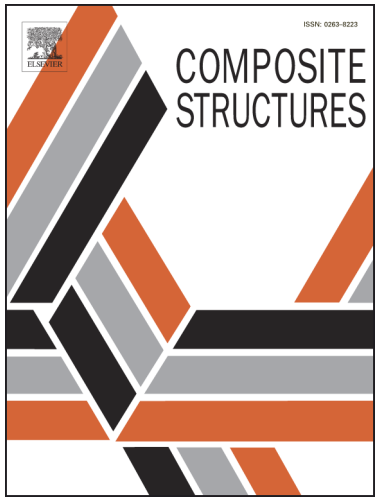

Robust vibration control of laminated rectangular composite plates in hygro-thermal and thermal environment

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Robust vibration control of laminated rectangular composite plates in hygrothermal and thermal environment

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Abstract

In this research, vibration analysis and robust vibration control of laminated rectangular composite plates subjected to moisture and temperature are investigated. For this purpose, piezoelectric patches are used as sensors to measure the displacement of the plate and as actuators to implement control forces. The governing PDEs are derived by Hamilton's principle based on classical lamination plate theory. Chebyshev-Ritz method is then used to obtain the temporal ordinary differential equations and therefore to perform vibration analysis. For the purpose of vibration suppression, a linear matrix inequality-based robust controller is proposed. In this way, a robust state estimator is also used. Simulation studies demonstrate the effectiveness of the proposed robust control strategy with respect to the model uncertainties.

Keywords: Active vibration control; Laminated composite plate; Chebyshev-Ritz method; Robust control; Model uncertainty; Thermal and hygrothermal environment.

1. Introduction

Composite lamination structures are being increasingly used in aerospace, automotive, civil, naval and other high-performance engineering applications due to their lightweight, low

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