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# Robust convex combination of affine projection-type algorithms using an impulsive noise indicator

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## Abstract

A novel adaptive filter combining the affine projection algorithm (APA) and the affine projection sign algorithm (APSA) is proposed using an impulsive noise indicator. This indicator is proposed to use the APA as the component filter in impulsive noise environments, and it is easily obtained with convex combination schemes. From this, the proposed algorithm achieves robustness against impulsive noise regardless of the convergence state. In addition, the proposed algorithm exhibits a fast convergence rate of the APA for various noise environments. Simulation results verify that the proposed algorithm adequately combines the advantages of the two component filters for system identification scenarios.

*Key words:* Adaptive filter, affine projection algorithm, affine projection sign algorithm, colored input, outlier

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## 1. Introduction

Adaptive filter is a widely used algorithm in various fields such as acoustic echo cancellation, system identification and active noise control [1]. The normalized least mean-square (NLMS) algorithm was introduced as an early version of the filter. However, the NLMS's performance is degraded when input sequences are highly correlated with each other [2] or when impulsive noise occurs in an observation [3]. To overcome the first case, the affine projection algorithm (APA) was introduced [4]. The APA accelerates its convergence rate for

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