Preface to Special issue dedicated to ISCO 2012

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PREFACE

Preface

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This special issue of *Mathematical Programming B* is dedicated to the second International Symposium on Combinatorial Optimization (ISCO 2012), which took place in Athens, University of Economics and Business (AUEB), on April 19–21, 2012. ISCO 2012 was preceded by the Spring School on "Mathematical Programming and Design of Approximation Algorithms" given by David Shmoys and David Williamson. This edition of ISCO was the second of a series of biennial conferences on combinatorial optimization with its first venue held in Hammamet, Tunisia in March 2010. ISCO is intended to be a forum for the exchange of recent scientific developments and for the discussion of new trends. The scope of the conference includes all aspects of combinatorial optimization ranging from mathematical foundations and theory of algorithms to computational studies and practical applications. Detailed information about ISCO 2012 is available in http://isco12.cs.aueb.gr/.

In the past years, combinatorial optimization has undergone rapid developments, major advances being obtained in different areas such as computational complexity, approximation algorithms, cutting-plane methods, and stochastic and robust optimization. Combinatorial optimization problems arise in different domains of production, telecommunication, economy, and the likes. Various exact, heuristic, and metaheuristic

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approaches have been devised for analyzing and solving hard combinatorial optimization problems. Moreover, great development has been seen in graph theory and combinatorics, which are central tools in combinatorial optimization. In this issue, several combinatorial optimization problems and resolution techniques as well as structural aspects of graphs and combinatorics are considered.

– Friendly Bin Packing Instances without Integer Round-up Property by A. Caprara, M. Dell'Amico, J. Carlos Diaz Diaz, M. Iori and R. Rizzi.

In this paper, the authors consider the bin packing problem, and provide smaller counterexamples to the so-called Integer Round-up Property, that is the optimal value of the fractional bin packing problem, rounded up to the closest integer, yields the optimal bin packing value. The authors give counterexamples with bin capacity of the order of a hundred whereas the smallest counterexample known in the literature involves a bin capacity of the order of a million. Here the instances use edge coloring counterexamples.

– A 3/2-Approximation Algorithm for Some Minimum-Cost Graph Problems by B. Couëtoux, J. Davis, and D. P. Williamson.

Here the authors consider a class of problems that involve finding forests of minimum edge cost. They give a 3/2-approximation algorithm for this class improving a 2-approximation algorithm given before by Goemans and Williamson.

– Dual Consistent Systems of Linear Inequalities and Cardinality Constrained Polytopes by S. Fujishige and J. Maßberg.

In this paper the authors introduce a concept of dual consistency of systems of linear inequalities with full generality. They show that a cardinality constrained polytope is represented by a certain system of linear inequalities if and only if the systems of linear inequalities associated with the cardinalities are dual consistent. They discuss a characterization of certain complete systems of linear inequalities expressing cardinality constrained polytopes such as the cardinality constrained ordinary bipartite matching polytope and the cardinality constrained polymatroid intersection polytope.

– The Two-Level Diameter Constrained Spanning Tree Problem by L. Gouveia, M. Leitner and I. Ljubić.

This article deals with a generalization of the Diameter Constrained Spanning Tree Problem. By exploiting the relation between the solutions of the two problems, the authors describe structural properties and develop mixed integer programming formulations based on layered graph approaches.

– Minimum Concave Cost Flow Over a Grid Network by Q. He, S. Ahmed and G. L. Nemhauser.

The authors study in this paper the minimum concave cost network flow problem over a grid network with a general nonnegative separable concave cost function. This problem is NP-hard in general; it is shown that the problem is polynomially solvable on grid networks with some configurations.

– Modifed Orbital Branching for Structured Symmetry with an Application to Unit Commitment by J. Ostrowski, M. F. Anjos and A. Vannelli.

In this paper the authors propose a modified orbital branching technique to exploit special structures in a problem's symmetry group. The proposed technique can solve more efficiently problems with structured symmetry. The authors show that this technique is effective for problems in which the solution variables can be expressed as 0/1 matrices where the problem's symmetry group contains all permutations of the columns. They use the unit commitment problem to demonstrate the strength of their method.

– On the Integrality Gap of the Subtour LP for the 1,2-TSP by J. Qian, F. Schalekamp, D. P. Williamson and A. van Zuylen.

The authors study the integrality gap of the subtour LP relaxation for the traveling salesman problem in the special case when all edge costs are either 1 or 2. They show that the integrality gap in this case is 10/9 when the optimal subtour LP solution has a certain structure. Under some assumption, they show that the integrality gap is at most 7/6. And when no assumption made on the structure of the optimal subtour LP solution, they show that the integrality gap is at most 5/4. This is the first bound on the integrality gap of the subtour LP strictly less than 4/3 known for an interesting special case of the TSP.

– Oriented Euler Complexes and Signed Perfect Matchings by L. A. Vegh and B. von Stengel.

This paper is concerned with the oriented Euler complexes. The authors introduce the concept of oriented Euler complexes, and show that the ends of a pivoting path have opposite sign. Moreover, a polynomial time algorithm is given for finding a perfect matching of opposite sign in a graph with an Eulerian orientation and a perfect matching.

All the submitted papers have gone through the strict reviewing process of this journal. We would like to thank all the authors who submitted their work to this issue and the reviewers for their excellent work. Moreover, we would like to thank Danny Ralph, past Editor-in-Chief of *Mathematical Programming, Series B*, for having accepted the publication of this special issue and the editorial assistance of the journal Sindhuja Narayanasamy for their great effort and cooperation.