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Model reduction and uncertainty quantification for parameter estimation

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Adaptive methods for optimal experimental design

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Abstract: Optimal experimental design (OED) is a suitable tool to reduce uncertainty in parameter estimation problems. The two major approaches to OED are the Bayesian approach and the deterministic method based on approximations of linearized confidence regions. Although the Bayesian approach can theoretically deal with a larger class of problems, we consider only certain deterministic approaches. In these methods the uncertainty is taken into account as a given perturbation and its propagation is only considered through a linearized mapping that describes the inverse problem. In the framework of partial differential equations (PDE) based models, where computations of a quantity of interest can have high computational costs, the deterministic approach is preferable in all practical cases in which it gives satisfactory results.

The cost reduction remains nevertheless an essential subject. All methods for model reduction are important, and we consider here cost reduction in finite element computations through adaptive strategies.