

Stability Analysis and Performance Evaluation of a Feedback Controller for  
Local Control of Sound

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Abstract

This paper investigates the performance and stability of a virtual microphone feedback controller for local control of sound through theoretical analysis and simulations. A novel method to design a stable feedback controller for the local control system is also presented in this paper. The local control system is designed to attenuate a broadband disturbance at a point near the listener's ear, i.e. the virtual microphone, rather than at the control microphone, i.e. the physical microphone. The results showed that if a good performance was to be achieved the controller would be unstable. This is because the magnitude of the response of the virtual plant is lower than that of the physical plant. The feedback controller in this work is designed to minimize the noise at the virtual microphone, with a virtual plant response used in the performance objective. However the physical plant is used in the stability constraint. Therefore there is a trade-off between the performance and controller stability.

Key words : Virtual microphone feedback controller; Broadband disturbance;  
Local control of sound