Robust topology optimization incorporating uncertainity in load positions

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ABSTRACT

Conventional topology optimization techniques yield effective results tailored to specific load positions. Nonetheless, in most structures, loads are frequently applied at uncertain locations rather than at fixed points. To ensure structural stability despite this load position uncertainty, it is essential to minimize structural compliance variations. This study introduces a novel topology optimization approach aimed at reducing structural compliance variations while considering the wide range of potential load positions. By incorporating both the mean and variance of the design objective, which is compliance for various load cases at different positions, into a multi-objective optimization problem, it becomes possible to achieve consistent compliance levels across all load cases. Numerical examples for the design of 2D and 3D cantilever beams are provided to validate the proposed approach.