Julien Ugon
E-mail: a.bagirov@ballarat.edu.au and j.ugon@ballarat.edu.au

In this paper, we describe an heuristic algorithm for solving cluster analysis problems on large data sets. Cluster analysis, also known as unsupervised data classification, is an important subject in data mining. Its aim is to partition a collection of patterns into clusters of similar data points. In cluster analysis we assume that we have been given a finite set of points A in the n-dimensional space $\mathbb{R}^n$, that is $A = \{a^1, \ldots, a^m\}$, where $a^i \in \mathbb{R}^n$, $i = 1, \ldots, m$.
We consider the hard unconstrained partition clustering problem, that is the distribution of the points of the set A into a given number k of disjoint subsets A^j, $j = 1, \ldots, k$ with respect to predefined criteria such that:

1) $A^j \neq \emptyset$, $j = 1, \ldots, k$;

2) $A^j \bigcap A^l = \emptyset$, $j, l = 1, \ldots, k$, $j \neq l$;

3) $A = \bigcup\limits_{j=1}^{k} A^j$;

4) no constraints are imposed on the clusters A^j, $j = 1, \ldots, k$.

The sets A^j, $j = 1, \ldots, k$ are called clusters. We assume that each cluster A^j can be identified by its center (or centroid) $x^j \in \mathbb{R}^n$, $j = 1, \ldots, k$. There are different reformulations of the clustering problem as an optimization problem. They are equivalent in the sense that they have the same global minimizers. A nonsmooth, nonconvex optimization formulation is as follows [2]:

$$\text{minimize} \quad f_k(x) \quad \text{subject to } x = (x^1, \ldots, x^k) \in \mathbb{R}^{n \times k}, \tag{1}$$

where

$$f_k(x^1, \ldots, x^k) = \frac{1}{m} \sum_{i=1}^{m} \min_{j=1,\ldots,k} \|x^j - a^i\|^2. \tag{2}$$

Here $\| \cdot \|$ is the Euclidean norm. In this case the problem (1) is also known as the minimum sum-of-squares clustering problem. Many algorithms have been developed to solve problem (1) (see, for example, [3, 6]). Most of them are not applicable to solve clustering problems in even moderately large data sets. Problem (1) is a global optimization problem, however the solving such problems in large data sets is out of reach by any existing global optimization technique. Over the last several years different incremental algorithms have been proposed to solve (1) [1, 2, 4, 5]. In these algorithms clusters are computed incrementally by solving all intermediate clustering problems [1, 2, 4, 5]. The global k-means algorithm proposed in [5] and the modified

global k-means algorithm proposed in [1] are incremental clustering algorithms. These algorithms allow one to find global or near global minimizers of the cluster (or error) function (2). However, they are very time consuming on large data sets as the computation of the affinity matrix is required at each iteration.

In this paper, a fast version of the modified global k-means algorithm is proposed. We apply an auxiliary cluster function, introduced in [1], to generate a set of starting points lying in different parts of the data set. We exploit information gathered in previous iterations of the incremental algorithm to avoid computing the whole affinity matrix. Also the triangle inequality for distances is used to avoid unnecessary computations.

Modified global k-means algorithm

The modified global k-means algorithm, introduced in [1], is an incremental clustering algorithm. To solve k-partition problem, this algorithm starts with the computation of one cluster center, that is with the computation of the centroid of the data set, and attempts to optimally add one new cluster center at each iteration. An auxiliary cluster function is defined using $k-1$ cluster centers from the $(k-1)$-st iteration and is minimized to compute the starting point for the k-th center. Then this new center together with previous $k-1$ cluster centers is taken as a starting point for the k-partition problem. The k-means algorithm is applied starting from this point to find the k-partition of the set A. Such an approach allows one to find a global or a near global solution to Problem (1).

Next we briefly describe the modified global k-means algorithm. Assume that the solution $x^1, \ldots, x^{k-1}$ to the $(k-1)$-partition problem and the corresponding value $f_{k-1}^* = f_{k-1}(x^1, \ldots, x^{k-1})$ of the function f_{k-1} in (2) are known. Here $k > 1$. We introduce the so-called auxiliary cluster function [1]:

$$\bar{f}_k(y) = \frac{1}{m} \sum_{i=1}^{m} \min \left\{ d_{k-1}^i, \|y - a^i\|^2 \right\}. \tag{3}$$

Here d_{k-1}^i is the squared distance between a^i and the closest center among $k-1$ cluster centers $x^1, \ldots, x^{k-1}$:

$$d_{k-1}^i = \min \left\{ \|x^1 - a^i\|^2, \ldots, \|x^{k-1} - a^i\|^2 \right\}. \tag{4}$$

It is obvious that $\bar{f}_k(y) = f_k(x^1, \ldots, x^{k-1}, y), \quad y \in \mathbb{R}^n$. Consider the following set

$$P = \left\{ y \in \mathbb{R}^n : \exists I \subset \{1, \ldots, m\}, \ I \neq \emptyset : \|y - a^i\|^2 < d_{k-1}^i \quad \forall i \in I \right\}. \tag{5}$$

The set P contains all points from $\mathbb{R}^n$ which are not cluster centers and can attract at least one data point from the set A. It is clear that $x^j \notin P$ for all $j = 1, \ldots, k-1$ and $a^i \in P$ for all $a^i \in A : \ a^i \neq x^j, \ j = 1, \ldots, k-1$. It is also clear that $\bar{f}_k(y) < f_{k-1}^*$ for all $y \in P$. For any $y \in P$ consider the following set:

$$S(y) = \left\{ a^i \in A : \|y - a^i\|^2 < d_{k-1}^i \right\}, \tag{6}$$

The set $S(y)$ contains all points from A which are attracted by the point $y \in P$. $S(y) \neq \emptyset$ for any $y \in P$.

A starting point for the k-th cluster center is found as a solution to the following minimization problem:

$$\text{minimize} \quad \bar{f}_k(y) \quad \text{subject to} \quad y \in \mathbb{R}^n. \tag{7}$$

The algorithm for solving Problem (7) involves the k-means algorithm and proceeds as follows.

Algorithm 1. An algorithm for finding a starting point.

Step 1. For each $a^i \in P \bigcap A$ compute the set $S(a^i)$, its center c^i and the value $\bar{f}_{k,a^i} = \bar{f}_k(c^i)$ of the function $\bar{f}_k$ at the point c^i.

Step 2. Compute $\bar{f}_{k,min} = \min_{a^i \in P \bigcap A} \bar{f}_{k,a^i}$, $a^j = \operatorname{argmin}_{a^i \in P \bigcap A} \bar{f}_{k,a^i}$, select the corresponding center c^j and the set $S(c^j)$.

Step 3. Recompute the set $S(c^j)$ and its center until no more data points escape or return to this cluster. The final value of c^j is a starting point for the k-th cluster center.

Now we describe the modified global k-means algorithm.

Algorithm 2. Modified global k-means algorithm (MGKM).

Step 1. (Initialization). Compute the center $x^1 \in \mathbb{R}^n$ of the set A. Set $q := 1$.

Step 2. (Computation of the next cluster center). Set $q := q+1$. Let $x^1, \ldots, x^{q-1}$ be the cluster centers for $(q-1)$-partition problem. Apply Algorithm 1 to find a starting point $\bar{y} \in \mathbb{R}^n$ for the q-th cluster center.

Step 3. (Refinement of all cluster centers). Select $(x^1, \ldots, x^{q-1}, \bar{y})$ as a new starting point, apply the k-means algorithm to solve the q-partition problem. Let $y^1, \ldots, y^q$ be a solution to this problem.

Step 4. (Stopping criterion). If $q = k$ then stop, otherwise set $x^i = y^i$, $i = 1, \ldots, q$ and go to Step 2.

Solution of the auxiliary problem
Let $U = \{u_1, \ldots, u_p\}$ be a finite set of positive numbers and $u \in U$. We modify the auxiliary function $\bar{f}_k$ as follows:

$$\bar{f}_k^u(y) = \frac{1}{m} \sum_{i=1}^{m} \min \left\{ d_{k-1}^i, u\|y - a^i\|^2 \right\}. \qquad (8)$$

If $u = 1$ then $\bar{f}_k^u(y) = \bar{f}_k(y)$ for all $y \in \mathbb{R}^n$. Let $u \in U$ be given. Introduce the following set:

$$P(u) = \left\{ y \in \mathbb{R}^n : \exists I \subset \{1, \ldots, m\}, \ I \neq \emptyset : u\|y - a^i\|^2 < d_{k-1}^i, \ \forall i \in I \right\}.$$

Then for any $y \in P(u)$ consider the following set:

$$S^u(y) = \left\{ a^i \in A : u\|y - a^i\|^2 < d_{k-1}^i \right\}. \qquad (9)$$

The set $S^u(y)$ contains all data points attracted by the point $y \in P$ with given weight $u > 0$. The following algorithm finds the starting point for the k-th cluster center.

Algorithm 3. An algorithm to find the starting point.

Step 0. Set $t := 0$.

Step 1. Set $t := t + 1$. If $t > p$ then go to Step 6. Otherwise take $u(t) \in U$.

Step 2. For each $a \in P(u(t)) \bigcap A$ compute the set $S^{u(t)}(a)$, its center c and the value $\bar{f}_{k,a}^{u(t)} = \bar{f}_k^{u(t)}(c)$ of the function $\bar{f}_k^{u(t)}$ at the point c.

Step 3. Compute
$$\bar{f}^{u(t)}_{k,min} = \min_{a \in P(u(t)) \bigcap A} \bar{f}^{u(t)}_{k,a}, \quad \bar{a} = \underset{a \in P(u(t)) \bigcap A}{\operatorname{argmin}} \bar{f}^{u(t)}_{k,a},$$
the corresponding center $\bar{c}$ and the set $S^{u(t)}(\bar{c})$.

Step 4. Recompute the set $S^{u(t)}(\bar{c})$ and its center until no more data points escape or return to this set. Let $\bar{c}(u(t))$ be the final value for the center $\bar{c}$. Compute the value $\bar{f}_{k,t}$ of the auxiliary function $\bar{f}_k$ at the point $\bar{c}(u(t))$.

Step 5. Go to Step 1.

Step 6. Compute $\bar{f}_{k,min} = \min_{t=1,\ldots,p} \bar{f}_{k,t}$ and $t_0 \in \{1,\ldots,p\}$ such that $\bar{f}_{k,t_0} = \bar{f}_{k,min}$. Set $\bar{c}_f = \bar{c}(u(t_0))$. $\bar{c}_f$ is a starting point for the k-th cluster center.

In order to solve the subproblem (7) Algorithm 3 applies the k-means algorithm (Step 4). Here we update only one cluster center and other cluster centers are known from previous iteration and fixed. Since the k-means algorithm is able only to find local solutions to this problem more than one starting points are used to find as better solution as possible. Starting points are computed in Step 1 using the function (8) with different values of u. If u is sufficiently small then the starting point will be close to other cluster centers, most likely near the center of the largest cluster. If $u = 1$ we get the same starting point as in the case of Algorithm 1. As we increase u the starting points become more isolated data points. Thus such an approach allows one to find starting points from different parts of the data set. In Steps 1-4 we obtain a set of local minimizers of the function $\bar{f}_k$ and then we choose the best solution as the starting point for the k-th cluster center (Step 6).

The following algorithm is the further modification of the modified global k-means algorithm. The difference between the new version and Algorithm 2 is in Step 2 where Algorithm 3 is applied instead of Algorithm 1.

Algorithm 4. Multi-start modified global k-means algorithm (MSMGKM).

Step 1. (Initialization). Compute the center $x^1 \in \mathbb{R}^n$ of the set A. Set $q := 1$.

Step 2. (Computation of the next cluster center). Set $q := q+1$. Let $x^1, \ldots, x^{q-1}$ be the cluster centers for $(q-1)$-partition problem. Apply Algorithm 3 to find a starting point $\bar{y} \in \mathbb{R}^n$ for the q-th cluster center.

Step 3. (Refinement of all cluster centers). Select $(x^1, \ldots, x^{q-1}, \bar{y})$ as a new starting point, apply the k-means algorithm to solve the q-partition problem. Let $y^1, \ldots, y^q$ be a solution to this problem.

Step 4. (Stopping criterion). If $q = k$ then stop, otherwise set $x^i = y^i$, $i = 1, \ldots, q$ and go to Step 2.

Reduction of computational effort
An incremental approach provides information to further decrease the computational effort in the MSMGKM algorithm and to avoid to compute the whole affinity matrix at each iteration. We will discuss some approaches to reduce the amount of computations in the MSMGKM algorithm.
In Algorithm 4 the most time consuming step is Step 2, where we apply the reduced k-means algorithm (Algorithm 3) to minimize the auxiliary function for different $u \in U$ and to find the starting point for the k-th cluster center. In Algorithm 3 the most time consuming step is Step

2. In this step first we compute clusters for each data point $a \in P(u(t)) \bigcap A$. This requires the computation of the affinity matrix. Then we compute centers of those clusters and the value of the function $\bar{f}_k^u$ at these centers. Since we get one center for each data point the complexity of the computation of the function $\bar{f}_k^u$ is the same as the complexity of the computation of the affinity matrix.

We consider two schemes to reduce the amount of computational effort in Step 2 of Algorithm 3. Both schemes exploit the incremental nature of the algorithm. We suggest to use the distances between data points and cluster centers instead of the affinity matrix. Since the number of clusters is significantly less than the number of data points the former matrix is much smaller than the latter one. Let $x^1, \ldots, x^{k-1}$, $k \geq 2$ be known cluster centers.

$$v_{il} = \|a^i - x^l\|^2$$

is the squared distance between the data point a^i, $i = 1, \ldots, m$ and the cluster center x^l, $l = 1, \ldots, k - 1$. Then we can consider an $m \times (k - 1)$ matrix $V_{k-1} = (v_{il})$, $i = 1, \ldots, m$, $l = 1, \ldots, k - 1$. We also consider the vector $D_{k-1} = (d_{k-1}^1, \ldots, d_{k-1}^m)$ of m components where d_{k-1}^1 is the squared distance between the data point a^i and its cluster center in the $(k-1)$-partition. Note that the matrix V_{k-1} and the vector D_{k-1} are available after the $(k-1)$-st iteration.

The first approach, to reduce the computational effort in Step 2 of Algorithm 3, is simple. Let a data point $a^j \in A$ be given and $x^{l(j)}$ is its cluster center. Here $l(j) \in \{1, \ldots, k - 1\}$. For a given $u \in U$ and data point a^i if

$$v_{il(j)} \geq \left(1 + \frac{1}{\sqrt{u}}\right)^2 d_{k-1}^j$$

then $a^j \notin S^u(a^i)$. Indeed,

$$\|a^i - a^j\| \geq \|a^i - x^{l(j)}\| - \|a^j - x^{l(j)}\| \geq (1/\sqrt{u})\|a^j - x^{l(j)}\|,$$

that is $u\|a^i - a^j\|^2 \geq d_{k-1}^j$ and therefore $a^j \notin S^u(a^i)$. This condition allows us to reduce the number of pairwise distance computations. This reduction becomes substantial as the number of clusters increases. We introduce the following set:

$$R^u(a^i) = \left\{ a^j \in A : \ v_{il(j)} < \left(1 + \frac{1}{\sqrt{u}}\right)^2 d_{k-1}^j \right\}.$$

Results described above show that $S^u(a^i) \subset R^u(a^i)$. Then we can use the set $R^u(a^i)$ instead of the set A to compute the value of the function $\bar{f}_k^u$ in Step 2 of Algorithm 3. In this case we may not get the exact value of this function however it gives a good approximation to the exact value. Moreover, one can take

$$w \in \left(1, \left(1 + \frac{1}{\sqrt{u}}\right)^2\right],$$

consider the set

$$R_w^u(a^i) = \left\{ a^j \in A : \ \|a^i - a^j\|^2 < w d_{k-1}^j \right\}.$$

and then replace A by $R_w^u(a^i)$ for the computation of the function $\bar{f}_k^u$. This will further reduce the amount of computational effort in Step 2 of Algorithm 3.

The second approach is based on the fact that data points which are very close to previous cluster centers cannot be considered as candidates to be starting point to minimize the auxiliary function. At the $(k-1)$-st iteration we compute a squared averaged radius of each cluster A^l, $l = 1, \ldots, k-1$

$$r_l^2 = \frac{1}{|A^l|} \sum_{a \in A^l} \|x^l - a\|^2$$

and a squared maximum radius

$$r_l^{max} = \max_{a \in A^l} \|x^l - a\|^2.$$

Here $|\cdot|$ is the cardinality of a set. Consider the following numbers

$$\alpha = \frac{r_l^{max}}{r_l^2} \geq 1, \quad \beta = \varepsilon(\alpha - 1).$$

Here ε is a sufficiently small number. Introduce the following numbers

$$\gamma_{lk} = 1 + \beta_l(k-1), \ l = 1, \ldots, k-1.$$

It is clear that $\gamma_{lk} \geq 1, \ l = 1, \ldots, k-1$. Consider the following subset of the cluster A^l:

$$\bar{A}^l = \{a \in A^l : \ \|x^l - a\|^2 \geq \gamma_{lk} r_l^2\}.$$

In other words we remove from the cluster A_l all points for which $\|x^l - a\|^2 < \gamma_l r_l^2$. In incremental approach the clusters are becoming more stable as their number k increases. Therefore we also increase the numbers γ_{lk} as k increases. Consider the set

$$\bar{A} = \bigcup_{l=1,\ldots,k-1} \bar{A}^l.$$

Only data points $a \in \bar{A}$ are considered as the candidates to be starting points for minimizing the auxiliary function $\bar{f}_k$. One can see that the use of the above described approaches allow us to avoid the computation of the whole affinity matrix.

Thus, Steps 2 and 3 of Algorithm 3 can be rewritten as follows:

Step 2'. For each $a \in P(u(t)) \bigcap \bar{A}$ compute the set $S^{u(t)}(a)$, its center c and the value $\bar{f}_{k,a}^{u(t)} = \bar{f}_k^{u(t)}(c)$ of the function $\bar{f}_k^{u(t)}$ at the point c over the set $R_w^u(a^i)$.

Step 3'. Compute

$$\bar{f}_{k,min}^{u(t)} = \min_{a \in P(u(t)) \bigcap \bar{A}} \bar{f}_{k,a}^{u(t)}, \quad \bar{a} = \underset{a \in P(u(t)) \bigcap \bar{A}}{\mathrm{argmin}} \ \bar{f}_{k,a}^{u(t)},$$

the corresponding center $\bar{c}$ and the set $S^{u(t)}(\bar{c})$. One can take $w = 1.5$ and $\varepsilon = 0.001$.

Computational complexity of algorithms

The fast global k-means algorithm from [5] requires $O(mk^2T + km^2)$ distance calculations to generate k cluster centers.

In order to select an initial point for the next cluster center in the modified global k-means algorithm one needs $O(m^2 + mt)$ distance calculations. Here t is the number of iterations by Algorithm 1. Then the estimation for the total number of distance calculations at the k-th iteration of Algorithm 2 is $O(mkT + m^2 + mt)$. Here T is the number of iterations

by Algorithm 2. Thus, in order to compute k cluster centers the modified global k-means algorithm requires $O(mk^2T + km^2 + kmt)$ distance calculations. To find k cluster centers the multi-start modified global k-means algorithm (without complexity reduction schemes) requires $O(p(mk^2T + km^2 + kmt))$ distance calculations. Here p is the cardinality of the set U.

Steps 2' and 3' require $O(m_1^2 + m_1t)$ distance calculations. Here m_1 is the number of data points in the set $P(u) \cap \bar{A}$ and $m_1 \ll m$. m_1 becomes smaller and smaller as the number of clusters increases. Therefore the multi-start modified global k-means algorithm, with Steps 2 and 3 in Algorithm 3 replaced by Steps 2' and 3', requires $O(p(mk^2T + km_1^2 + km_1t))$ distance calculations.

Comparing with other global k-means algorithms and taking into account that the number p is small (in most cases $p \leq 5$) and $m_1 \ll m$ we can see that the multi-start modified global k-means algorithm with complexity reduction schemes requires less computational effort than the global and modified global k-means algorithms.

Numerical experiments

We use two data sets: Pendigit and Shuttle control data sets from UCI Repository:

(http://www.ics.uci.edu/mlearn/MLRepository.html) to compare the MSMGKM algorithm with the global k-means algorithm (GKM) as well as with the MGKM algorithm. $m = 10992$ and $n = 16$ for Pendigit data set and $m = 58000$ and $n = 9$ for Shuttle control data set. Computations have been carried out on a Pentium 4 1.83 GHz CPU and 1 GB RAM. We apply the MSMGKM algorithm with $U = \{1, 3\}$ and compute up to 100 clusters. Results are presented in Table 1. In this table we use the following notation:

- k is the number of clusters;

- f_{opt} is the best known value of the cluster function (2) (multiplied by the number of instances m) for the corresponding number of clusters;

- E is the error in %;

- N is the number of Euclidean distance evaluations for the computation of the corresponding number of clusters. To avoid big numbers being in the table we express them in the form $N = \alpha \times 10^l$ and present the values of α in the table. Here $l = 8$.

- t is the CPU time (in seconds).

The error E is computed as

$$E = \frac{(\bar{f} - f_{opt})}{f_{opt}} \cdot 100,$$

where $\bar{f}$ is the best value (multiplied by m) of the objective function (2) obtained by an algorithm. $E = 0$ implies that an algorithm finds the best known solution.

Results clearly demonstrate that the MSMGKM finds solutions which are either best known or near best known solution. However, it uses significantly less amount of computational effort than other algorithms. The MSMGKM algorithm is especially efficient for solving clustering problems in large data sets.

Table 1: Results for Pendigit and Shuttle control data sets

k	f_{opt}	GKM			MGKM			MSMGKM		
		E	α	t	E	α	t	E	α	t
Pendigit										
2	$0.12812 \cdot 10^9$	0.39	1.21	9.30	0.00	2.42	17.08	0.00	0.65	5.72
10	$0.49302 \cdot 10^8$	0.00	10.97	81.08	0.00	21.85	137.48	0.00	3.58	42.69
50	$0.21164 \cdot 10^8$	0.36	61.27	426.14	0.00	120.47	719.48	0.16	8.57	165.19
80	$0.16982 \cdot 10^8$	0.14	100.30	689.23	0.00	195.67	1153.33	0.02	12.27	237.14
100	$0.15326 \cdot 10^8$	0.10	126.94	867.17	0.00	246.11	1443.19	0.11	14.88	281.75
Shuttle control										
2	$0.21343 \cdot 10^{10}$	0.00	33.64	212.19	0.00	67.28	402.11	0.00	0.07	0.36
10	$0.28317 \cdot 10^9$	0.02	302.86	1980.22	0.00	605.64	3673.09	0.00	3.69	103.39
50	$0.25937 \cdot 10^8$	0.93	1655.04	10436.01	0.00	3303.57	17977.59	0.00	108.06	1998.30
80	$0.14371 \cdot 10^8$	0.00	2679.18	15930.31	0.13	5338.22	27296.36	0.45	147.79	2957.89
100	$0.10591 \cdot 10^8$	0.10	3365.34	19538.72	0.02	6700.45	33398.92	0.00	177.02	3536.83

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Editor's personal comments

Dear EUROPT members, dear fiends,
This issue is very large. Probably, the largest among all EUROPT Newsletter issues published before. This means an increasing involvement and cooperation of our colleagues and friends and also the great success and strengthening of optimization.

This year is particularly auspicious for EUROPT members, namely with the celebration in Aveiro, in July 2010, of the EUROPT's 10th anniversary. Please do not forget that the 8th EUROPT Workshop (www.europt2010.com) will be held in Portugal, Aveiro, in July 9-10, 2010, immediately before EURO XXIV 2010 in Lisbon (http://euro2010lisbon.org/). Notice here that the EURO XXIV 2010 deadline for abstract submission was extended to March 22nd, 2010. We invite all participants in our Workshop to participate also in EURO XXIV 2010.

This issue includes a novel section entitled "International Research Center on Optimization" with a presentation of the Optimization in Engineering Center (OPTEC) of the Katholieke University of Leuven, Belgium. We are indebted to Prof. Kaisa Miettinen who, after visiting this center suggested us to include in this issue the information about it, and to Dr. Filip Logist from OPTEC who has kindly provided us with the information. For the next issues, other proposals with descriptions of prestigious international research centers are welcome.

Finally, I would like to emphasize that we are very proud with a very interesting contribution of EUROPT Chair, Prof. Marco Lopez, and with the invited short note of Professors Adil Bagirov (EUROPT fellow 2009) and Jullien Ugon, entitled "An efficient heuristic algorithm for solving large scale clustering problems".

On behalf of the Editorial Board of EUROPT Newsletter,
Domingos M Cardoso

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