

Einladung zum Oberseminar

Optimale Steuerung und Optimierung

Julius-Maximilians-Universität Würzburg
Lehrstuhl für Mathematik VII | Optimale Steuerung

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joint work with Charles Dapogny and Alex Ferrer

Relaxation of optimal design problems based on shape and topological derivatives

Montag, 26. Juni 2023 • 14:15 Uhr

Seminarraum 41.01.004 • Forschungsbau (Emil-Fischer-Straße 41, 97074 Würzburg)

Abstract: I will present a procedure for approximating a ‘black and white’ shape and topology optimization problem by a density optimization problem, allowing for the presence of ‘grayscale’ regions. The construction relies on a regularizing operator for smearing the characteristic functions involved in the exact optimization problem, and on an interpolation profile, which endows the intermediate density regions with fictitious material properties. In particular, this framework includes the classical SIMP model.

Under mild hypotheses on the smoothing operator and on the interpolation profile, we prove that some features of the approximate density optimization problem converge to their exact counterparts as the smoothing parameter vanishes. Notably, the Fréchet derivative of the approximate objective functional with respect to the density function converges to either the shape or the topological derivative of the exact objective, depending on whether it is evaluated at the boundary of the domain or in its interior. These results shed new light on the connections between these two different notions of sensitivities for domain functionals and on the construction of consistent interpolation schemes. This also applies to the bi-material case.

The concepts of shape and topological derivatives will be recalled in the beginning of the talk. Then the approximation procedure will be explained. Related algorithms, including level-set formulations and the incorporation of perimeter regularization, will be finally discussed and illustrated by numerical examples in heat conductivity and linear elasticity.



<https://www.mathematik.uni-wuerzburg.de/optimalcontrol/aktuelles/>

Zu diesem Vortrag laden wir Sie herzlich ein.

gez. Prof. Dr. Daniel Wachsmuth

