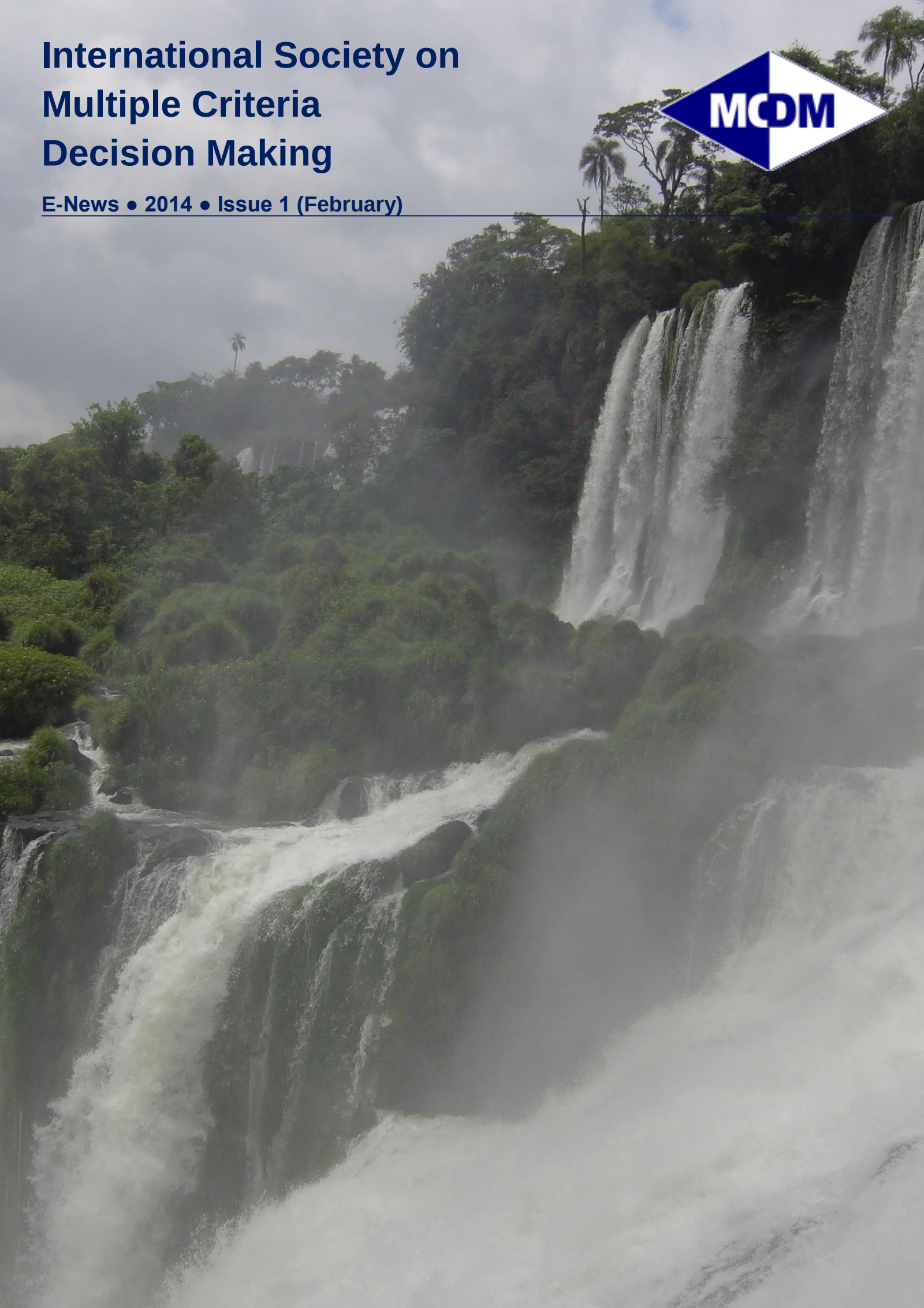
International Society on Multiple Criteria Decision Making

E-News • 2014 • Issue 1 (February)



Contents

Letter from the president **1**

1 Society news **3**

1.1 23rd International Conference on Multiple Criteria Decision Making (MCDM 2015) 3

1.2 Journal of Multi-Criteria Decision Analysis 4

2 To the memory of Professor Tomas Gal **6**

3 Upcoming Events and Call for Papers **7**

3.1 Workshop on Multicriteria Analysis with imprecise information and criteria interaction in Moscow, June 2014 7

3.2 8th International Conference on Evolutionary Multi-Criterion Optimization 8

4 New Books/Publications **9**

4.1 Book and book chapters 9

4.2 Journal papers 9

4.3 Conference proceedings 14

4.4 PhD Thesis 15

5 Past Conferences, Workshops, and other News **16**

5.1 A Report on the activities of the INFORMS MCDM Section at the INFORMS Annual Meeting in Minneapolis, Minnesota (USA), October 6-10, 2013 16

5.2 A report of the 78th meeting of the European Working Group on MCDA in Catania, Italy. 18

5.3 Conference Report for the International Conference on Multidimensional Finance, Insurance and Investment, University of Bahrain. 20

6 Research Team Presentation: Industrial Optimization Group, University of Jyväskylä, Finland **28**

7 Imprints **34**

Front: Iguazu Falls, Brasil © Theresa Weiss, Munich, Germany

Letter from the president

Dear Members of the International Society on Multiple Criteria Decision Making,

Even though 2014 is not a year of our Society's own conference, there is still a lot happening in our field. Among others, the IFORS 2014 Triennial Conference, to be more precise, the 20th Conference of the International Federation of Operational Research Societies (http://www.ifors2014.org), will be held in Barcelona, Spain, in July. It will bring together researchers representing the wide field of operations research. Among others, there will be many streams and sessions devoted to multiobjective optimization, multiple criteria decision making, decision analysis and decision support systems. The abstract submission deadline has been extended till February 10, so there is still time to submit a 600-character abstract!

The collaboration between the MCDM and evolutionary multiobjective optimization (EMO) communities has constantly increased during the past years. The call for papers of the upcoming 8th International Conference on Evolutionary Multi-Criterion Optimization (http://www.dep.uminho.pt/EMO2015/) is now available. Submissions are welcome in three tracks: core EMO track, MCDM track and real-world applications track. The conference will take place in the historic city of Guimarães in Portugal at the University of Minho.

In this newsletter you can also find information about the 23rd International Conference on MCDM which will be organized in Hamburg, Germany, on August 3-7, 2015. This is a good time to start preparing excellent research results to be presented there!

Sad news have reached us: Professor Tomas Gal has passed away. In this newsletter, you can find an obituary written by Professor Gunter Fandel.

This newsletter also included information about the Journal of Multi-Criteria Decision Analysis, upcoming events, calls for papers, pleasantly many recent publications, notes about past conferences and workshops and a research group description. I hope that you will find all this interesting and useful.

I thank the active editorial team for preparing this newsletter. Collecting material from busy people is not always easy so I want to warmly acknowledge the efforts devoted in preparation! I also remind you, dear readers, that your feedback and contributions to these newsletters, are most welcome!

Remember that the officers of our Society can easily be contacted at the following email addresses:

president (at) mcdmsociety.org, president-elect (at) mcdmsociety.org, secretary (at) mcdmsociety.org, mcdm-award (at) mcdmsociety.org and newsletter (at) mcdmsociety.org.

Please note that a new email address has been created. By sending a message to phdaward@mcdmsociety.org, you can reach the chair of the MCDM Doctoral Dissertation Award Committee.

I wish you all the most successful and rewarding continuation of this year!

Kaisa Miettinen

President of the International Society on MCDM

President (at) mcdmsociety.org

Professor and Vice-rector

University of Jyvaskyla, Finland

P.S. It is important that you are active and **keep your contact information up to date** at http://mcdmsociety.org/members/ by typing in your email address and password. If you have forgotten your password, please, click the "Forgot your password" link, type in your email address and you'll receive instructions by email. If you face any problems in updating your data, e.g. your email address has changed, please, contact the Secretary at secretary (at) mcdmsociety.org.

1 Society news

1.1 23rd International Conference on Multiple Criteria Decision Making (MCDM 2015)

23rd International Conference on Multiple Criteria Decision Making (MCDM 2015)

– second announcement –

Dear friends and colleagues,

another friendly *Moin* from Hamburg!

It is still quite some time before we kick off the 23rd International Conference on Multiple Criteria Decision Making, held from **August 3rd to 7th, 2015**, at the Helmut-Schmidt-University in Hamburg, Germany (with a get-together on **August 2nd, 2015**). Nevertheless, I would like to take this opportunity for yet another announcement. Since my first letter, several colleagues at the Helmut-Schmidt-University have teamed up and formed a local organizing committee. We have taken the appropriate steps towards the preparation of the event. So much about the local organization, which is working well so far.

But, most important is of course your involvement and your contribution to the conference, and I happily invite you to participate on several levels. In this sense, a preliminary timeline can be stated as follows:

- We are going to send out **calls for session proposals** and **calls for abstract this summer**, before the next issue of the newsletter. You are probably already aware of the topics covered by the conference, so please take the time to think about a potential special session or an abstract right now (ok, I admit, this is early indeed).
- We would like to collect **session proposals** in **November 2014**, and **abstracts** until the end of **February 2015**.
- All contributions will be reviewed by members of the scientific committee, and **acceptance notifications** will be sent out **soon after the submission deadline** for the abstracts (~March 2015).
- The "early registration" will close some weeks after we've sent out the acceptance messages.

Final remark: We are also putting up an instrument that will financially support the participation of some selected candidates. The information on this instrument (→how to apply, i.e. the documents to deliver, application deadlines, communication of the decision, etc.) will be sent out together with the call for session proposals/call for abstract.

Looking forward to welcome you next year, and looking forward to collect your contribution(s), I remain, sincerely,

Martin Josef Geiger

1.2 Journal of Multi-Criteria Decision Analysis

Our journal (JMCDA) is published by Wiley-Blackwell. Although in that sense, JMCDA is not an official organ of the International Society on Multiple Criteria Decision Making, there has been a close collaboration the journal and the society. For example, when the editorial board was restructured some 5 years ago (leading to my appointment as editor-in-chief), Wiley-Blackwell consulted a representative group from the Society before making decisions. Also, the Wiley practice prize has been a feature of our conferences for many years. Recently, the Society has agreed to amend its bylaws to make the editor-in-chief of JMCDA an ex officio member of the Executive Committee of the society.

In many ways therefore, the journal serves as a public face for the profession of MCDM/-MCDA represented by the society. It is in the interests of all members of the society to work towards a wider recognition of JMCDA in the broader OR/MS field. There was a period when the journal had struggled to maintain a regular flow of issues with good-quality papers. Over the past four years, however, we have turned this situation around. Issues appear regularly and contain very good papers over a broad range of MCDMA/MCDM topics. The journal is now indexed by Scopus, which is one step towards wider recognition.

With this message, I wish to urge members of the Society to create awareness of the Journal amongst colleagues and students. This can be achieved in many ways. Firstly, make it a habit to scan the contents of each issue and of early view articles (for example from http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-1360). You may well find that your library does have direct access, as electronic access to JMCDA is bundled with certain Wiley-Blackwell subscription packages - if so, use this access to download articles as that too will boost the standing of the journal.

In the long run, we do wish to achieve Web of Science (ISI) listing. A key consideration for this purpose is the citation rate, as this measure is used as an indication of the importance (impact) of the journal and of MCDA/MCDM research in general. Here members can all help by referencing the articles which they find in JMDA, and by drawing attention of others to these papers. Of course, the biggest contribution a member can make is to submit important research results to the Journal. We also encourage authors to be proactive in bringing their papers published in JMCDA to the attention of the broader community (for example in this newsletter).

JMCDA seeks to cover a broadly inclusive range of papers in MCDA. This fact is illustrated by the composition of the board of area editors, which besides myself (who has handled risk and uncertainty in MCDA, and DEA models) consists of Valerie Belton (integrated methods and philosophy), Kalyanmoy Deb (evolutionary multiobjective optimization), José Figueira (outranking), Salvatore Greco (rule-based methods and AI), Masahiro Inuiguchi (fuzzy sets and models), Gilberto Montibeller (value and utility models), Carlos Romero (multiobjective optimization and goal programming) and Luis Vargas (AHP/ANP). Currently we have calls out for submissions to special issues on MCDA in Networks (guest editors Christos K. Georgiadis and Konstantinos Petridis), Distance-Based Approaches to MCDM (guest editor Dylan Jones) and Multi-Objective Supply Chain Management (guest editor Belaidd Aouni).

Papers published in the last three issues are included in the list of MCDM publications listed elsewhere in this newsletter.

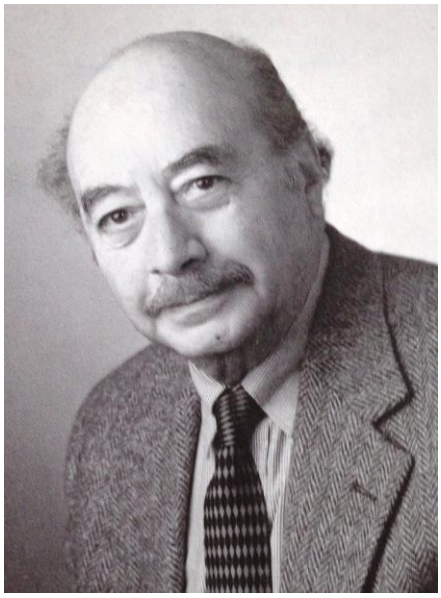
Theo Stewart

Emeritus Professor of Statistical Sciences and Senior Research Scholar, University of Cape Town

Part-time Professor of Decision Science, Manchester Business School

Editor-in-Chief, Journal of Multi-Criteria Decision Analysis

2 To the memory of Professor Tomas Gal



Tomas Gal has passed away. He left us for good at the age of 87 in the early morning hours of Sunday, the 15th of September 2013.

We lost a humorous friend, a dear colleague, and a brilliant scientist, which leaves us in deep mourning.

Persecuted and deported as a Jew in Czechoslovakia, Tomas Gal survived the concentration camp in Auschwitz. Nevertheless personal relationships to his German friends and encouraging experiences as a university teacher for the postwar generations in Germany meant a lot to him.

His outstanding reputation as a university professor and scientist led him from the Agricultural University of Prague to the Leuven University, to the RWTH Aachen and finally to the University of Hagen. For 14 years, until his retirement in 1991, he was tenured professor of the chair of operations research and mathematics for economical scientists. His publications in excellent German and international journals and his exceptional distinction as a scientist in the field of operations research were honored by eminently respectable awards from international societies multiple times.

He appreciated his retirement. He occupied his time with ongoing research and hobbies, which he enjoyed a lot. Even in his senior years he still was a very humorous person with a keen mind, who kept his friends and colleagues close to him. Even knowing about his severe illness, his well-adjusted nature could not be affected negatively.

We are thankful that we had Tomas Gal as a fine friend and colleague. Our deepest thoughts and our sincerest condolences belong to his wife and family. We will keep him in our hearts and minds forever.

Günter Fandel

Fernuniversität Hagen, Hagen, Germany

3 Upcoming Events and Call for Papers

3.1 Workshop on Multicriteria Analysis with imprecise information and criteria interaction in Moscow, June 2014

A Workshop on Multicriteria Analysis with Imprecise Information and Criteria Interaction will take place in Moscow, as part of the Second International Conference on Information Technology and Quantitative Management (ITQM 2014), June 3-5, 2014 (http://itqm2014.hse.ru/). The Workshop will be chaired by Luiz F. Autran M. Gomes, (Ibmec/Rio de Janeiro, Brazil) and Alexander E. Lepskiy (HSE/ Moscow, Russia).

The Workshop will comprise from four to five papers that are expected to approach technical aspects related to structuring, analyzing, and solving multicriteria problems with imprecise information and criteria interaction. Some of the tools that may be present in those papers are fuzzy, fuzzy intuitionistic, grey, probabilistic, rough, and verbal decision analytical modelling; and different forms to treat interaction between criteria in multicriteria analysis, such as the uses of the polar and the bipolar Choquet integrals as well as other fuzzy integrals. Papers following others streams of thought are very welcome, as long as they cover either imprecise information, criteria interaction or both.

The paper submission deadline for the Workshop is February 15, 2014. Submitted papers must not substantially overlap papers that have been published or that are simultaneously submitted to a journal or a conference with proceedings. Papers should be at most 10 pages including the bibliography and well-marked appendices. Papers must be received by the submission deadline. We invite you to submit your paper to the EasyChair Login Page for ITQM 2014. All relevant information is available from ITQM 2014 webpage (http://itqm2014.hse.ru/).

Authors of accepted papers must guarantee that their papers will be presented at the conference. Accepted papers will be published in the conference proceedings by Elsevier in their new Procedia Computer Science series. Selected best papers will be published in special issues of high quality journals (Int. J. of Information Technology and Decision Making, Annals of Optimization and Data Science, and others that are currently under negotiation).

3.2 8th International Conference on Evolutionary Multi-Criterion Optimization

EMO Guimarães 2015

8th International Conference on Evolutionary Multi-Criterion Optimization

29 March – 1 April, 2015, Guimarães, PORTUGAL

CALL FOR PAPERS

EMO 2015 is the 8th International Conference on Evolutionary Multi-Criterion Optimization, aiming to continue the success of the previous EMO meetings. EMO 2015 will bring together the evolutionary multi- criterion optimization (EMO) and multiple criteria decision making (MCDM) communities. Special attention will be paid to EMO and MCDM application for solving real-world problems in government, business and industry.

The conference programme will include:

- Invited keynote speakers
- EMO track
- MCDM track
- Real-world applications track

Following the tradition of the EMO community, the conference will be in **single session format**, with papers provided as either oral or as poster presentations.

EMO Track

Full papers are invited on novel aspects of EMO theory and methodology. A list of topics can be found in the conference web page.

MCDM Track

In this track, full papers are invited for the integrated MCDM track on new developments in the multiple criteria decision making community that might be blended with EMO themes. Original research, tutorial and survey papers are welcome in this track.

Real-World Applications Track

Papers are invited from both within and outside the academy on real-world problems in government, business, industry and interdisciplinary sciences, whose solutions have benefitted from the recent application of EMO or MCDM methods. Papers addressing issues that decision makers generally have in trusting formal approaches over their own experience and intuitions are also invited.

Publication

All accepted works will be published as full papers in Springer-Verlag's Lecture Notes in Computer Science (LNCS) series.

Papers are limited to a maximum size of 15 pages.

Important Dates

Submission deadline	**14 September 2014**
Notification of acceptance	4 November 2014
Camera-ready submission	2 December 2014
Conference	29 March -1 April 2015

Venue

The conference will take place at the Campus de Azurém of the University of Minho in the **historical city of Guimarães** in Portugal.

Guimarães is located approximately 350 km from Lisbon, the Portuguese capital, and about 50 km from Porto, the country's second largest city. The Porto International Airport (OPO) has regular flights to the main international cities by several flag companies as well as low cost ones.

Committees

General Chairs:
António Gaspar-Cunha, University of Minho, Portugal
Carlos Henggeler Antunes, University of Coimbra, Portugal
Carlos Coello Coello, CINVESTAV-IPN, Mexico

MCDM Track Chairs:
Kaisa Miettinen, University of Jyväskylä, Finland
Salvatore Greco, University of Catania, Italy

Real-world Applications Track Chairs:
Robin C. Purshouse, University of Sheffield, UK
Carlos Henggeler Antunes, University of Coimbra, Portugal

EMO Steering Committee:
Carlos Coello Coello, CINVESTAV-IPN, Mexico
David Corne, Heriot-Watt University, UK
Kalyanmoy Deb, Michigan State University, USA
Peter J. Fleming, University of Sheffield, UK
Carlos M. Fonseca, University of Coimbra, Portugal
Hisao Ishibuchi, Osaka Prefecture University, Japan
Joshua D. Knowles, University of Manchester, UK
Kaisa Miettinen, University of Jyväskylä, Finland
J. David Schaffer, Binghamton University, USA
Lothar Thiele, ETH Zürich, Switzerland
Eckart Zitzler, PH Bern, Switzerland

http://www.dep.uminho.pt/EMO2015/

4 New Books/Publications

This section presents a list of papers published in 2013, 2014 or to appear. This list is by no means exhaustive. If you want your recent publications to appear in the next newsletter, please send an email with the complete citation of your work to lucie.galand@dauphine.fr.

4.1 Book and book chapters

Abou-El-Enien T., **TOPSIS Algorithms for Multiple Objectives Decision Making: Large Scale Programming Approach,** *LAP Lambert Academic Publishing*, 2013.

Gomes C.F.S., Gomes L.F.A.M., Lucas S.F., **Evolutionary modelling in discrete multicriteria decision aiding: determining the parameters of ELECTRE methods**. In: A.T. de Almeida; A.P.C.S. Costa; F.C.M. de Souza; J.C.N. Clímaco. (Org.). *Selected contributions from presenters of REDS - Recife Decision Support School: First seven editions*. Recife: Ed. Universitária da UFPE, 1:109-124, 2013.

Pereira J., Gomes L.F.A.M., Paredes F., **Towards robustness analysis for ranking problems in multicriteria decision aiding**, In: A.T. de Almeida; A.P.C.S. Costa; F.M.C. de Souza; J.C.N. Clímaco. (Org.). *Selected contributions from presenters of REDS - Recife Decision Support School: First Seven Editions*. Recife: Ed. Universitária da UFPE, 1:101-108, 2013.

4.2 Journal papers

Amorim P., Antunes C.H., Almada-Lobo B., **A dual mutation operator to solve the multi-objective production planning of perishable goods**, *In L. Di Gaspero, A. Schaerf, T. Stutzle (Eds.), "*Advances in Metaheuristics*", Operations Research / Computer Science Interfaces Series*, 53:77-97, Springer, 2013.

Antunes H.C., Oliveira E., Lima P., **A Multi-Objective GRASP Procedure for Reactive Power Compensation Planning**, *Optimization and Engineering*, 2013.

Bazgan C., Jamain F., Vanderpooten D., **On the number of non-dominated points of a multicriteria optimization problem**, *Discrete Applied Mathematics*, 161(18):2841-2850, 2013.

Berzins L.J., Gomes L.F.A.M., Rangel L.A.D., **Performance evaluation in Inmetro: a contribution from Multicriteria Decision Aid**, *Revista de Administração do Gestor*, 3:19-35, 2013.

Bisdorff R., **On Polarizing Outranking Relations with Large Performance Differences**, *Journal of Multi-Criteria Decision Analysis*, 20(1-2):3-12, 2013.

Brockhoff D., Bader J., Thiele L., Zitzler E., **Directed Multiobjective Optimization Based on the Weighted Hypervolume Indicator**, *Journal of Multi-Criteria Decision Analysis, Special Issue on Evolutionary Multi-objective Optimization*, 20(5-6):291-317, 2013.

Cabello J.M., Navarro E., Prieto F., Rodríguez B., Ruiz F., **Multicriteria Development of Synthetic Indicators of the Environmental Profile of the Spanish Regions**, *Ecological Indicators*, 39:10-23, 2014.

Cabello J.M., Ruiz F., Pérez B., Méndez P., **Synthetic Indicators of Mutual Funds' Environmental Responsibility: An Application of the Reference Point Method**, *European Journal of Operational Research*, to appear.

Comes T., Hiete M., Schultmann F., **An Approach to Multi-Criteria Decision Problems Under Severe Uncertainty**, *Journal of Multi-Criteria Decision Analysis*, 20(1-2):29-48, 2013.

Dandurand B., Guarneri P., Fadel G., Wiecek M. M., **Equitable multiobjective optimization applied to the design of a hybrid electric vehicle battery**, *Journal of Mechanical Design*, 135(4), 2013.

El Madawy M.E., El Zareef M.A., **Multicriteria Optimization Technique for Optimal Design of Orthotropic Bridges**, *Journal of Multi-Criteria Decision Analysis*, 20(3-4):173-183, 2013.

Eraslan E., **A Multi-criteria Usability Assessment of Similar Types of Touch Screen Mobile Phones**, *Journal of Multi-Criteria Decision Analysis*, 20(3-4):185-195, 2013.

Fernandes J.E. de M., Gomes L. F. A. M., Mello J.C.C.B.S., Gomes Jr. S.F., **Selection of an airplane for regional charter activities through the Borda method modified by the use of the median**, *Journal of Transport Literature*, 7:171-191, 2013.

Figueira J.R., Greco S., Roy B., Słowiński R., **An Overview of ELECTRE Methods and their Recent Extensions**, *Journal of Multi-Criteria Decision Analysis*, 20(1-2):61-85, 2013.

Figueira J.R., Paquete L., Simões M., Vanderpooten D., **Algorithmic improvements on dynamic programming for the bi-objective {0, 1} knapsack problem**, *Computational Optimization and Applications*, 56(1):97-111, 2013.

Gardenghi M., Wiecek M.M., Wang W., **Biobjective optimization for analytical target cascading: optimality vs. achievability**, *Structural and Multidisciplinary Optimization*, 47(1):111-133, 2013.

Giri B.K., Hakanen J., Miettinen K., Chakraborti N., **Genetic Programming through Bi-objective Genetic Algorithms with Study of a Simulated Moving Bed Process Involving Multiple Objectives**, *Applied Soft Computing*, 13:2613-2623, 2013.

Gomes L.F.A.M., Machado M.A.S., da Costa F. F., Rangel L. A. D., **Criteria Interactions in Multiple Criteria Decision Aiding: A Choquet Formulation for the TODIM Method**, *Procedia Computer Science*, 17:324-331, 2013.

Gomes L.F.A.M., Machado M.A.S., González X.I., Rangel L.A.D., **Behavioral multi-criteria decision analysis: the TODIM method with criteria interactions**, *Annals of Operation Research*, 211(1):531-548, 2013.

Gomes L.F.A.M., Moshkovich H., Torres A., **Marketing in small firms: an application of Verbal Decision Analysis with ORCLASS**, *Tecnologia & Cultura*, 15:7-21, 2013.

Gomes L.F.A.M., Zamora L.P., Lopez J.C.L., Pereira J., **RED-M: The Ibero-American Network of Multicriteria Evaluation and Decision Making**, *Newsletter of the EURO Working Group on Multicriterion Decision Aiding*, 27:6-9, 2013.

Hakanen J., Sahlstedt K., Miettinen K., **Wastewater Treatment Plant Design and Operation under Multiple Conflicting Objective Functions**, *Environmental Modelling and Software*, 46(1):240-249, 2013.

Jarraya B., Bouri A., **Multiobjective Optimization for the Asset Allocation of European Nonlife Insurance Companies**, *Journal of Multi-Criteria Decision Analysis*, 20(3-4):97-108, 2013.

Jiménez A., Mateos A., Sabio P., **Dominance Intensity Measure within Weight Oriented MAUT: An Application**, *OMEGA*, 41:397-405, 2013.

Jiménez A., Suárez-Figueroa M.C., Mateos A., Gómez-Pérez A., Fernández-López M., **A MAUT Approach for Reusing Domain Ontologies on the Basis of the NeOn Methodology**, *International Journal of Information Technology & Decision Making*, 12(5):945-968, 2013.

Judt L., Mersmann O., Naujoks B., **Non-monotonicity of Observed Hypervolume in 1-Greedy S-Metric Selection**, *Journal of Multi-Criteria Decision Analysis, Special Issue on Evolutionary Multi-objective Optimization*, 20(5-6):277-290, 2013.

Kaliszewski I., Miroforidis J., **Primal–Dual Type Evolutionary Multiobjective Optimisation**, *Foundations of Computing and Decision Sciences*, 38(4):267-275, 2013.

Kaliszewski I., Miroforidis J., **Two-sided Pareto Front Approximations**, *Journal of Optimization Theory and its Applications*, 2013.

Kaliszewski I., Miroforidis J., Podkopaev D., **Erratum to "Interactive multiple criteria decision making based on preference driven evolutionary multiobjective optimization with controllable accuracy, European Journal of Operational Research 216 (2012) 188–199"**, *European Journal of Operational Research*, 226(1):183, 2013.

Kangas A., Hartikainen M., Miettinen K., **Simultaneous Optimization of Harvest Schedule and Measurement Strategy**, *Scandinavian Journal of Forest Research*, to appear.

Köksalan M., Wallenius J., Zionts S., **An Early History of Multiple Criteria Decision Making**, *Journal of Multi-Criteria Decision Analysis*, 20(1-2):87-94, 2013.

Lin C.S., Harris S.L., **A Unified Framework for the Prioritization of Organ Transplant Patients: Analytic Hierarchy Process, Sensitivity and Multifactor Robustness Study**, *Journal of Multi-Criteria Decision Analysis*, 20(3-4):157-172, 2013.

Maleki H., Zahir S., **A Comprehensive Literature Review of the Rank Reversal Phenomenon in the Analytic Hierarchy Process**, *Journal of Multi-Criteria Decision Analysis*, 20(3-4):141-155, 2013.

Mateos A., Jiménez A., Aguayo E.A., Sabio P., **Dominance Intensity Measuring Methods in MCDM with Ordinal Relations Regarding Weights**, *Knowledge-Based Systems*, in press.

Mattila V., Virtanen K., Hämäläinen R.P., **A Simulated Annealing Algorithm for Noisy Multiobjective Optimization**, *Journal of Multi-Criteria Decision Analysis, Special Issue on Evolutionary Multi-objective Optimization*, 20(5-6):255-276, 2013.

Miettinen K., **Survey of Methods to Visualize Alternatives in Multiple Criteria Decision Making Problems**, *OR Spectrum*, 36(1):3-37, 2014.

Miettinen K., Mustajoki J., Stewart T.J., **Interactive Multiobjective Optimization with NIMBUS for Decision Making under Uncertainty**, *OR Spectrum*, 36(1):39-56, 2014.

Monkkonen M., Juutinen A., Mazziota A., Miettinen K., Podkopaev D., Reunanen P., Salminen H., Tikkanen O.-P., **Spatially Dynamic Forest Management to Sustain Biodiversity and Economic Returns**, *Journal of Environmental Management*, to appear.

Ogryczak W., Perny P., Weng P., **A compromise programming approach to multiobjective Markov decision processes**, *International Journal of Information Technology & Decision Making*, 12(05):1021-1053, 2013.

Oliveira E., Antunes C.H., Gomes A., **A comparative study of different approaches using an outranking relation in a multi-objective evolutionary algorithm**, *Computers and Operations Research*, 40(6):1602–1615, 2013.

Padmanabhan D., **A Clustering-based Methodology for Discontinuous Pareto Frontier Representation**, *Journal of Multi-Criteria Decision Analysis, Special Issue on Evolutionary Multi-objective Optimization*, 20(5-6):235-253, 2013.

Parnell G.S., Hughes D.W., Burk R.C., Driscoll P.J., Kucik P.D., Morales B.L., Nunn L.R., **Invited Review—Survey of Value-Focused Thinking: Applications, Research Developments and Areas for Future Research**, *Journal of Multi-Criteria Decision Analysis*, 20(1-2):49-60, 2013.

Passos A.C., Teixeira M. G., Garcia K.C., Cardoso A. M., Gomes L.F.A.M., **Using the TODIM-FSE method as a decision-making support methodology for oil spill response**, *Computers & Operations Research*, 2013:1-9, 2013.

Pérez de la Cruz J.L., Mandow L., Machuca E., **A Case of Pathology in Multiobjective Heuristic Search**, *Journal of Artificial Intelligence Research*, 48:717-732, 2013.

Pérez-Gladish B., Rodríguez P.M., M'zali B., Lang P., **Mutual Funds Efficiency Measurement under Financial and Social Responsibility Criteria**, *Journal of Multi-Criteria Decision Analysis*, 20(3-4):109-125, 2013.

Punkka A., Salo A., **Preference Programming with incomplete ordinal information**, *European Journal of Operational Research*, 231(1):141-150, 2013.

Punkka A., Salo A., **Scale dependence and ranking intervals in additive value models under incomplete preference information**, *Decision Analysis*, in press.

Qi Y., Wu F., Peng X., Steuer R. E., **Chinese Corporate Social Responsibility by Multiple Objective Portfolio Selection and Genetic Algorithms**, *Journal of Multi-Criteria Decision Analysis*, 20(3-4):127-139, 2013.

Reneke J. A., Wiecek M.M., Fadel G., Samson S., **Multidisciplinary design optimization under uncertainty: An information model approach**, *International Journal of Vehicle Design*, 61(1-4):249-284, 2013.

Rocha C., Dias L.C., Dimas I., **Multicriteria Classification with Unknown Categories: A Clustering–Sorting Approach and an Application to Conflict Management**, *Journal of Multi-Criteria Decision Analysis*, 20(1-2):13-27, 2013.

Rout T.M., Walshe T., **Accounting for Time Preference in Management Decisions: An Application to Invasive Species**, *Journal of Multi-Criteria Decision Analysis*, 20(3-4):197-211, 2013.

Sindhya K., Miettinen K., Deb K., **A Hybrid Framework for Evolutionary Multi-Objective Optimization**, *IEEE Transactions on Evolutionary Computation*, 17(4):495-511, 2013.

Sindhya K., Ojalehto V., Savolainen J., Niemistö H., Hakanen J., Miettinen K., **Coupling Dynamic Simulation and Interactive Multiobjective Optimization for Complex Problems: An APROS-NIMBUS Case Study**, *Expert Systems with Applications*, 41(5):2546-2558, 2014.

Skulimowski A. M. J., **Anticipatory network models of multicriteria decision-making processes**, *International Journal of Systems Science*, 45(1):39-59, 2014.

Steponavice I., Ruuska S., Miettinen K., **A Solution Process for Simulation-based Multiobjective Design Optimization with an Application in Paper Industry**, *Computer-Aided Design*, 47:45-58, 2014.

Stewart T.J., French S., Rios J., **Integrating Multicriteria Decision Analysis and Scenario Planning -- Review and Extension**, *Omega, The International Journal of Management Science*, 41:679-688, 2013.

Stewart T.J., Janssen R., **Integrated Value Function Construction with Application to Impact Assessments**, *International Transactions in Operational Research*, 20:559-578, 2013.

Tarkkanen S., Miettinen K., Hakanen J., Isomäki H., **Incremental User-Interface Development for Interactive Multiobjective Optimization**, *Expert Systems with Applications*, 40:3220-3232, 2013.

Trautmann H., Wagner T., Biermann D., Weihs C., **Indicator-based Selection in Evolutionary Multiobjective Optimization Algorithms Based On the Desirability Index**, *Journal of Multi-*

Criteria Decision Analysis, Special Issue on Evolutionary Multi-objective Optimization, 20(5-6):319-337, 2013.

Ulrich T., **Pareto-Set Analysis: Biobjective Clustering in Decision and Objective Spaces**, *Journal of Multi-Criteria Decision Analysis, Special Issue on Evolutionary Multi-objective Optimization*, 20(5-6):217-234, 2013.

4.3 Conference proceedings

Aissanou F., Petrowski A., **Autonomous multi-criteria decision making for route selection in a telecommunication network**, *IEEE Symposium on Computational Intelligence in Multi-Criteria Decision-Making (MCDM)*, 33-40, 2013

Faria M.J.S., Gomes L.F.A.M., **Linear De Novo Programming applied to the development of petroleum fields**, In *Proceedings of the XLV Brazilian Symposium of Operations Research*, Natal, Brazil, 2013.

Gomes L.F.A.M., Machado M.A.S., Costa F.F., Rangel L.A.D., **Criteria interactions in multiple criteria decision aiding: A Choquet formulation for the TODIM method**. In *Proceedings of the First International Conference on Information Technology and Quantitative Management*, Suzhou, China, 2013.

Gomes L.F.A.M., Machado M.A.S., Rangel L.A.D., Araujo R.M., **Modelling interactions between criteria in MCDA: A comparative analysis of the bipolar Choquet integral and an ELECTRE method**, In *Proceedings of the XLV Brazilian Symposium of Operations Research*, Natal, Brazil, 2013.

Machuca E., Mandow L., Galand L., **An Evaluation of Best Compromise Search in Graphs**, *In Proceedings of XV Conference of the Spanish Association for Artificial Intelligence (CAEPIA'13), Bielza C. et al. (Eds.), Advances in Artificial Intelligence LNCS*, 8109: 1-11, 2013.

Rangel L.A.D., Gomes L.F.A.M., Rangel S.V.D., **Multicriteria evaluation of alternatives with TODIM by using different values of the loss attenuation factor**, In *Proceedings of the XLV Brazilian Symposium of Operations Research*, 2013, Natal, Brazil, 2013.

Rangel L.A.D., Gomes L.F.A.M., Salomon V.A.P., **Comparing two evaluations of residential properties: Multicriteria decision making versus fuzzy expert systems**, In: *Proceedings of the XVI Operations Research & Logistics Symposium of the Brazilian Navy*, Rio de Janeiro, Brazil, 1:1-12, 2013.

Sanders P., Mandow L., **Parallel label-setting multi-objective shortest path search**, *In 27th IEEE International Parallel & Distributed Processig Symposium (IPDPS 2013)*, 215-224, 2013.

Sindhya K., Ojalehto V., Savolainen J., Niemisto H., Hakanen J., Miettinen K., **APROS-NIMBUS: Dynamic Process Simulator and Interactive Multiobjective Optimization in Plant Automation**, *in Proceedings of the 23rd European Symposium on Computer Aided Process Engineering, Edited by A. Kraslawski, I. Turunen, Elsevier, Oxford*, 871-876, 2013.

4.4 PhD Thesis

Goetzmann K.-S., **The Power of Compromise. Reference Point Methods and Approximation in Multicriteria Optimization**, TU Berlin, *Cuvillier Verlag Göttingen Publisher*, 2013.

5 Past Conferences, Workshops, and other News

5.1 A Report on the activities of the INFORMS MCDM Section at the INFORMS Annual Meeting in Minneapolis, Minnesota (USA), October 6-10, 2013.

The MCDM Section was established in 2010, having had its roots in the International Society on Multiple Criteria Decision Making dating from 1979. For the 2013 INFORMS conference, the Section President Ralph Steuer organized an MCDM cluster, making a properly presence at the conference under consideration.

The MCDM Section in the Minneapolis conference had a *Sponsored Cluster*, with 10 sessions, including 34 talks (starting Sunday morning, ending Tuesday noon). The sessions covered a wide spectrum within MCDM. The Section plans at the INFORMS Annual Meeting 2014 in San Francisco to expand its presence at the conference. Pekka Korhonen (pekka.korhonen@aalto.fi) will be in charge for organizing the MCDM stream. If you are interested in organizing a session, please send an email to Pekka.

Group photo after the business meeting.

The business meeting was the stage for lively discussions and was followed by a reception. Both events were well-attended. The minutes of the business meeting can be found at http://www.informs.org/Community/MCDM clicking the link "Bylaws-and-Meeting-Minutes". We also discussed the possibility of establishing an MCDM student award in 2014, as a means of attracting young researchers to the field.

In the elections conducted, Matthias Ehrgott (Lancaster University, UK. President for 2015 [to succeed Pekka Korhonen]) was elected as the new Vice President and Johannes Siebert (University of Bayreuth, Germany) as the Secretary/Treasurer for 2014. Luiz Gomes (Instituto Brasileiro de Mercado de Capiais, Rio de Janeiro, Brasil), and Danielle Morais (Federal University of Pernambuco, Recife, Brasil) were elected as the new Board members. The term of Ralph Steuer ends at the end of 2013, and he will serve as an ex officio board member in 2014. He thanked his fellow officers and board members. Ralph also thanked all members of the Section for their support and participation. Pekka Korhonen will serve as the new president during 2014.

Overall the Minneapolis INFORMS conference was a success for the MCDM Section with high quality talks attracting a large audience. The MCDM Section has reached over 250 members in about a year. While this is a healthy growth, the size of the MCDM researchers and practitioners worldwide shows a potential of further growth. The MCDM Section urges its members to be involved in recruiting new members. The stronger we get, the more powerful we will be in convincing others about our issues. Membership is open to anyone interested in MCDM.

To become a member or to renew your membership for 2014, visit http://www.informs.org/Community/MCDM. The dues for 2014 are $5 for INFORMS members and $7 for others.

Ralph Steuer *Johannes Siebert*

5.2 A report of the 78th meeting of the European Working Group on MCDA in Catania, Italy.

On the 24, 25 and 26 October 2013, the 78th Meeting of the European Working Group on Multiple Criteria Decision Aiding was held at the Department of Economics and Business of the University of Catania (Italy) from Prof. Salvatore Greco and Benedetto Matarazzo and their staff including Silvia Angilella, Salvatore Corrente, Alfio Giarlotta and Damiano Rossello. About 50 researchers from all the world (the most part from Europe but also someone from Canada) participated to the meeting that had as main theme "Multicriteria decision aiding in finance" and was scheduled in six different sessions. The round table on ''Multicriteria decision aiding and financial risk evaluation" was organized on the first day and it has had as speakers Bernard Roy (Lamsade, France), Roman Słowiński (Poznan University of Technology, Poland), Jaap Spronk (Erasmus University of Rotterdam, The Netherlands) and Constantin Zopounidis (Technical University of Crete, Greece). Seventeen presentations were scheduled in six different sessions chaired by Milosz Kadziński (Poznan University of Technology, Poland), Yannis Siskos (University of Piraeus, Greece), Vincent Cliville (Université de Savoie, France), Horst Hamacher (University of Kaiserslautern, Germany) and Josè Figueira (University of Lisbon, Portugal) while other nineteen papers have been submitted to discussion.

On Thursday afternoon were also

presented the 79th and the 80th editions of the meeting that will be held in Athens in spring 2014 and in Quebec in fall 2014, respectively.

On Thursday evening, the participant to the conference where delighted from a wonderful dinner hold in a typical restaurant in the old part of Catania while on Saturday morning the participants enjoyed the visit of the Greek theatre of Syracuse and the tour of the city.

Note that during the meeting the sun has been always shining and the weather has been pleasantly hot.

Last but not least, on early Saturday morning Mount Etna erupted above the town of Catania, spewing lava and sending a plume of ash into the air ….

Silvia Angilella, Salvatore Corrente, and Salvatore Greco

5.3 Conference Report for the International Conference on Multidimensional Finance, Insurance and Investment, University of Bahrain.

Opening Ceremony

The College of Business Administration at University of Bahrain has organized on 25-27 November 2013, with the co-sponsorship of the International Society on Multiple Criteria Decision Making and the Institute for Operations Research and the Management Sciences - MCDM section, the International Conference on Multidimensional Finance, Insurance and Investment (ICMFII'13). The ICMFII'13 is the fifth of the series of conferences and provides an international forum for presentations and discussion of research in all areas of Finance, Insurance and Investment. The first conference was held in Helsinki in 2005 and chaired by Pekka Korhonen, Jaap Spronk and Ralph Steuer. The second edition of this scientific event took place in Montreal and was organized by Belaid Aouni in 2007. The third edition was organized by Alejandro Balbas in Madrid in 2009. The 2011 edition of the ICMFII held on April 14-16, 2011 in Hammamet Tunisia and chaired by Fouad Ben Abdelaziz. The 2013 edition held in the college of Business Administration at the University of Bahrain and chaired by Minwir Al-Shammari. ICMFII'13 received 128 manuscripts and after a peer review process, by national and international reviewers, 64 were accepted to be presented in the conference program. The conference program features a broad international representation from 23 countries, including: Algeria, Australia, Bahrain, China, Czech Republic, France, Germany, India, Indonesia, Iraq, Italy, KSA, Lebanon, Malaysia, Oman, Pakistan, Spain, Taiwan, Tunisia, Turkey, UAE, UK and USA. The accepted papers include both theoretical and application research works from very diverse areas related to quantitative modeling, Mutiple criteria decision making, Finance, Insurance and Investment.

Keynote Speakers

Keynote Speeches:

This year's conference invited 3 international speakers. The first invited talk, entitled "Markowitz Bi-Criterion Portfolio Selection to the Tri-Criterion Case" was given by Ralph E. Steuer (University of Georgia, USA). Professor Ralph presented the recent progress that has been made in the tri-criterion area on computing efficient surfaces and the avenues of research opportunities that this opens up in the field of portfolio selection. Graphs were employed wherever possible. The second invited talk, "Goal Programming Model for Multi-Attribute Financial Portfolio Selection: A Glorious History and Promising Future" was given by Belaid Aouni (Laurentian University, Canada). Professor Belaid notified the significant increase in publications related to the use of goal programming in portfolio selection where in most decision-making context, the financial decision maker will be looking for the portfolio of the best compromise that take into consideration his/her preferences. The aim of the second invited talk was to discuss some new perspectives related to the application of the goal programming models within the field of multi-attribute financial portfolio selection. The last invited talk entitled "Multiobjective stochastic portfolio selection models" by Fouad Ben Abdelaziz (NEOMA Business School, France) who gave a short talk which stimulated a lengthy discussion about uncertainty and mathematical programming models used for portfolio selection. Professor Fouad asserted that the previously described models for portfolio selection should consider the random nature of rate of return, liquidity and risk. He noted that the way of measuring risk (as presented later on by Meryem Masmoudi) can be stochastic. Each of the invited speakers did a great job and their talks were followed by lengthy discussions.

Conference Lunch

Conference Dinner (Golden Tulip, Manama, Bahrain)

After the plenary Keynote Speeches, 64 papers were presented and discussed in the following special sessions which were as follows:

- Portfolio Selection
- Foreign Direct Investment
- Islamic Banking
- Multiple Objective Programming
- Financial Modeling
- Stock Exchange Market
- Risk and Corporate Governance
- Performance Measures
- Economic Issues
- Control, Evaluation and Forecasting
- Invited Session in Marketing and Supply Chain Management

Al-Salam Hall (0-44) at the College of Business Administration

Shaikh Abdulaziz Hall

Hall 0-47 at the Administration Lobby

Sightseeing tour (27 November 2013)

Bab Albahrain

Qalat al Bahrain site and museum

Albander Resort

Bab Albahrain

Qalat al Bahrain site and museum

Albander Resort

The half-day tour began in the Old Town and the historic heart of the city "Bab Albahrain". Bab Albahrain is a historical building located in the Customs Square in Manama's former central business district. It marks the main entrance to the Manama souq. Government Avenue, which runs in front of Bab Al Bahrain, contains many major banks and business establishments. The Gold City is a shopping complex for gold ornaments and is also located on Government Avenue. The trip continues into Qalat al Bahrain site and museum. Bahrain known as Dilmun in ancient times, Bahrain's rich trading history is reflected in numerous archaeological sites, the most fascinating of which is the Bahrain Fort site that is registered as a UNESCO World Heritage site. The fort is located atop a 17.5 hectare artificial hill that has been built over more than 4000 years of continuous occupation. It is the site of the former capital of Dilmun and one of the most archaeological sites in the Arabian Gulf. The excavations over the past 50 years have revealed residential, public, commercial and military structures that testify to the importance of the site

over the centuries. These findings are brought to life by an audio guide available at the site museum. The tour ends with a Lunch in one of the most beautiful restaurants in Bahrain in Albander Resort.

General Comments (Closing Ceremony)

Closing Ceremony

The conference Panel members are:

- Minwir Al Shammari (University of Bahrain, Bahrain)
- Ralph Steuer (University of Georgia, USA)
- Belaid Aouni (Laurentian University, Canada)
- Fouad Ben Abdelaziz (NEOMA Business School, France)
- Hatem Masri (University of Bahrain, Bahrain)
- Francisco Ruiz (University of Málaga, Spain)
- Davide La Torre (University of Milan, Italy)
- Mohammad Omar Farooq (Bahrain Institute of Banking and Finance, Bahrain)

The Panel was very impressed by the high-quality of most of the research papers included in the conference program. They indicated that the papers presented have ambitious goals and significant potential to be published in international journals. The Panel found the conference program has a well-balanced portfolio of fundamental science papers, applied research papers, and large-scale industry projects. The Panel was particularly impressed with the efforts being performed and the use of modeling to support decision making in many of the papers, particularly those papers focused on economic issues related to Bahrain. Based on the progress made to date by the papers reviewed, the Panel was optimistic about the potential that has these research papers to improve the quality of decisions in the field of finance, insurance and investments.

Islamic Finance:

As part of their comments, the Panel also emphasized the importance of organizing such an international conference in Bahrain to further strengthen its position as an acknowledged international banking and financial hub and a world leader in Islamic banking. Conducting seminars and conferences of global significance will boost the international confidence in the economic and financial sector of the Kingdom of Bahrain.

The Panel members noted the valuable addition of the Islamic Finance stream to the ICMFII'13. They also noted the need to fund many research projects to link between the literature in Islamic finance and the latest quantitative models. For example a multiple criteria Islamic portfolio selection model may be developed.

Recommendations:

While the majority of the recommendations provided by the Panel were technical in nature and specific to a particular research papers, please find in the following some important issues to be considered in the future by the ICMFII committees and the college of Business Administration at the University of Bahrain:

1. Maintain the stream on Islamic Finance within the main topics of the future ICMFII editions
2. For ICMFII, launching a bi-annual scientific Journal would be a significant addition
3. Attract more professionals from the Bank sector and Insurance companies to link theory to practice
4. Develop a minor in the area of Islamic banking and finance in the college of Business Administration that embed professional training contents so that by the time a student receives his relevant Bachelor degree in Finance, the student will be ready to take the professional qualification exams
5. Enhance the collaboration with MCDM, INFORMS and other international societies in developing structured research programs and to benefit the research community both at the University of Bahrain and in Bahrain.

Conference Speakers

Student Support Committees

We would like to thank the following conference committee members:

Organizing Committee

- *Riyadh Al-Abdulla* (University of Bahrain, Bahrain)
- *Mohammed Almossawi* (University of Bahrain, Bahrain)
- *Mahmood Asad* (University of Bahrain, Bahrain)
- *Batool Asiri* (University of Bahrain, Bahrain)
- *Adel Al-Alawi* (University of Bahrain, Bahrain)
- *Ebtihaj Al-Aali* (University of Bahrain, Bahrain)
- *Evelinagh Maguire* (University of Bahrain, Bahrain)
- *Farkhanda Shamim* (University of Bahrain, Bahrain)
- *Mesfer Al-Muhanadi* (University of Bahrain, Bahrain)
- *Mohammed Fareed Al-Sahn* (University of Bahrain, Bahrain)
- *Mowafaq Mohammed* (University of Bahrain, Bahrain)
- *Sayyed Al-Habib* (University of Bahrain, Bahrain)
- **IT support:** Mohamed Nasser and Dheya Al-Mahroos
- **Graphics and Design:** Roula Jamal
- **Public Relation & Services:** Mahmood Al-Hiki and Luma Yousif
- **Website design & Development:** Ahmed Ragab
- **Media:** Ali Al-Sabbagh
- **Conference Secretary:** Fatima Al-Aradi and Fatima Buhusayyen

Scientific committee:

- Hatem Masri (University of Bahrain, Bahrain)
- Abdulmohsin Desoky (University of Bahrain, Bahrain)
- Abdulwahab Al-Ameen (University of Bahrain, Bahrain)
- Basma Majerbi (University of Victoria, Canada)
- Bora Aktan (University of Bahrain, Bahrain)
- Carlos Romero (Technical University of Madrid, Spain)
- Constantin Zopounidis (Technical University of Crete, Greece)

- Davide La Torre (University of Milan,Italy)
- Enrique Ballestero (Escuela Politécnica Superior de Alcoy, Spain)
- Gehan Abdulhadi Mousa (University of Bahrain, Bahrain)
- Hatem El-Shishini (University of Bahrain, Bahrain)
- Hisham H. A.Baki (University of Bahrain, Bahrain)
- Ibrahim Hasan Alezzee (University of Bahrain, Bahrain)
- Khamoussi Halioui (University of Imam Muhammed ben Saud, KSA)
- Mohamed Sayed Abou Elseoud (University of Bahrain, Bahrain)
- Mohamed Akram (University of Bahrain, Bahrain)
- Sabri Boubaker (Champagne School of Management, ESC Troyes, France)
- Seref Ahmed Turen (University of Bahrain, Bahrain)
- Walid Cheffi (Rouen Business School, France)

The ICMFII'13 was an excellent conference and a real research experience for all participants. We look forward to seeing you in the next edition of the conference will be in Turkey in 2015.

Finally, we would further like to thank the University of Bahrain Staff, faculty and students for their efforts in organizing the ICMFII'13.

Minwir Al Shammari
Conference Chair

6 Research Team Presentation: Industrial Optimization Group, University of Jyväskylä, Finland

Research team presentation:
Industrial Optimization Group, University of Jyväskylä, Finland
http://www.mit.jyu.fi/optgroup/

Introduction

The Industrial Optimization Group of the University of Jyväskylä, Finland, is a part of the Department of Mathematical Information Technology and is headed by Prof. Kaisa Miettinen (since 1998). The research interests of the group are focused on MCDM and in particular on developing theory, methods and software for solving real-world optimization problems, especially when multiple nonlinear objectives are involved. Overall, the work is inspired by real-life applications.

As the name of the group suggests, in general theoretical and methodological development, the focus is mainly on methods which are suitable and applicable for industrial level applications. Even though the methods applied are typically based on strong mathematical foundations, in practice, the applications may lack nice mathematical properties or involve complicating elements (e.g., they can involve black-box models and computationally expensive functions) and these practical characteristics must be taken into account when developing methods. Another characteristic of the methods developed is application-independence. In other words, behind the application-specific user-interface, the optimization method can be the same for designing paper machines or planning radiotherapy treatment.

The group has devoted a lot of attention to interactive multiobjective optimization methods and developed and applied them extensively. Among others, the industrial applications considered have dealt with improvement of product properties, making production processes and their controls more efficient, or finding the best shape or structure, etc.

Current Research Directions

The most well-known interactive method developed in the group is NIMBUS. NIMBUS is a classification-based method where the decision maker classifies objective functions to indicate the kind of changes that are desired in the current Pareto optimal solution to make it better. Several variants of the method have been published during the years and the synchronous version is currently in use.

Among more recently developed interactive methods we can mention Pareto Navigator which has been directed for computationally expensive problems. The idea is to create an approximation of the Pareto optimal set and enable the decision maker to navigate on it. On the approximation, changes of trade-offs can be seen in real-time and then any interesting solution can be projected to the real Pareto optimal set. Without the approximation, the navigation would be too slow because calculating new Pareto optimal solutions for computationally expensive problems would take too much time but the approximation avoids this. Another way to consider computationally expensive problem is PAINT which creates a computationally inexpensive surrogate problem which can be solved with e.g. NIMBUS. On the other hand, the interactive Nautilus method questions the idea of considering only Pareto optimal solutions throughout the solution process. Instead, the method starts from the nadir point and allows finding the most preferred solution without anchoring and the need of trading-off, that is, giving up in some objectives. Enabling improvement in all objectives can be useful also for group decision making situations.

Because many methods developed in the group are motivated by practical applications, it is important that this work is also brought close to people who in real-life face the actual problems and apply the methods. Therefore, the group has developed and is developing several different interactive tools for multiobjective optimization.

One can say that the most widely available interactive multiobjective optimization software is WWW-NIMBUS (available at http://nimbus.it.jyu.fi/), an implementation of the NIMBUS method. WWW-NIMBUS is a web-based software freely available for academic teaching and research use around the world (the first version was published as early as in 1995). Based on the WWW-NIMBUS software, the group has also developed a commercial optimization tool IND-NIMBUS, which is a desktop application operating on Linux and Windows platforms. IND-NIMBUS has been lately used for most industrial applications considered. Besides academic use, it is available for industrial partners and a demo-version is available for interested parties (http://ind-nimbus.it.jyu.fi/).

After testing with demo versions, the implementation of the new interactive methods Pareto Navigator and Nautilus has been started so that they can become more widely applicable. In method and related software development, the group is paying special attention to intuitive human-computer interaction. Because interactive methods are supposed to support learning, the way preference information is acquired from and new insight into the problem is presented to the decision maker plays a very important role in the success of the solution process. This research contains user interface and interaction design, usability research, information visualization and visual analytic environments.

The group has been active in building bridges between the MCDM and evolutionary multiobjective optimization (EMO) communities. Examples of hybrid method development include approaches for estimating the nadir point utilizing EMO and achievement scalarizing functions. In addition, the efficiency and accuracy of EMO methods have been improved by hybridizing scalarizing functions and local search in them. Preference information has been also incorporated in EMO methods in the form of a reference point improving efficiency and enabling concentration on interesting Pareto optimal solutions.

Alongside the general theoretical and methodological development, recently, the development of so-called approximation methods has been considered in the group. These methods aim, in a way or another at building or utilizing an approximation of the objective functions or the Pareto optimal set (e.g. meta-models, polyhedral and tangent plane approximations). An approximation of the Pareto optimal set is especially useful in the case of industrial applications because problem related models are typically computationally very time-consuming to operate.

Another research direction is related how to tackle with uncertainty in multiobjective optimization problems, that is, how to make decisions under uncertainty and in changing environments. This research contains studies related to uncertainties in process parameters, optimization of the production plant concepts under different production tasks and production plant design through a bilevel multiobjective optimization problem formulation.

The group has extensive collaboration networks in Finland and abroad and frequently hosts visiting researchers. For example, in the fall 2013, doctoral student Giulia Saccani from Politecnico di Milano visited the group for several months and post-doctoral researcher Ernestas

Filatovas from the Vilnius University for several weeks. In addition, Ana Belen Ruiz from the University of Malaga will spend three months in the spring 2014 in Jyväskylä.

Members

1. Professor Kaisa Miettinen
2. Dr. Jussi Hakanen, Post-doctoral researcher
3. Dr. Dmitry Podkopaev, Post-doctoral researcher
4. Dr. Karthik Sindhya, Post-doctoral researcher
5. Dr. Markus Hartikainen, Post-doctoral researcher
6. Mr. Vesa Ojalehto, Doctoral student
7. Mr. Mohammad Tabatabaei, Doctoral student
8. Mr. Tinkle Chugh, Doctoral student

Examples of Publications

- Steponavice, I., Ruuska, S., Miettinen, K., A Solution Process for Simulation-based Multiobjective Design Optimization with an Application in Paper Industry, Computer-Aided Design, 47, 45-58, 2014.
- Sindhya, K., Ojalehto, V., Savolainen, J., Niemistö, H., Hakanen, J., Miettinen, K., Coupling Dynamic Simulation and Interactive Multiobjective Optimization for Complex Problems: An APROS-NIMBUS Case Study, Expert Systems with Applications, 41(5), 2546-2558, 2014.
- Miettinen, K., Mustajoki, J., Stewart T.J., Interactive Multiobjective Optimization with NIMBUS for Decision Making under Uncertainty, OR Spectrum, 36(1), 39-56, 2014.
- Sindhya, K., Miettinen, K., Deb, K., A Hybrid Framework for Evolutionary Multi-Objective Optimization, IEEE Transactions on Evolutionary Computation, 17(4), 495-511, 2013.
- Tarkkanen, S., Miettinen, K., Hakanen, J., Isomäki, H., Incremental User-Interface Development for Interactive Multiobjective Optimization, Expert Systems with Applications, 40, 3220-3232, 2013.

- Hartikainen, M., Miettinen, K. and Wiecek, M., PAINT: Pareto Front Interpolation for Nonlinear Multiobjective Optimization, Computational Optimization and Applications, 52, 845-867, 2012.
- Miettinen, K., Eskelinen, P., Ruiz, F., Luque, M., NAUTILUS Method: An Interactive Technique in Multiobjective Optimization based on the Nadir Point, European Journal of Operational Research, 206(2), 426-434, 2010.
- Deb, K., Miettinen, K., Chaudhuri S., Towards an Estimation of Nadir Objective Vector Using a Hybrid of Evolutionary and Local Search Approaches, IEEE Transactions on Evolutionary Computation, 14(6), 821-841, 2010.
- Eskelinen, P., Miettinen, K., Klamroth, K. and Hakanen, J., Pareto Navigator for Interactive Nonlinear Multiobjective Optimization, OR Spectrum, 32(1), 211-227, 2010.
- Miettinen, K., Mäkelä, M.M., Synchronous Approach in Interactive Multiobjective Optimization, European Journal of Operational Research, 170(3), 909-922, 2006.
- Miettinen, K., Nonlinear Multiobjective Optimization, Kluwer Academic Publishers, 1999.

Software Developed at the Research Group: IND-NIMBUS

IND-NIMBUS is aimed at solving nonlinear multiobjective optimization problems and it can be used for solving real-world applications. It is based on interaction between a human decision maker who interactively directs the search for the most preferred Pareto optimal solutions. IND-NIMBUS contains implementations of different interactive multiobjective optimization methods. In addition, different ways of visualizing the Pareto optimal solutions obtained are included. IND-NIMBUS

- is available for interactive decision support
- can solve problems with several conflicting (nonlinear) objectives subject to equality and inequality constraints
- can be used to analyze interrelationships between different, conflicting objectives
- enables learning about the problem and decision maker's preferences
- produces Pareto optimal and approximate of Pareto optimal solutions based on preferences given by the decision maker

- uses same ideology as WWW-NIMBUS
- can be tested with a demo available at http://ind-nimbus.it.jyu.fi/

Features

- NIMBUS, Pareto Navigator and PAINT methods available
- versions for different operating systems
- tested with several industrial problems
- can be connected with different simulator or modelling tools (e.g. Matlab, APROS BALAS and GAMS)
- contains several underlying single-objective optimization methods which can be selected by the user (e.g. proximal bundle method, genetic algorithm, differential evolution and controlled random search).

Group photo

7 Imprints

Dr. Johannes Siebert
Chair of Operations Management (Prof. Schlüchtermann)
University of Bayreuth
D–95440 Bayreuth
Germany
Fon: +49 921 55 619 4
Fax: +49 921 55 619 2
Johannes.Siebert@uni-bayreuth.de
newsletter@mcdmsociety.org

Lucie Galand: lucie.galand@dauphine.fr
Karthik Sindya: karthik.sindhya@jyu.fi
Salvatore Corrente: salvatore.corrente@unict.it

We are working on publishing the newsletter of the International Society on Multiple Criteria Decision Making two times a year. Contributions can be sent at any time to the editor (please see the address provided above).