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Online monitoring and self-tuning control using pole placement method for active vibration control of a flexible beam

Abstract

This paper presents the experimental results of online self-tuning pole placement control for active vibration of a flexible beam. The vibration is controlled using a piezoelectric actuator bonded on a flexible beam. An online computer control that runs on a PC-based control and its graphical user interface have been developed in such a way that the user can perform online monitoring and manipulation of control parameters of the active vibration control algorithm for a flexible beam system. The parameters of the pole placement controller have been self-tuned based on autoregression with an exogenous terms model of a bonded piezoelectric actuator beam identified via a recursive least square algorithm. A PC-based control system was implemented using a peripheral component interconnect data acquisition card and LABVIEW software. Results show that the online self-tuning pole placement control offers better transient performance over the fixed controller when tested at different tip loads. The control parameters have converged to a new value as the physical parameter of a flexible beam is changed.

Keywords; Active vibration control; Flexible beam; Online self-tuning pole placement control; Recursive least square