Preference Articulation in Evolutionary Multiobjective Optimisation

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Abstract

Real-world optimisation problems often involve a number of conflicting criteria, or objectives. Such problems usually admit multiple Pareto-optimal solutions, i.e. solutions, which cannot be improved upon in all objectives simultaneously. In practice, however, acceptable solutions must perform sufficiently well with respect to all objectives, which means that not all Pareto-optimal solutions may be satisfactory.

Evolutionary approaches to multiobjective optimisation have concentrated mainly on the task of approximating the set of Pareto-optimal solutions of a given problem as well as possible, by generating diverse sets of non-dominated alternatives. Subjective information concerning how different combinations of objective values influence the relative quality of a solution is not required, but this approach tends to become impractical as the number of objectives grows. In practice, however, there are many situations in which such preference information is either available a priori or may be acquired during the initial steps of an optimisation run, even if not in a complete form. Incorporating preference information in evolutionary multiobjective optimisation (EMO) algorithms allows the search to concentrate on, and to better approximate, the relevant regions of the Pareto-optimal front.

In this talk, a number of ways in which preference information may be combined with evolutionary search, in order to improve the relevance and the quality of the optimisation results will be discussed, and application examples will be presented. Important aspects of the discussion will include the form in which preference information is initially available, the impact of preference articulation techniques on the optimisation problems to be solved, the quality of the final solutions obtained, and user-related issues, such as visualisation and interaction. The talk will conclude with the identification of some opportunities for future work.