Adaptive Line Enhancer with Selectable Algorithms based on Noise Eigenvalue Spread

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***Abstract*— Adaptive efficient mechanism eliminates varying environmental noise embedded in speech signals, since the eigenvalue spread has a great influence on the convergence behavior of adaptive algorithms. The inefficient least mean square (LMS) algorithm for ill-conditioned signals, with high eigenvalue spread in the autocorrelation matrix, hence slow convergence and degraded signal quality are observed. Meanwhile, the Recursive Least Squares (RLS) solved this problem at the expense of high computational power. For these purposes, adaptive filtering offers a viable alternative to be used in various noise cancellation applications. In this paper, adaptive set-membership filtering based on a combination of a selective adaptive line enhancer with optimized set-membership filtering approach for single input noise cancellation system was proposed. The adaptive selection from a set of multiple adaptive algorithms to operate according to the characteristics of noise signals. The simulation results showed the capability of proposed algorithm to eliminate different types of environmental noise with fast convergence, reduction in computational complexity and improvement in signal-to-noise ratio when compared with an equivalent system using a single adaptive algorithm. The computational complexity of the proposed approach showed reduction of nearly 90% compared to the RLS and converged in about 6.25 msec.**

Keywords—adaptive filter; speech enhancement; noise cancellation; adaptive algorithm.

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