Editorial

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Biographical notes: Mhand Hifi is Full Professor of Computer Science and Operations Research at the University of Picardie Jules Verne, France. He is Vice-President of the Scientific Council of the same university. He received his BSc in Computer Engineering from USTHB, Algeria, his MSc in Modelling and Mathematical Methods in Economics from the University Paris-1 Pantheon-Sorbonne and his PhD in Computer Science from the University of Versailles St-Quentin-en-Yvelines (France). He is the Head of the Laboratory EPROAD (Eco-PRocédés, Optimisation et Aide à la Décision). He is on the Editorial Boards of several international journals: *Computers & OR*, *IJMOR*, *Advances in OR*, *Studia Informatica Universalis*, *American Journal of Operations Research*, and *Nature & Technology Review*. His research interests include combinatorial optimisation and OR problems.

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IJAOM, *Advances in OR*, *IJPS*, *IJAMC*, *JSCI*, *JPAM* and *JISE*. He received the 3rd Robert Faure Award from the ROADEF in 2009 and the 2010 Research Award from the Association of the Lorraine Universities.

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Combinatorial optimisation problems are encountered in different real-life areas (production systems, logistical systems, networks, maintenance and reliability, service systems, economical systems …). Motivated by their practical interest, numerous research teams studied theoretical and applied aspects of combinatorial optimisation and derived various methods based on exact and/or heuristic principles. In particular, polyhedral approaches have shown to be effective for formulating, analysing and solving hard real combinatorial optimisation problems.

This special issue, dedicated to JPOC6 (*Journées Polyèdres et Optimisation Combinatoire*), the *Sixth Polyhedra and Combinatorial Optimisation Days*, is intended to present new and recent trends in combinatorial optimisation and in particular, those related to polyhedral approaches and their applications.

The topics of this special issue include mainly polyhedral combinatorics, mathematical programming, linear and integer programming, polyhedral based approximation algorithms, branch-and-price algorithms, branch-and-cut algorithms, cutting plane algorithms, reformulation based algorithms, polyhedral based heuristic and branch-and-bound algorithms. This issue is composed of seven papers that focus on these topics.

In the first paper, Lalami, Elkihel, El Baz and Boyer present a heuristic which derives a feasible solution for the multiple knapsack problem. The proposed heuristic (RCH) is a recursive method that performs computation on the core of knapsacks. The RCH heuristic is compared with the MTHM heuristic of Martello and Toth. Computational results on randomly generated instances show that the proposed approach gives better gap and smaller restitution times.

In the second paper, Bendali, Mailfert and Tang study some polyhedral issues concerning the dominant of the hop-constrained path polytope. If L is the limit on the length (number of hops) of a path, a graph G, with two distinguished nodes s and t, is said to be L-h simple if the dominant is given by the trivial, st-cut and L-st-path inequalities. First the authors show that K_n is L-h-simple if and only if $n \leq L + 2$. Then, they describe three graph composition operations which preserve the L-h simple property.

The third paper, by Létocart, Nagih and Touati-Moungla propose a new Dantzig-Wolfe master model based on Lagrangian decomposition. They establish

the relationship with classical Dantzig-Wolfe decomposition master problem and propose an alternative proof of the dominance of Lagrangian decomposition on Lagrangian relaxation dual bound. As illustration, they give the corresponding models along with numerical results for two standard mathematical programs: the 0-1 bidimensional knapsack problem and the generalised assignment problem.

In the fourth paper, Pêcher and Wagler recall that a main result in combinatorial optimisation is that clique and chromatic number of a perfect graph can be computed in polynomial time (Grötschel, Lovàsz and Schrijver 1981) and that the circular-clique and circular-chromatic number are well-studied refinements of these graph parameters, and circular-perfect graphs form the corresponding superclass of perfect graphs. They recall that so far, it is unknown whether clique, circular-clique, circular-chromatic and chromatic numbers of a circular-perfect graph are computable in polynomial time. And they show the polynomial time computability of these graph parameters for some classes of circular-perfect graphs with the help of polyhedral arguments.

Ben-Ameur and Neto present in the fifth paper a randomised heuristic for the maximum cut problem. This heuristic permits to find an approximate solution for a formulation of the maximum cut problem as an unconstrained non-convex optimisation problem. A computational study is reported. The authors indicate that the proposed method is competitive with the best known procedures in the literature.

In the sixth paper, Nguyen and Thuy Nguyen study the version of the asymmetric prize collecting travelling salesman problem, where the objective is to find a directed tour that visits a subset of vertices such that the length of the tour plus the sum of the penalties associated with the vertices not in the tour is as small as possible (Profitable Tour Problem or PTP). They present a $(1+\lceil \log(n) \rceil)$-approximation algorithm for the asymmetric PTP where n is the number of vertices.

In the last paper, Abbas, Chergui and Ait Mehdia propose a multiobjective branch and bound algorithm for reaching the non-dominated set. Two types of nodes are considered in the tree-search. The first type of nodes characterises the non-integer optimal solutions of the Linear Programming (LP) problems. Such a non-integer solution is transformed to an integer one by applying a mechanism based upon branching procedure. The second type of nodes contains an integer solution. Efficient cuts are established for such nodes in order either to remove dominated integer vectors or to fathom them. The exact method is analysed computationally on a set of problem instances taken from the literature and a set of randomly generated problem instances. The obtained results are also compared to those provided by two exact algorithms of the literature tailored for the general case, where two, three and four criteria are considered.

To conclude, the guest editors would like to thank the authors for their valuable contributions, all the reviewers for their help in the evaluation process, and the Editor-In-Chief for accepting to organise this special issue on polyhedra and combinatorial optimisation.