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Robust shape optimization under vibroacoustic criteria and uncertain parameters

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Abstract

Our paper adresses the noise reduction level in acoustic cavities subject to uncertain parameters. Such issue is nowadays of paramount importance when treating inflight conditions of commercial planes or boats. The noise level is represented by an energy density in the cavity. This objective function is provided through an energy method called Simplified Energy Method. We use a transformation function mapping a given 3D cavity surface on a 2D domain. The optimization process directly relies on this function and thus avoids remeshing of the initial geometry. We consider geometrical and material uncertainties during the shape optimization process. Such uncertainties are usually generated by involved manufacturing processes. Robust optimization is performed using the non-dominated sorting genetic algorithm (NSGA-II) together with the Kriging surrogate model. We will show in our presentation the influence of geometrical and material characteristics on the optimal solution.

Keywords: shape optimization; simplified energy method; robust optimization; kriging, genetic algorithm.