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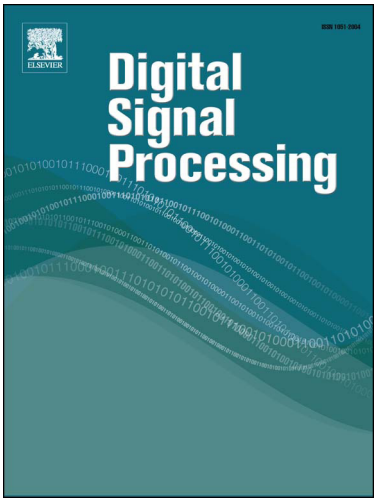

Improvements on deinterleaving of radar pulses in dynamically varying signal environments

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Improvements on deinterleaving of radar pulses in dynamically varying signal environments

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Abstract: An electronic support system receiver which is a passive receiver picks up an interleaved stream of pulses and extracts their pulse parameters. These parameters are sent to a deinterleaving subsystem which sorts them and forms pulse cells that each are assumed to belong to a specific emitter. In this paper, we develop a method for this task of deinterleaving of radar pulse sequences. For this aim, a novel pulse amplitude tracking algorithm is proposed for dynamically varying signal environments wherein radar parameters can change abruptly. This method particularly works for air-to-air engagements where pulse amplitude distortion due to channel effects can be considered negligible. Simulation results show that the proposed algorithm incorporated with a clustering algorithm improves deinterleaving of radar emitters that have agile pulse parameters such as airborne radars.

Keywords: Electronic support systems; Deinterleaving; Self-organizing map (SOM); Fuzzy ART; Pulse amplitude tracking algorithm

1. Introduction

The main purpose of Electronic Support (ES) systems is to intercept as many electromagnetic emissions as it can, deinterleave them and thus identify the surrounding threatening emitters in electronic warfare (EW) environments. In dense environments, pulse sequences received from multiple sources is interleaved in one communication channel by the receiver. The problem here is to separate the emitting sources by a sorting process called deinterleaving. In the past, ES systems excessively needed operator interpretation of measured signal parameters to identify emitters of interest. As EW environments evolve and become much denser, it has become inevitable that the process is fully automatized. Davies and Hollands [1] introduced the first deinterleaving approach for automatic processing of emitter pulse trains. Following this study, various techniques have been proposed by authors [2-10]. Mardia [2] introduced a technique based on cumulative differences (C-DIF) of PRI histograms and Milojevic and Popovic [3] improved this method by employing sequential differences (S-DIF) of histograms that need less calculations. On the other hand, some of the authors utilized Kalman filtering [4,6] and Hidden Markov models [5] for this problem. Estimation of PRIs of interleaved pulse sequences also has been in the focus