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und Naturwissenschaften
Fachbereich Mathematik

Der Vortrag muss leider kurzfristig abgesagt werden!

Lothar-Collatz-Kolloquium für Angewandte Mathematik

Donnerstag, den 12. Dezember 2019, um 17:15 Uhr, im Hörsaal 5

Prof. Dr. Kathrin Welker*
(Helmut-Schmidt-Universität Hamburg, Institut f. Mathematik im Bauingenieurwesen)

Efficient techniques for constrained shape optimization problems in shape spaces

Zusammenfassung/Abstract:

Shape optimization problems arise frequently in technological processes which are modeled in the form of partial differential equations (PDE) or variational inequalities (VI). In many practical circumstances, the shape under investigation is parameterized by finitely many parameters, which on the one hand allows the application of standard optimization approaches, but on the other hand limits the space of reachable shapes unnecessarily.
In this talk, the theory of shape optimization is connected to the differential-geometric structure of shape spaces. In particular, efficient algorithms in terms of shape spaces and the resulting framework from infinite dimensional Riemannian geometry are presented. Moreover, we consider VI constrained shape optimization problems and and treat these problems from an analytical and numerical point of view in order to formulate approaches on shape spaces. In contrast to classical VIs, where no explicit dependence on the domain is given, VI constrained shape optimization problems are in particular highly challenging because of the two main reasons: Firstly, one needs to operate in inherently non-linear, non-convex and infinite-dimensional shape spaces. Secondly, one cannot expect for an arbitrary shape functional depending on solutions to VIs the existence of
the shape derivative or to obtain the shape derivative as a linear mapping, which imply that the adjoint state cannot be introduced and, thus, the problem cannot be solved directly without any regularization techniques. In this talk, we investigate analytically a VI constrained shape optimization problem with respect to its state, adjoint and design equation. The analytical insight in this problem enables its computational treatment which is also presented in this talk.

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Stand: 05.12.2019 (Katrin Kopp)