

Comparison of Interactive Evolutionary Multiobjective Optimization Methods Using an Artificial Decision Maker

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Abstract

In interactive evolutionary multiobjective optimization methods, preferences of a decision maker (DM), a domain expert, are iteratively incorporated to generate solutions that reflect the DM's interests. When comparing these methods, we need means to capture features inherent in the nature of the solution processes. Namely, the DM's preferences evolve while (s)he learns about the problem's trade-offs and the feasibility of her/his own preferences. In this work, we implement an artificial decision maker (ADM) to evaluate reference point-based interactive evolutionary methods. A reference point consists of desirable values for the objectives. To simulate several iterations with an interactive method, the ADM generates reference points differently depending on two phases that can be distinguished in the solution process. In the learning phase, reference points simulate exploration to examine various Pareto optimal solutions to find a potential region of interest. Then, reference points of the decision phase mimic a progressive convergence towards the most preferred solution in this region. Each reference point is used to assess the methods' performances per iteration. The ADM's performance is demonstrated by comparing several interactive evolutionary methods on benchmark problems with up to 9 objectives. Future work includes consideration of other types of preference information and incorporation of a procedure to automatically switch from the learning to the decision phase.

Keywords: Decision making, Performance comparison, Interactive methods, Evolutionary algorithms, Reference point.