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Robust shape optimization

Prof. Marc Dambrine

University of Pau and Pays de l'Adour marc.dambrine@univ-pau.fr

Abstract :

In this presentation, I will study a particular class of shape optimization problems under uncertainties on the input parameters. The example that motivates this study is the optimization of a structure subjected to random loading.

In a first step, we are interested in minimizing the expectation of a quadratic objective in a situation where the state function depends linearly on a random input parameter. This framework covers important objectives such as tracking functions for second order elliptic partial differential equations and compliance in linear elasticity. We will show that the robust objective and its gradient are completely and explicitly determined by the low order moments of the random input. We then derive a cheap deterministic algorithm to minimize this objective and present model cases in structural optimization.

In this second step, in order to deal with more application-oriented objectives, I will present the extension to the case of any polynomial objective. This covers the Von Mises criterion and constraints on the compliance variance.