

Multi-objective generalization of probability of improvement method

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Surrogate-based optimization is a prominent approach to deal with computationally intensive models. Time considerations become especially pressing in a multi-objective case. In this work we propose a new multi-objective optimization algorithm based on a generalization of probability of improvement method (developed in [1]).

Key component of suggested algorithm is a certain scalarization approach. Scalarization itself has a mixed reputation in a field. Single obvious advantage – possibility to apply a single-objective method, is usually considered outweighed by numerous problems, crucial ones being non-uniform frontier discovery and wasteful evaluations. However, there is a way around both of these limitations.

Frontier discovery can be improved by adaptive selection of scalarization parameters. Our incrementally growing knowledge about Pareto-frontier allows us to direct search into the most promising areas.

Surrogate models help us to tie together usually independent scalarized subtasks. All expensive evaluations made during solution of prior subtasks are used to build more and more precise models thus making current subtask incrementally easier.

REFERENCES

1. *H. Kushner* “A new method of locating the maximum point of an arbitrary multipeak curve in the presence of noise,” *Journal of Basic Engineering*, **86**, 97–106, 1964.