
Editorial

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Biographical notes: Rubén Ruiz is a Full Professor of Statistics and Operations Research at the Polytechnic University of Valencia, Spain. He is co-author of more than 60 papers in international journals and has participated in presentations of more than 150 papers in national and international conferences. He is editor of the *Elsevier Journal Operations Research Perspectives (ORP)* and co-editor of the JCR-listed journal *European Journal of Industrial Engineering (EJIE)*. He is also an Associate Editor of other important journals like *TOP* and *Applied Mathematics and Computation* as well as a member of the editorial boards of several journals, most notably *European Journal of Operational Research* and *Computers and Operations Research*. He is the Director of the Applied Optimization Systems Group (SOA, <http://www.soa.iti.es>) at the Instituto Tecnológico de Informática (ITI, <http://www.iti.es>) where he is or has been the Principal Investigator in several public research projects as well as privately funded projects with industrial companies. His research interests include scheduling and routing in real life scenarios.

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We are pleased to introduce the special issue on 'Project Management and Scheduling' following the 15th International Conference on Project Management and Scheduling held in Valencia from the 19th to the 22nd of April, 2016 (PMS 2016, <http://www.congresos.adeituv.es/pms2016/>). PMS conferences are bi-annual events organised by the EURO working Group on Project Management and Scheduling and cover all aspects of project management and scheduling. The special issue call for papers was issued shortly after the conference, with a deadline set as 30th September 2016. Topics of interest included network modelling, project scheduling, resource management, due-date management, project risk management, project scheduling under uncertainty, proactive/reactive project scheduling, multicriteria project scheduling, shop scheduling, scheduling with additional constraints, machine assignment and scheduling, flexible/robust scheduling, grid scheduling, multicriteria scheduling, applications and software. The special issue was open to the whole scientific community.

More than 20 submissions were received. All papers were subject to a rigorous double blind peer review process. After several revisions and about one year later, only six papers were accepted for this special issue. All the papers focus more on the area of project management and scheduling rather than on machine scheduling. In what follows, we briefly summarise the contents and main contributions of these six excellent papers in the special issue.

The paper 'The total adjustment cost problem with variable activity durations and intensities' by Lucio Bianco, Massimiliano Caramia and Stefano Giordani studies resource levelling in project scheduling. More specifically, the authors focus on the total adjustment cost objective. They present mixed-integer mathematical models and consider interesting variants with variable durations and execution intensities. CPLEX is employed to test the proposed model over standard benchmarks. For the specific case of fixed durations and execution intensities, the authors compare results with existing models obtaining very good results.

In 'A decomposition heuristic for short-term planning of assessment centres', Tom Rihm and Norbert Trautmann deal with a very interesting and complex real-life problem. The objective is to organise assessment centres for service providers. The result, referred to as the assessment centre-planning problem (ACP) consists in scheduling tasks that candidates carry out when opting for a job in a recruiting process. Assessors are assigned to the candidate-task pairs. There is a large number of real constraints and situations that the problem considers. The authors present a mixed integer programming-based decomposition heuristic that is shown to be able to compete with existing methods as well as to provide optimal solutions for real cases. The ACP is related to the special issue as the problem can be viewed as an extension of the resource-constrained project scheduling problem (RCPSP). This research received the Best Paper Award at the aforementioned 15th International Conference on Project Management and Scheduling held in Valencia in April, 2016. Therefore, this research, in full paper version after revisions, is highly regarded by the editors of this special issue.

Adrian Zimmermann in the paper 'A mixed-integer programming-based heuristic for project scheduling with work-content constraints' studies a project scheduling problem in which each of the project's activities has a prescribed work content that must be completed by a related specific resource (work-content resource). Furthermore, the resource usage is not constant over the planning horizon. There are some additional

constraints like lower and upper bounds on the resource usage as well as the impossibility of changing the resource usage for a minimum number of consecutive periods. The result is a practical extension of the multi-mode resource-constrained project scheduling problem (MRCPSP). The author presents a mixed-integer programming formulation and a heuristic based on this formulation. Preprocessing, scheduling and rescheduling rules are presented as well. A complete experimental design and evaluation is carried out where it is shown that the proposed approaches improve on the existing state-of-the-art ones.

Patrick Gerhards, Christian Stürck and Andreas Fink present the paper ‘An adaptive large neighbourhood search as a matheuristic for the multi-mode resource-constrained project scheduling problem’ and study the well-known MRCPSP with the typical makespan minimisation objective. The authors put forward a hybrid method combining adaptive large neighbourhood search and mixed integer programming. These methods have been recently referred to as matheuristics. The presented method performs very strongly as is demonstrated in the authors’ computational evaluations, as it clearly performs better than all other published methods in the MMLIB+ benchmark. Furthermore, 294 new best-known solutions are reported.

In ‘Periodically aggregated resource-constrained project scheduling problem’, Pierre-Antoine Morin, Christian Artigues and Alain Haït introduce an interesting new problem, the periodically aggregated resource-constrained project scheduling problem (PARCPSP), where resource usage is computed on average over aggregated periods of a given length. The start and completion times of activities as precedence relations are considered in a precise (not averaged) way. This is interesting, as a very detailed project schedule is not always needed. For example, at a tactical level, approximate resource consumption might suffice, when the project still needs to be scheduled in a specific way. The problem is formulated as a hybrid between a project scheduling and capacity planning problem. After a careful definition of this new problem, the authors study its theoretical properties and present a mixed integer linear formulation. Adapted schedule generation schemes are given and some experiments are carried out to show the performance of the introduced elements.

The special issue is closed by the paper: ‘Multi-objective binary cuckoo search for constrained project portfolio selection under uncertainty’. Mohammed M.S. El-Kholany and Hisham M. Abdelsalam present a bio-inspired methodology for solving the project portfolio selection problem (PPS). In this problem, a selection of the most profitable projects must be selected by an organisation from a set of potential projects. In particular, the authors combine a binary cuckoo search metaheuristic with simulation techniques where uncertainties are considered in a multi-objective scenario. In the computational evaluation, the authors study up to five different objectives. The results and discussion presented in the paper show the different advantages and drawbacks of the methods proposed.

This special issue is the result of a community effort where the cooperation between authors, reviewers and editors has been the norm. We would like to express our sincere thanks and acknowledgement to the reviewers for their high-quality and timely refereeing. Last but not least, we thank all authors for their contributions which have made this special issue possible.