Active Vibration Control in Transmission System

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ABSTRACT

In this study, seven different active vibration control (AVC) techniques are implemented and compared in the experimental investigation of gear set shafts. The adaptive control structure is using filtered-x least-mean-square (FXLMS) with synthetic reference, the feedback control structure are using linear quadratic Gaussian (LQG) algorithm with compensator in optimal theory, H-infinity ( ) and -analysis of robust theory. Apart from the adaptive filter and the feedback control system, a hybrid controller which is a combination of an adaptive control with FXLMS algorithm and feedback control with LQG, and -analysis theory to obtain fast convergence, robust stability and robust performance are proposed. The control plant configuration is identified by frequency domain technique and implemented by using a digital signal processor (DSP). Experiments are implemented to evaluate the vibration attenuation performance and characteristic of seven control systems in a gear-set shaft. Experimental results indicate that the hybrid technique is effective to reduce vibration and yields best performance, robust stability and robust performance in experimental investigation. The experimental comparison and analysis of the proposed controllers are also described in this thesis.

Keywords : transmission system ; active vibration control ; digital signal processor ; finite-impulse-response

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