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RESEARCH ON ACTIVE FLUTTER SUPPRESSION USING ROBUSTIC CONTROL METHODOLOGY FOR REUSABLE LAUNCH VEHICLE

Abstract

Using wing-body configuration and big lifting surface and control surface, Reusable Launch Vehicle (RLV) usually has low overall structure stiffness, and must withstand complex flight environment and serve aerodynamic heating during reentry. Factors above may easily induce aerothermoelastic stability problem that involves structure dynamics, unsteady aerodynamics and aerodynamic heating, especially flutter problem, which is the most serious aeroelastic problem. In this paper, motion equations of flexible flight vehicle are deduced by using Lagrangian method considering coupling between rigid-body modes and elastic vibration modes. State-space model of aeroelastic system is established based on rational function approximation of unsteady aerodynamics and modeling of servosystem. Furthermore, active flutter suppression for aerodynamic control surface using robustic control method is studied. Modeling scheme and control method are proved valid and promising in active flutter suppression for RLV by analytic results.