ROBUST CONTROLLER DEVELOPMENT FOR A 2 DOF ELECTROMAGNETIC VIBRATION ABSORBER

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Abstract

Magnetic bearings have been shown to be effective when used as auxiliary mass dynamic absorbers. This paper looks at enhancing their performance with improved nominal modeling and application of robust control schemes. A 2 DOF proof mass electromagnetic vibration absorber (EMA) test rig is used for model development and for quantifying controller performance. The test rig is modeled as a lumped mass and a linear approximation is used for the actuator force. The nominal system model is built in Matlab and validated with sine sweep tests performed on the EMA. An optimal proportional-derivative controller is designed to serve as a basis of comparison for the higher order controller developed via mu-synthesis using DK iteration. System uncertainties and noise are included in the model as well as performance specifications. Performance is evaluated by observing the vibration reduction achieved by the EMA which is obtained by measuring the displacement of the main mass of the test rig. Preliminary results indicate the robust controller performs significantly better over the traditional PD controller.