Compensated inverse PID controller for active vibration control with piezoelectric patches: modeling, simulation and implementation

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Abstract

Active vibration control of the first three modes of a vibrating cantilever beam using collocated piezoelectric sensor and actuator is examined in this paper. To achieve this, a model based on Euler-Bernoulli beam equation is adopted and extended to the case of three bonded piezoelectric patches that act as sensor, actuator and exciter respectively. A compensated inverse PID controller has been designed and developed to damp first three modes of vibration. Controllers have been designed for each mode and these are later combined in parallel to damp any of the three modes. Individual controller gives better reduction in sensor output for the second and third modes while the combined controller performs better for the first mode. Simulation studies are carried out using MATLAB. These results are compared and verified experimentally and the real-time implementation is carried out with xPC-target toolbox in MATLAB

Keywords: Compensated Inverse, PID Controller, Active Vibration Control, Piezoelectric Patches, Modeling, Simulation Implementation

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