

PROCEEDINGS

A Fail-Safe Topology Optimization for Multiscale Structures

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ABSTRACT

Multiscale structures can be more robust to partial damage than solid structures. Inspired by this, a novel fail-safe topology optimization method is proposed for multiscale structures. Computational cost is reduced by simplifying the partial damage of the truss-like microstructure and polynomial function is used to fit the effective elasticity tensor obtained via the homogenization method. Moreover, Heaviside projection is applied to speed up the convergence and yield a relatively clear configuration. Numerical examples are tested to demonstrate the advantages of the optimized multiscale structures. Numerical examples are tested to demonstrate that the optimized multiscale structures successfully obtain comprehensive performances than optimized solid structures when appropriate microstructure configurations are chosen.

KEYWORDS

Fail-safe topology optimization; multiscale structures; partial damage; homogenization method; heaviside projection

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