SYNCHRONOUS SCALARIZATION APPROACH WITH APPLICATION IN INTERACTIVE MULTICRITERIA OPTIMIZATION AND DECISION MAKING

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In our latest research [2,3], we introduce new families of parameterized achievement scalarizing functions (ASFs) for multiobjective optimization. With these functions we can guarantee the (weak) Pareto optimality of the solutions produced and under mild assumptions every (weakly) Pareto optimal solution can be obtained. Parameterization of this kind gives a systematic way to produce different solutions from the same preference information. For the newest concept of two-slope parameterized ASFs introduced in [3], with two weighting vectors depending on the achievability of the reference point there is no need for any assumptions about the reference point. In addition to theory, in [3] we give the graphical illustrations of parameterized ASFs and analyze the quality of the solutions produced in convex and nonconvex test problems.

Synchronous approach in the context of interactive multiobjective optimization originates from [1], where only a few most widely used types of scalarizing functions were considered. For the purpose of simultaneous and synchronous generation of several Pareto optimal solutions, it looks potentially beneficial to use a larger variety of functions – it can be achieved by the usage of parametrized ASFs which give the decision maker more diversified Pareto optimal solutions for further analysis. This means that the method developers do not make the choice between different scalarizing functions but calculate the results of different scalarizing functions and leave the final decision to the decision makers. Simultaneously, a better view of the solutions corresponding to the individual preferences of the decision maker expressed during each iteration of the interactive process.

NIMBUS is a Nondifferentiable Interactive Multiobjective Bundle-based optimization System that has been developed at the University of Jyväskylä, Department of Mathematical Information Technology with the fourth version of the web interface available recently for online usage (see [4]).

In our future plan, we are going to consider possibility of extending the classes ASFs used in NIMBUS system by including parameterized ASFs, and then test the efficiency of a new synchronous approach on the set of traditional benchmarks [1]. Preliminary results obtained in [2] encourage us to follow towards this direction.

References

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