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Analysing the Performance of Dynamic Multi-objective Optimisation Algorithms

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Abstract

Dynamic multi-objective optimisation problems (DMOOPs) have more than one objective, with at least one objective changing over time. Since at least two of the objectives are normally in conflict with one another, a single solution does not exist and the goal of the algorithm is to track a set of tradeoff solutions over time. Analysing the performance of a dynamic multi-objective optimisation algorithm (DMOA) is not a trivial task. For each environment (before a change occurs) the DMOA has to find a set of solutions that are both diverse and as close as possible to the optimal trade-off solution set. In addition, the DMOA has to track the changing set of trade-off solutions over time. Approaches used to analyse the performance of dynamic single-objective optimisation algorithms (DSOAs) and DMOAs do not provide any information about the ability of the algorithms to track the changing optimum. Therefore, this paper introduces a new approach to analyse the performance of DMOAs and applies this approach to the results obtained by five DMOAs. In addition, it compares the new analysis approach to another approach that does not take the tracking ability of the DMOAs into account. The results indicate that the new analysis approach provide additional information, measuring the ability of the algorithm to find good performance measure values while tracking the changing optima.