Ciências ULisboa

SEMINÁRIO

ANÁLISE E EQUAÇÕES DIFERENCIAIS

27 de Junho | 13h30 | sala 6.2.33

CMAFcIO

A consistent relaxation of optimal design problems for coupling shape and topological derivatives

Samuel Amstutz
(Université d'Avignon)

Abstract:
I will present a general procedure for approximating a `black and white' shape and topology optimization problem with 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. Under mild hypotheses on the smoothing operator and on the interpolation profile, we prove that the features of the approximate density optimization problem (material properties, objective function, etc.) converge to their exact counterparts as the smoothing parameter vanishes. In particular, the Frechet 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 functions of the domain and on the construction of consistent interpolation schemes. Related algorithms, including level-set formulations and the incorporation of perimeter penalization, will be discussed and illustrated by numerical outputs.

Joint work with Charles Dapogny and Alex Ferrer.

Financiado por Fundos Nacionais através da FCT – Fundação para a Ciência e a Tecnologia no âmbito do projeto UID/MAT/04561/2019

FCT Fundação para a Ciência e a Tecnologia