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MULTI-AGENT COMBINATION OF EVOLUTIONARY ALGORITHMS AND DATA MINING FOR IMPROVED SEARCH IN REAL-WORLD OPTIMIZATION PROBLEMS

Joaquin Izquierdo, jizquier@upv.es

Universitat Politècnica de València, Spain

Enrique Campbell, encamgo1@upv.es

UPV, Spain

Idel Montalvo, imontalvo@ingeniousware.net

IngeniousWare GmbH, Germany

Rafael Perez-Garcia, rperez@upv.es

Universitat Politecnica de Valencia, Spain

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The flexibility introduced by evolutionary algorithms has allowed the use of virtually any objective and constraint functions, even when evaluations require running complex mathematical and/or procedural simulations of the systems under analysis and, in particular, are bound to be derivative-free. However, selecting which is the most appropriate heuristic for solving a specific problem is not easy and some algorithms can perform better in some problems and worse or very poorly in others. The reasons are manifold. Firstly, some operators apply better to certain problems than to others. Secondly, even when a population of solutions does evolve, the way it does is not dynamic enough, given the huge size of the space to be explored in the case of real-world problems. Thirdly, traditionally, the applied solution search processes have been totally unaware of the specific problem being solved, thus ignoring the size, the complexity and the domain of the problem. This contribution, proposes an approach based on hybridation of various metaheuristics working synergistically, the use of adaptive and auto-adaptive parameters, and the introduction of rules both obtained from the problem know-how and derived from knowledge discovery (data mining techniques) on databases of solutions explored in previous generations. The overall environment wrapping all these ingredients is based on the so-called multi-agent paradigm. We claim that based on the combination of these elements, applications can be developed for supporting decision making in both offline and online, real time contexts. The aim of this work is to enrich the problem formulation of optimization problems and to increase the computational efficiency to be able to cater to realistic problems. Specifically, we address the problem of the optimal design of a water distribution network from a multi-objective perspective.