Design of self-tuning minimum effort active noise control with feedback inclusion architecture

ABSTRACT

This paper presents the development of a self-tuning controller design of minimum effort active noise control (ANC) for feedforward single-input single-output (SISO) architecture which includes the feedback acoustic path in the controller formulation. The controller design law is derived for suitable self-tuning implementation and the self-tuning controller is evaluated in a realistically constructed ANC simulation environment. The self-tuning controller design involves a two-stage identification process where the controller is replaced by a switch. This switch is closed and opened in sequence generating two transfer functions which are then used in constructing the controller specified by a minimum effort control law. The implementation requires an estimate of the secondary path transfer function which can be identified either online or offline. The controller design and implementation are evaluated in terms of the level of cancellation at the observer through simulation studies for various values of modified effort weighting parameter in the range $\leqslant 0\gamma\leqslant 1$. It was found that the optimal controller designed using this technique which is constrained only by the accuracy of the two models identified using recursive least squares algorithm, yields good cancellation level.

Keyword: Active noise control; Self-tuning controller; Minimum effort