Efficient reanalysis techniques for robust topology optimization

The article focuses on the reduction of the computational effort involved in robust topology optimization procedures. The performance of structures designed by means of topology optimization may be seriously degraded due to fabrication errors. Robust formulations of the optimization problem were shown to yield optimized designs that are tolerant with respect to such manufacturing uncertainties. The main drawback of such procedures is the added computational cost associated with the need to evaluate a set of designs by performing multiple finite element analyses. In this article, we propose efficient robust topology optimization procedures based on reanalysis techniques. The approach is demonstrated on two compliant mechanism design problems where robust design is achieved by employing either a worst case formulation or a stochastic formulation. It is shown that the time spent on finite element analysis within robust topology optimization can be reduced significantly, without affecting the outcome of the optimization process.

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