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Decoupled Robust Vibration Control of an Optical Table

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Abstract

In this paper we propose the design and control of a novel two-layer optical table. An optical table normally needs to isolate two main vibration sources: the ground disturbances and the load disturbances. Because the suspension settings for suppressing these two disturbances conflict with each other, we applied disturbance response decoupling (DRD) techniques to treat them independently. First, we used passive elements to insulate the ground disturbances. Second, we employed DRD methods to design active robust controllers that would drive piezoelectric transducers to improve the load responses without influencing the ground responses. Finally, the designed controllers were implemented for experimental verification. The DRD theorem and robust controllers were confirmed to be effective at suppressing system vibrations.