
UTOPIAE LTW I

Solving Multi- and Many-Objective Optimisation Test Problems

General Description

In this training, participants are asked to write code to solve several academic multi- and many-objective optimisation test problems. The algorithm to be implemented is the MSOPS[1,2]. The test problems are the DTLZ test suite [3]. Each of the groups should test the MSOPS on at least 2 test problems (e.g. DTLZ1 and DTLZ3) and to be able to compare results, there should be at least one other group doing the same test problem.

Objective

The training aims to familiarise participants to Evolutionary Multi- and many- objective optimization algorithms by implementing one such algorithm. The training also serves to introduce algorithmic variants (weighted min-max, VADS) test functions (DTLZ test suite), and performance metrics (hypervolume).

Instruction

1. Each group picks two problems from DTLZ1 to DTLZ4 they would like to solve. For each problem chosen, ensure that there is at least one other group solving the same problem.
2. Code the MSOPS in Java, R, or Python.
3. Solve the test functions with the following parameters:
 - Number of objectives M : 3
 - Number of variables n : 5

The test functions will be provided in R language; however, it should be easy to translate the functions to the corresponding language in use.

4. Calculate the hypervolume w.r.t. the reference point (2, 2, 2), compare scores with other group. The package/library for calculating hypervolumes can be found here:
<https://ls11-www.cs.tu-dortmund.de/rudolph/hypervolume/start>

References

[1] Hughes, E.J.: Multiple Single Objective Pareto Sampling. In: Congress on Evolutionary Computation (CEC03), IEEE Press, Piscataway NJ (2003), 2678–2684

[2] Hughes, E.J.: Evolutionary Many-Objective Optimisation: Many Once or One Many? In: Congress on Evolutionary Computation (CEC05), IEEE Press, Piscataway NJ (2005) 222–227

[3] K. Deb, L. Thiele, M. Laumanns, E. Zitzler: Scalable test problems for evolutionary multiobjective optimization. In: Evolutionary Multiobjective Optimization. In Congress on Evolutionary Computation (CEC02), IEEE Press, Piscataway NJ (2002) 825–830 (there is a more detailed version available at <https://pdfs.semanticscholar.org/f4a4/d4484366ebca680021a5f4033bee3ca3b26d.pdf>)