Bi-Level Multiobjective Optimisation with Uncertainties

In the real design a Decision Maker is capable of analysing and taking the decision on the basis of only several candidate-solutions. Therefore, an efficient representation and analysis of the entire Pareto frontier is very important. A trade-off between the number of Pareto solutions to be considered and the information on the entire Pareto frontier should be addressed. A recently developed Directed Search Domain (DSD) algorithm [1-4] proved to be efficient to tackle this problem.

In the bi-level optimization two multiobjective optimization (MOO) problems are considered simultaneously. These two problems are supposed to be complex enough in order not to be combined in one problem. This case is quite typical in the real industrial multidisciplinary design. One MOO problem is supposed to be the master problem. The optimality with respect to the other problem is considered as a constraint for the master one. The DSD approach should be modified for the bi-level MOO. Multiobjective optimisation under uncertainties will be considered in the project. The trade-off between robustness and optimality will also be addressed. The approach suggested in [3] should be extended to the presence of uncertainties which can be taken into account by probability methods. The Optimal Prediction method will also be applied.

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2. Erfani, T., and Utyuzhnikov, S.V., “Directed Search Domain: a method for even generation of Pareto.
3. Erfani, T., and Utyuzhnikov, S.V., “Control of robust design in multiobjective optimization under uncertainties”, J. Structural and Multidisciplinary Optimization, 2012, 45 (2): 247-256.
4. Utyuzhnikov, S V, Fantini P, Guenov M., "A method for generating a well-distributed Pareto set in nonlinear multiobjective optimization", J. of Computational and Applied Mathematics, 2009, 223 (2): 820-841.