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Model reduction and uncertainty quantification for parameter estimation

Reduced Basis Method for the solution of Multiobjective Optimization problems

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Abstract: A reduced order technique for the numerical solution of PDE-constrained multiobjective optimization is proposed with the aim of solving problems where several objective functions have to be simultaneously optimized. The idea is to find a solution which does not penalize the optimization of any objective function and which represents a good compromise for all the individual ones. In general, does not exist a single optimal solution, but there exists a (possibly infinite) number of optimal solutions, called Pareto points. In the multiobjective optimization theory, the Pareto optimality allows to determine efficient optimal points for all the considered objective functions [C. Hillermeier. Nonlinear multiobjective optimization. A generalized homotopy approach. Birkhaeuser Verlag, Basel, 2001]. We apply the reduced basis method in this context where the constraints are given by parametric linear and semilinear partial differential equations [A.T. Patera and G. Rozza. Reduced basis approximation and a posteriori error estimation for parametrized partial differential equations Version 1.0. Copyright MIT, http://augustine.mit.edu, 2007]. The goal is to use a reduced-order strategy to handle the computational complexity and resolution times of the problem and, at the same time, to ensure a suitable level of the solution accuracy.