Guest Editorial Preface

Special Issue on Advances in Soft Computing Techniques and Applications

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This special issue presents some advances in the broad field of soft computing techniques. Conventional (hard) computing techniques, that despite the fact they are "bit-precise", are unfeasible to tackle real-life NP-complete problems. Unlike them, soft computing methods resemble biological stochastic processes which exploit the inherent uncertainty to achieve tractability. Therefore, even if their precise output is never possible to predict, soft computing methods are the only feasible approach to deal with the complexity and uncertainty of many realistic problems. The six papers from this special issue have been selected based on their complementarity, and include either some different emerging methods that mimic more closely the biological processes than traditional ones (the first four papers), or well-established techniques applied on new problems (the last two papers).

In the first paper, Pintea et al. introduce a new and closer to reality parallel computing technique for the traditional ACO (Ant Colony Optimization) method. The method has been investigated in the realistic context of the dynamic traveling salesman problem where the distances and the associated traveling costs between cities are unstable in time.

The second paper, written by Nuser, presents a molecular-inspired computing approach to solve the classical three-partition problem. Besides the computational complexity, the approach is investigated in terms of specific elements, such as number of strands, tubes and the longest library strand.

In the third paper, Singh et al. adopted the features of an ABC (Artificial Bee Colony) algorithm to solve one of the most popular problems in molecular biology, i.e. motif discovery. The approach, tested for human and mouse nucleotide sequences, shows superior performance in respect to other approaches proposed in the literature.

Tekchandani et al. are employing, in the forth paper, some variations of PSO (Particle Swarm Optimization) and DE (Differential Evolution) algorithms to optimize the flooding time synchronization in wireless sensor networks. Compared to the traditional linear regression techniques, the experimental results of this approach show a clear reduction of the average time synchronization error.

The last two papers present two classical soft computing techniques, namely fuzzy logic

and formal concept analysis. In the first one, Georgescu is using the fuzzy logic to model three notions of dominance (i.e., possibility, necessity and credibility) for the complex risk situations, while in the last paper, Kovács, based on the theory of formal concept analysis is introducing a more efficient generalization feature for morpheme analysis in natural language processing.

As may be noted, all the papers from this issue illustrate different soft computing techniques to deal with NP-complete problems. All of them are in fact meta-algorithms with a considerable design space that should be explored by configuration, tuning and experimentation for a specific problem.

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