航空学报 » 2000, Vol. 21 » Issue (3) :247-250 DOI:

配置压电自感作动器复合层板的振动主动控制

方有亮, 武哲

北京航空航天大学飞行器设计与应用力学系 北京 100083

ACTIVE VIBRATION CONTROL OF COMPOSITE PLATE WITH SELF-SENSINGPIEZOELECTRIC ACTUATORS

FANG You-liang,WU Zhe

Dept of Flight Vehicle Design and Applied Mechanics, Beijing Univ. of Aero. and Astro., Beijing 100083,China

摘要 采用一阶剪应变理论,对具有自感作动器的复合层板进行有限元分析,为避免自由度数太大,采用按结构模态展开的方法,给出以模态坐标为变量的状态方程,和以电流为输出的观测方程。在此基础上,考虑振动系统的外激励干扰衰减 LQG,H_∞ 控制问题。对具有四对压电薄膜的层板结构进行了数值仿真,绘制出LQG控制下和 H_∞ 控制下闭环系统控制对象的奇异值曲线,还给出持续外力作用下速度响应曲线比较,仿真结果表明控制的方法是有效的。

关键词: 复合材料 振动 控制问题 有限元 智能结构

Abstract: Using first order shear theory, this paper proposes the FEM analysis for self sensing laminate composite plates For reducing the degrees of freedom, this paper employs the method of expansion over the mode shapes Then state equations are given with the modal coordinate being the state variables and the current induced by mechanics is considered as the output variable of the measurement equation Based on the equations, this paper implements the LQG and H_∞ control Numerical simulation of self sensing laminates with four pairs of piezoelectric films bonded on the surface of base structure is given. Singular value curves of system and velocity response caused by applied force are plotted, and external excitation of the vibration system is suppressed effectively The simulation solution illustrates that the control method in this paper is effective

Keywords: composite materials vibr ation contr ol problem FEM smart st ructure

Received 1999-02-09; published 2000-06-25

引用本文:

方有亮;武哲. 配置压电自感作动器复合层板的振动主动控制[J]. 航空学报, 2000, 21(3): 247-250.

FANG You-liang;WU Zhe. ACTIVE VIBRATION CONTROL OF COMPOSITE PLATE WITH SELF-SENSINGPIEZOELECTRIC ACTUATORS[J]. Acta Aeronautica et Astronautica Sinica, 2000, 21(3): 247-250.