

Preface

Some previous issues of *Control and Cybernetics* have been already focusing on different metaheuristic methods for dealing with complex optimization problems, and namely:

- *Simulated Annealing Applied to Combinatorial Optimization*, Vol. 25, No. 1, 1996, guest-edited by René Victor Valqui Vidal and Zbigniew Nahorski,
- *Evolutionary Computation*, Vol. 26, No. 3, 1997, guest-edited by Zbigniew Michalewicz and Marc Schoenauer.

In the first of these two volumes the editors wrote in the preface:

“The main idea of most metaheuristic methods is evident if we consider two opposite approaches to optimization of combinatorial problems: local search (in an appropriately defined neighbourhood) and global search (like full enumeration or stochastic Monte Carlo type techniques). The former easily ends in the first (of usually many) local optimum while the latter is computationally prohibitive for real-life problems. Metaheuristics provide ways of going out of a local optimum while keeping the necessary amount of computation on a reasonable level.”

This special issue is focusing on one of the most popular metaheuristic approaches: Tabu Search. The volume is specifically focusing on applications to solve complex combinatorial optimization problems.

The general idea of Tabu Search method lies in construction of a “tabu” list of moves which have been done earlier and proved wrong. This way, when moves to the neighbour points of a local optimum enter the tabu list the algorithm is forced to move out of the present optimum to look for a better one. More on the method can be found in a tutorial paper by Hindsberger and Vidal in this issue. A detailed description of the Tabu Search method and its algorithms can be found in a recent book (Glover and Laguna, 1997).

The origins of Tabu Search go back to the 1970's. Since then many both methodological and applied papers devoted to this metaheuristic have been published in the literature, many of them by Fred Glover, coauthor of one of the papers in this issue, often called the “father” of the method.

The volume starts with the tutorial paper mentioned (Hindsberger and Vidal) which gives an overview of the ideas behind Tabu Search and an up-to-date review of recent applications. The second paper (Glover, Laguna and Marti) presents the fundamentals of two recent evolutionary approaches: Scatter Search and Path Relinking, both intimately related to Tabu Search.

The rest of the papers present applications of the tabu search approach to solve different combinatorial optimization problems. Thus, the next two papers by Borges and Vidal and Hindsberger and Vidal are dealing with two complex real-life assignment problems within telecommunications and military planning areas.

The following paper (Drezner and Salhi) deals with the problem of designing a network which minimizes total travel time between all pair of nodes by the proper selection of one-way and two-ways arcs.

The next three papers in the volume are combining Tabu Search with other approaches. Løkketangen and Woodruff integrate pivot-based tabu search into branch and bound for 0-1 MIPS. Moccellini and Dos Santos present a hybrid Tabu-Search - Simulated Annealing algorithm for the minimal makespan flow-shop sequencing problem. And, Hasegawa, Ikeguchi and Aihara present a novel chaotic neurodynamical searching method based on Tabu Search for the quadratic assignment problem.

The last three papers present some recent results in the area of designing methods to cope with multi-objective combinatorial optimization problems. First, Hansen presents his results using hashing in the multi-objective tabu search and in the next paper he presents his TAMOCO, a multi-objective tabu search method to generate non-dominated alternatives. The last paper of the volume (Loukil, Teghem and Fortemps) presents a tabu search approach for coping with multicriteria scheduling problems.

We are convinced that this volume will be helpful in further identification of application possibilities offered by the tabu search approach. Moreover, new results are presented and new research areas are identified. Last but not least, the volume is intended to acquaint new potential users with the power and simplicity of this particular representative member of the family of metaheuristic approaches.

We are grateful to the authors for their interest in submitting papers, most of which have already been presented at international conferences, to this special issue of *Control and Cybernetics*. Thanks go to the referees for the careful and engaged work. Due to the efforts of both groups the issue may be enjoyed for its quality.

René Victor Valqui Vidal and Zbigniew Nahorski
Lyngby and Warsaw, September 2000

References

GLOVER, F. and LAGUNA, M. (1997) *Tabu Search*. Kluwer.