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MULTIPLE FAILURE MODES-COUPLED PIEZOELECTRIC VIBRATION INHIBITION SYSTEM LAYOUT OPTIMIZATION

Abstract

This paper proposes a vibration inhibition system layout optimization method based on multiple failure modes coupling for designing a sensor reliability-based smart structural system. To address the piezoelectric devices' characteristics of low reliability and complicated coupling, this paper unfolds researches from three aspects: the reliability of piezoelectric actuators, the representation of reliability of the piezoelectric vibration inhibition system and the layout optimization of the piezoelectric vibration inhibition system, to give a deepened insight into the optimal matching design mechanism of these three aspects. To consider the influences on the structural system's dynamic performance from the demand on both high reliability and functions, starting from multiple failure modes coupling and dynamic responses, this paper proposes a new collaborative layout design method based on multiple failure modes coupling and sensor layout optimization. With integrated use of piezoelectric device-level experimental design, multiple failure modes coupling reliability representation and layout optimization method, this paper aims at solving the reliability problem in structural vibration inhibition. This paper presents one case study to show the feasibility of the proposed method herein.