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Interactive multi-objective particle swarm optimization with heatmap-visualization-based user interface

Jan Hettenhausen, Andrew Lewis & Sanaz Mostaghim

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Abstract

This article introduces an interactive Multi-Objective Particle Swarm Optimization (MOPSO) method that allows a human decision maker to guide the optimization process based on domain-specific knowledge and problem-specific preferences. This article also presents a novel graphical user interface based on heatmap visualization which, combined with the algorithm, greatly reduces the workload on the user, thereby decreasing unwanted side effects caused by human fatigue.

The method was evaluated on a set of standard test problems and the results were compared to those of a non-interactive MOPSO method. To simulate domain-specific preferences and knowledge, the decision maker was instructed to focus the search on a specific region of the Pareto-front. The results demonstrate that the proposed method

was able to obtain better solutions than the non-interactive MOPSO method in terms of convergence towards the true Pareto-front and the number and spread of focused solutions.

Keywords:

interactive multi-objective particle swarm optimization | heatmap visualization | multi-objective optimization | interactive optimization

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