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Hybrid Robust Active Vibration Controller for Gear Set Shaft

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Abstract

The vibration of machinery is often caused by impact of components and misalignment of shaft. Although the passive control system has correspondent histories that using isolating material and elastomeric mount for achieving vibration reduction. However, the performance is limited due to the parameter of passive system is usual fixed. In this study, three different active vibration control (AVC) techniques are implemented and compared in the experimental investigation. Apart from feedforward and feedback control system, a hybrid controller which is a combination of the adaptive control with filtered-x least mean squares (FXLMS) algorithm and feedback structure with robust synthesis theory for obtaining the fast convergence and good robust performance is proposed in this study. The control plant configuration is identified by frequency domain technique and implemented by using a digital signal processor (DSP). Experiments are carried out to evaluate the vibration attenuation performance of three control systems at gear set shaft. The results of experiment indicate that the hybrid technique is effective in reducing the vibration and yield the best performance in experiments. The experimental comparison and analysis of the proposed controllers are also described.

Key words：Adaptive feedforward control; Feedback theory; Hybrid control; DSP