Preference-inspired co-evolutionary algorithms using weight vectors

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Preference-inspired co-evolutionary algorithms using weight vectors

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Abstract

Decomposition based algorithms perform well when a suitable set of weights are provided; however determining a good set of weights *a priori* for real-world problems is usually not straightforward due to a lack of knowledge about the geometry of the problem. This study proposes a novel algorithm called preference-inspired co-evolutionary algorithm using weights (PICEA-w) in which weights are co-evolved with candidate solutions during the search process. The co-evolution enables suitable weights to be constructed adaptively during the optimisation process, thus guiding candidate solutions towards the Pareto optimal front effectively. The benefits of co-evolution are demonstrated by comparing PICEA-w against other leading decomposition based algorithms that use random, evenly distributed and adaptive weights on a set of problems encompassing the range of problem geometries likely to be seen in practice, including simultaneous optimization of up to seven conflicting objectives. Experimental results show that PICEA-w outperforms the comparison algorithms for most of the problems and is less sensitive to the problem geometry.

Keywords: Evolutionary algorithms, multi-objective optimisation, many-objective, co-evolution, weights

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