A new robust variable weighting coefficients diffusion LMS algorithm

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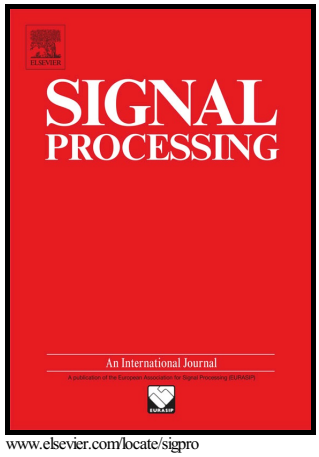

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A new robust variable weighting coefficients diffusion LMS algorithm

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Abstract

We introduce a new robust algorithm that is insensitive to impulsive noise (IN) for distributed estimation problem over adaptive networks. Motivated by the fact that each node can access to multiple spatial data, we propose to discard IN-contaminated data. Under the assumption that IN is successfully detected, we propose a cost function that considers only the uncontaminated data. The derived algorithm is the ATC diffusion LMS algorithm that has variable weighting coefficients depending on IN detection, which leads both to insensitivity to IN and to good estimation performance. A method to detect IN is also presented. Simulation results show that the proposed algorithm has good estimation performance in an environment that is subject to IN, and outperforms the conventional robust algorithms.

Keywords: Adaptive networks, Distributed estimation, Impulsive noise, Robust algorithm, Diffusion LMS algorithm

1. Introduction

Distributed estimation over adaptive networks has been frequently studied due to its potential for many applications [1, 2, 3, 4, 5]. In the problem of distributed estimation, numerous sensor nodes that have processing and communication ability cooperate to estimate a common parameter. Depending on the cooperation strategy, algorithms that have been proposed so far can be mainly categorized as incremental [6, 7] or diffusion [8, 9, 10]. There is no need for cyclic path in the diffusion strategy, which makes the diffusion strategy more popular than the incremental strategy.

In signal processing fields, measurement noise is usually assumed to have a Gaussian distribution, and many algorithms are designed to perform in such a case. However, in real-world applications, impulsive noise (IN) also happens and degrades estimation performance of many algorithms [11]. Especially in the case of distributed estimation, IN could be propagated over entire network, so its influence must be reduced.

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