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Active vibration isolator using piezoelectric actuator

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Passive vibration isolation has been extensively used to mitigate a sensitive object from unwanted motions. It is a simple configuration consisting of an isolated object, a damper, and a spring in which excess vibration is suppressed by using its harmonic oscillator. However, resonance amplification at low-frequency range is a major weakness of this system. In this work, we add an active vibration isolation on the passive system to cancel unabsorbed vibrations. Our active system consists of an acceleration sensor, a PID control system, and a piezoelectric (PZT) actuator. The PZT is used as the vibration source to generate the counteracted vibration. The PZT effect can response in a wide-frequency range up to kHz and can provide a rigid system assembly. The PZT displacement can be precisely controlled down to sub-micron range. In this work, we investigate the behaviors of the actuator and the performance of our active vibration isolator. One prospect use of our active vibration isolator will be to protect the inertial mirror in the quantum gravimeter from the surrounding vibrations.

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