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Audio Quality Improvement of Vehicular Hands-Free Communication Using Variable Step-Size Affine-Projection Algorithm

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Abstract

For a vehicular hands-free communication system, the sound quality of communication is usually degraded by noise which is known to be detrimental to system performance. In this paper, a novel adaptive filtering algorithm and an integrated system for acoustic echo and noise cancellation are presented. The proposed system includes adaptive noise cancellation, line enhancer, and echo cancellation which are based on a variable step-size affine-projection algorithm (VSS APA). The proposed VSS APA filtering algorithm is a combination of a variable step-size least-mean-square (VSS LMS) and an affine-projection algorithm (APA). The matrix of the APA allows more accurate, thorough input data and transforms the data into the structure of orthogonality, thus making the estimate of the weight vector faster and more accurate. To understand and verify the effectiveness of the proposed system, performance evaluation and comparison were conducted to compare the proposed algorithm and various traditional adaptive filtering algorithms in this application. The results demonstrated that the VSS APA has an effective performance and convergence in sound quality improvement of hands-free communication systems.

Key words：Acoustic; Adaptive filter algorithm; Sound quality; Signal processing