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

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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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Related Research Data

A fast and elitist multiobjective genetic algorithm: NSGA-II
Source: IEEE Transactions on Evolutionary Computation
Multiple Objective Decision Making — Methods and Applications
Source: Unknown Repository
MOPSO: a proposal for multiple objective particle swarm optimization
Source: Unknown Repository
Multi-Objective Particle Swarm Optimizers: A Survey of the State-of-the-Art
Source: International Journal of Computational Intelligence Research
A modified particle swarm optimizer
Source: Unknown Repository
Interactive Particle Swarm: A Pareto-Adaptive Metaheuristic to Multiobjective Optimization
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