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Department of Mechanical Engineering

A STUDY OF POWER TRANSMISSION IN ACTIVELY CONTROLLED SIMPLE STRUCTURES

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Abstract

Feedforward active control of harmonic vibratory power transmission in simple structures is investigated theoretically and experimentally. The structures investigated are a beam, a plate and a cylinder. Primary excitation is used to represent unwanted noise or vibration. Secondary excitation is introduced using control sources which are adjusted to minimize acceleration or power transmission in the structures. The primary and secondary excitation is produced by either electromagnetic force actuators (shakers) or piezoelectric ceramics.

The theoretical predictions are compared to the experimental test results. In addition, vibratory intensity distributions before and after control are investigated.

Both the theoretical and experimental results demonstrate that it is possible to minimize vibratory power transmission in the test simple structures using a maximum of three control sources in the test frequency range. The study also indicates that, in most cases, the harmonic vibratory power transmission in simple structures can be measured by using a maximum of two accelerometers in the test frequency range.