

Acoustic Echo Reduction in a Two-Channel Speech Reinforcement System for Vehicles

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Abstract

A two-channel speech reinforcement system which has the goal of improving speech intelligibility inside cars is presented in this work. As microphones pick up not only the voice of the speaker but also the reinforced speech coming from the loudspeakers, feedback paths appear in a speech reinforcement system for vehicles. This feedback paths can make the system become unstable and acoustic echo cancellation is needed in order to avoid it. In a two-channel system, two system identifications must be performed for each channel, one of them is an open-loop identification and the other one is closed-loop. Several methods have been proposed for echo suppression in open-loop systems like hands-free systems. We propose here the use of echo suppression filters specially designed for closed-loop subsystems along with echo suppression filters for open-loop subsystems based on the optimal filtering theory. The spectral estimation method for the power spectral density of the residual echo suppression filters is presented along with the derivation of the optimal echo suppression filter needed in the closed-loop subsystem. Results about the performance of the proposed system are also provided.