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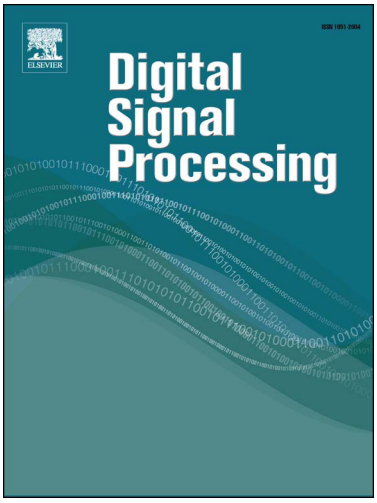

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A Rayleigh Weighted Variable Step-Size Sign Algorithm for Robust Adaptive Filtering in Impulsive Noises

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Abstract

The sign algorithm with a fixed step-size is incapable of addressing the conflicting requirements between fast convergence speed and low steady-state misadjustments. In order to deal with this problem, a Rayleigh weighted gradient vector based variable step-size sign algorithm is proposed in this paper. In the new algorithm, the variable step-size is updated by the squared norm of a Rayleigh weighted sign gradient vector. The proposed algorithm can improve the convergence speed and tracking capability while maintaining the similar steady-state misadjustments in the presence of impulsive noises. A complex-valued energy conservation relation based convergence analysis is carried out to evaluate the convergence performance of the new algorithm. Simulation results are presented to verify the theoretical analysis and to demonstrate the desirable performance of the proposed algorithm.

Keywords: Gradient vector, Variable step-size, Sign algorithm, Adaptive filtering algorithm

1. Introduction

The least mean square (LMS) [1] and normalized least mean square (NLMS) [2] are the most widely used adaptive filter owing to its simplicity of implementation and effectiveness. However, LMS-type algorithms suffer consider-

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