

Limit State of Heterogeneous Smart Structures under Unknown Cyclic Loading

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Abstract : This paper presents a numerical solution, namely limit and shakedown analysis, to predict the safety state of smart structures made of heterogeneous materials under unknown cyclic loadings, for instance, the flexure hinge in the micro-positioning stage driven by piezoelectric actuator. In combination of homogenization theory and finite-element method (FEM), the safety evaluation problem is converted to a large-scale nonlinear optimization programming for an acceptable bounded loading as the design reference. Furthermore, a general numerical scheme integrated with the FEM and interior-point-algorithm based optimization tool is developed, which makes the practical application possible.

Keywords : limit state, shakedown analysis, homogenization, heterogeneous structure

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