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Design of a Variable Step-size Filtering Algorithm for Acoustic Feedback Cancellation in Audio Systems

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Abstract

Acoustic feedback often limits the maximum usable gain of acoustic systems and degrades the overall system response. It is well known to be detrimental that the system stability and performance must be taken into account in system design. Most of the conventional methods for acoustic feedback cancellation in an acoustic system are based primarily on an adaptive filter with the least-mean-square (LMS) error algorithm. Unfortunately, convergence speed is often limited when a sound source or a filtering plant is varied, because the learning process of the adaptive algorithm fails to respond fast enough to changing operational conditions. This report proposes a variable step-size affine-projection algorithm (VSS APA) for acoustic feedback cancellation in audio systems. The proposed adaptive filter is based on the filtering affine-projection algorithm with variable step-size for improving convergence speed in acoustic feedback cancellation. A performance evaluation and simulation comparison has been conducted to compare the proposed algorithm and various traditional adaptive filtering algorithms.

Key words：Acoustic feedback; Adaptive filter; Affine-projection algorithm; Digital filter