Minisymposium 20 - Nonlinear and Stochastic Optimization

Shape Optimization Under Uncertainty - A Stochastic Programming Perspective

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We consider an elastic body subjected to internal and external forces which are uncertain. The deformations are described by PDEs that are solved efficiently by Composite Finite Elements. The objective is, for example, to minimize a least square error compared to a target displacement. A gradient method using the shape derivative together with a level-set method is employed to solve the problem.
We show that the structure of this problem is similar to that of a two-stage stochastic linear programming problem: In the first stage, the non-anticipative decision on the shape has to be taken. Afterwards, the realizations of the random forces are observed, and the variational formulation of the elasticity system takes the role of the second-stage problem.