Optimization of Passive Vibration Damping of Space Structures

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Abstract : The objective of this article is to improve the passive vibration damping of solar array (SA) used in space structures, by the effective application of numerical optimization. A case study of a SA is used for demonstration. A finite element (FE) model was created and verified by experimental testing. Optimization was then conducted by implementing the FE model with the genetic algorithm, to find the optimal placement of aluminum circular patches, to suppress the first two bending mode shapes. The results were verified using experimental testing. Finally, a parametric study was conducted using the FE model where patch locations, material type, and shape were varied one at a time, and the results were compared with the optimal ones. The results clearly show that through the proper application of FE modeling and numerical optimization, passive vibration damping of space structures has been successfully achieved.

Keywords : damping optimization, genetic algorithm optimization, passive vibration damping, solar array vibration damping

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