Topology optimization of laminated composite plates considering hybrid uncertainty

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Abstract

In the present work, a robust topology optimization model with hybrid random interval uncertainty for the optimization of laminated composite plates is proposed. The Mindlin-Reissner plate, in which the transverse stresses are taken into account, is adopted for the simulation of laminated composite plates, and it is meaningful to some advanced filamentary composite materials, like graphite-epoxy. The imprecise probability uncertainties of the laminated composite plate mechanical system including materials, geometry and boundary condition are treated as an interval random model, which means that the probability distribution of random variables are modeled as the interval parameters but precise values. In this work, the bi-directional evolutionary structural optimization (BESO) method is adopted to find the optimal robust layout of the structure. A series of numerical examples are presented to illustrate the optimization procedure, and the effectiveness of the proposed method is demonstrated clearly.

Keywords: Robust topology optimization; laminated composite plates; hybrid uncertainty