A Symmetry Reduction Method for Continuum Structural Topology Optimization

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Abstract

It is considered that asymmetrical material layout design solutions are caused by numerical roundoff and the convexity characteristics of alternative topology design formulations. Emphasis is placed here not on analyzing potential instabilities that lead to asymmetrical designs, but on a method to stabilize topology design formulations. A novel symmetry reduction method is proposed, implemented and studied. While enforcing symmetry and significantly reducing the size of the optimization problem, the symmetry reduction method is shown to have the added benefit of greatly simplify design sensitivity analysis of non-simple repeated vibrational eigenvalues which occur in many symmetrical structures.

**Keywords:** topology; topology optimization; continuum topology; design sensitivity analysis (DSA); optimal design; symmetry enforcement; structural optimization.


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