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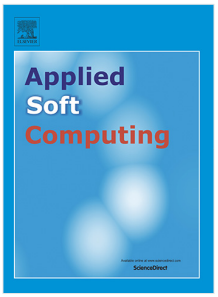

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Exploring the Probabilistic Graphic Model of a Hybrid Multi-objective Bayesian Estimation of Distribution Algorithm

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Abstract

The Hybrid Multi-objective Bayesian Estimation of Distribution Algorithm (HMOBEDA) has shown to be very competitive for Many Objective Optimization Problems (MaOPs). The Probabilistic Graphic Model (PGM) of HMOBEDA expands the possibilities for exploration as it provides the joint probability of decision variables, objectives, and configuration parameters of an embedded local search. This work investigates different sampling mechanisms of HMOBEDA, applying the considered approaches to two different combinatorial MaOPs. Moreover, the paper provides a broad set of statistical analyses on its PGM model. These analyses have been carried out to evaluate how the interactions among variables, objectives and local search parameters are captured by the model and how information collected from different runs can be aggregated and explored in a Probabilistic Pareto Front. In experiments, two variants of HMOBEDA are compared with the original version, each one with a different set of evidences fixed during the sampling process. Results for instances of multi-objective knapsack problem with 2 to 5 and 8 objectives show that the best variant outperforms the original HMOBEDA in terms of convergence and diversity in the solution set. This best variant is then compared with five state-of-the-art evolutionary algorithms using the knapsack problem instances as well as a set of MNK-landscape instances with 2, 3, 5 and 8 objectives. HMOBEDA outperforms all of them.

Keywords: Multi-objective optimization, estimation of distribution algorithms, automatic algorithm configuration

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