

Operational research methods for fundamental problems in theory and practice (EURO 2015)

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Some recent Operational Research events that took place in Glasgow and Edinburgh, United Kingdom, specifically those held during the EURO 2015 and two of its satellite events, Workshops: the EUROPT Workshop on Advances in Continuous Optimization (EUROPT Workshop 2015) and EURO Operational Research for Development – International Federation of Operational Research Societies Workshop (EURO ORD – IFORS Workshop) show how Operational Research theory has and is continuing to improve decision processes in a constantly changing and unstable World. The entire conference season is dealt with, while paying particular attention to OR for development and developing countries, continuous optimization and the social aspects of the various events.

Key words: operational research, optimization, developing countries, developed countries

1. Introduction

In addition to the challenges of big volumes of disparate data on one hand, and enhanced technological and computational resources on the other, societies now have to deal with more uncertainty in a rapidly changing environment. The usage of decision-making tools and methodologies for a non-stable world has thus become a necessity for practitioners, stakeholders, researchers and academics [1–3].

In an effort to provide a forum for discussing these issues, a series of conferences and workshops dedicated to the theory and application of Operational Research methodologies in uplifting living conditions in developing and developed countries, among others, had been organized.

2. EURO Conference

The European Conference on Operational Research, organized by the Association of European Operational Research Societies (EURO; <https://www.euro-online.org/>) within the International Federation of Operational Research Societies (IFORS; <http://ifors.org/ewg-ord/>) is a major conference that gathers more than 2000 participants each year, between the IFORS triennial conferences. For 2015, the EURO conference was held at the University of Strathclyde in Glasgow from 12th to 15th of July 2015 and the main theme of the conference was “Making an Impact”. This conference was prepared in conjunction with the OR Society of the United Kingdom [4].

The conference program included excellent and worldwide known plenary speakers in Operational Research. Ralph Tyrrell Rockafellar, designated as the IFORS Distinguished Lecturer for the Conference, talked about risk and reliability in stochastic optimization. Sir Alan Wilson gave an overview of the challenges in solving long-term complex problems in

cities. Maria Grazia Speranza presented the history and trends in transportation and logistics. All the plenary talks were given at the highly solemn Barony Great Hall with great success.

Keynote and tutorial speakers gave talks about diverse areas and trends of operational research. These included: “Automatic Algorithm Configuration” (Thomas Stuetzle), “Business Analytics” (Michael Trick); “Regional Innovation Ecosystems” (Markku Markkula); “The Relationship Between OR and the Government” (Tony O’Connor); “Criterion Space Search Methods” (Martin Savelsbergh); “Modern Supply Chain Planning” (Stefan Nickel); “Evacuation Planning Models” (Horst Hamacher); “Healthcare System Optimization” (Eva K. Lee); “Behavioural Operational Research” (Raimo P. Hämäläinen); “OR and Bioinformatics” (Jacek Blazewicz); and “OR Education” (Ariela Sofer).

A very interesting feature of the conference was the series of participative activities related to *Making an Impact*, with the idea of making the practice of OR in the real world more effective. Some of the activities included workshops, seminars and tutorials dedicated to the practice of OR, and case studies in OR and analytics. Activities bridging the academic-practitioner divide included poster and round table discussions, speed networking, mentoring clinics featuring one on one sessions with experienced practitioners. In the area of practice, the European Excellence in Practice Award (EEPA) was given to Jesse O’Hanley (University of Kent, UK) for his work on *Optimizing River Connectivity Restoration*. The EURO Gold Medal 2015 was awarded to Alexander Schrijver (CWI, Amsterdam, The Netherlands).

3. EURO working groups

The EURO association also has a remarkable number of different working groups devoted to specific areas of Operational Research (<https://www.euro-online.org/web/pages/1458/euro-working-groups>). Below are the highlights of two such workshops held prior to the main EURO 2015 conference.

3.1. EUROPT Workshop

EUROPT is a EURO working group that aims to promote and facilitate communication links among researchers working in the area of continuous optimization (<http://europt.iam.metu.edu.tr/>). Since its founding in 2000, EUROPT has continuously contributed to the international OR community.

The annual EUROPT Workshop on Advances in Continuous Optimization (EUROPT Workshop) was held during July 8-10, 2015, in Edinburgh, Scotland (<http://www.maths.ed.ac.uk/hall/EUROPT15/>), right before and under collaboration with the main EURO Conference. At this opportunity, the workshop gathered some famous and leading researchers in the field of mathematical optimization along with many specialists from the different research areas as well as young academicians. EUROPT Fellow 2015 Panos Pardalos from the Department of Industrial and Systems Engineering at the University of Florida addressed the history of the development of nonconventional computer models, such as quantum or DNA computer architectures, as an attempt to solve some of the intractable optimization problems. Serge Gratton from the University of Toulouse presented some of the recent computational results on multigrid approaches for large scale non-convex optimization problems, which make some of the large scale real-world problems arising in, for example physics and industry, efficiently solvable. Lieven Vanderberghe from the Electrical Engineering Department at the University of California, Los Angeles, spoke about chordal graphs and their applications in sparse semidefinite programming. Sven Leyffer from the Argonne National Laboratory tackled PDE-constrained mixed-integer programming

problems that arise in various engineering applications, discussed the existing approaches to solve these problems, and pointed out some of their emerging applications [5].

3.2. EURO ORD – IFORS Workshop

The purpose of the EURO working group on OR for Development (EWG-ORD; <https://www.euro-online.org/web/ewg/29/or-for-development-ewg-ord>) is to help raise consciousness and promote efforts towards the use of Operational Research to achieve the goals of development. Since its establishment in 2006, it has organized annual workshops intended to gather together experienced scientists, young scholars, and practitioners so that they may share ideas and collaborate on projects devoted to the specific idea area of development.

The EWG-ORD workshop for 2015 was held from July 9 to 10 at the University of Strathclyde in Glasgow, Scotland (<http://ifors.org/ewg-ord/>). The Workshop, with the theme “OR: Uplifting Living Conditions”, was jointly sponsored by EWG-ORD, IFORS and offered in conjunction with the EURO conference.

This workshop aimed to bring together members of our European and worldwide OR community who have utilized OR tools to address problems in education, health (e.g., epidemics), basic public services, water management, technology, use and reuse of resources (physical or financial), infrastructure, agriculture, industries, environmental sustainability, energy sector, unabated population growth and climate change.

The keynote speech was presented by Geoff Royston, former head of strategic analysis and Operational Research in the Department of Health for England and Past President of The Operational Research Society of the UK. He gave insightful comments and solutions that have been implemented by the Department to solve some known and existing real-world health OR issues. He also challenged the OR community to draw on a broader range of analytical methods including the use of “Big Data” analytics to address the growing need for better health in developing countries.

The presentations of workshop participants emphasized development issues from the traditional OR applications (e.g., optimum allocation in forestry, improving service quality in hospitals, supply chain management) and presented novel approaches to investigating issues on uplifting living conditions by incorporating data or models from geo-informatics, neuroscience, and non-parametric statistics [6].

4. Conclusions

The EURO Conference that took place in Scotland in 2015 catered to OR professionals engaged in a wide variety of OR areas. In depth treatment and discussion of some of the specific areas were possible through the Working Groups that EURO itself has established. Two such groups that conducted their satellite conferences were in the methodological area of continuous optimization and in the interest area focused on development and developing countries. The active involvement of these OR professionals in the enrichment of theory and continuing search for solutions to development problems is proof of the relevance of the discipline and its role in improving decision processes in a rapidly changing unstable world.

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