Using Choquet Integral as Preference Model in Interactive Evolutionary Multiobjective Optimization

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Extended abstract

We present an interactive evolutionary multiobjective optimization method that can be applied to both continuous and combinatorial problems. The search is driven by user's preference information elicited in form of pairwise comparisons of some non-dominated solutions in successive generations. This information is then used to curb the set of compatible user's value functions. When choosing the mathematical form of the preference model guiding the search, one faces the usual dilemma: if the preference model is too simplistic (say, linear), it is unlikely to be able to represent adequately the user's preferences expressed through the pairwise comparisons; on the other hand, if the preference model is too versatile, a lot of preference information is required

from the user to narrow down the model's parameters to a useful degree, i.e., such that the preference relation implied by the model is sufficiently richer than the dominance relation and thus helpful to converge to the most preferred part of the Pareto front. For this reason, we propose a method called NEMO-II-Ch that adapts to the complexity of user's preferences in the course of successive generations. It starts with a linear additive model, and switches to 2-additive Choquet integral, a preference model permitting to represent interaction between objectives, once the linear additive model is not able to represent the preference information iteratively supplied by the user. The Choquet integral is applied for the first time in the context of evolutionary computation. Computational experiments prove a good convergence of the proposed method to the most preferred region of the Pareto front for a simulated artificial user.

Keywords
Interactive Multiobjective Optimization; Evolutionary Algorithms; Interaction between criteria; Choquet Integral.

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