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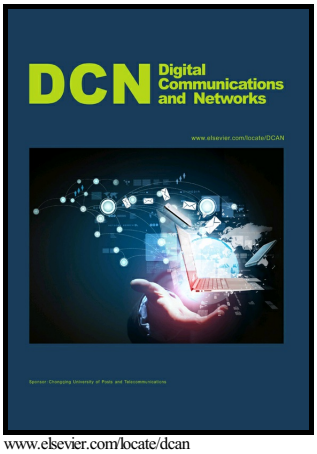
Anal Paul, Santi P. Maity



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Kernel Fuzzy C-Means Clustering on Energy Detection Based Cooperative Spectrum Sensing

Anal Paul, Santi P. Maity*

Department of Information Technology,
Indian Institute of Engineering Science and Technology,
Shibpur, Howrah, India-711 103

Abstract

Cooperation in spectral sensing (SS) offers a fast and reliable detection of primary user (PU) transmission over a frequency spectrum at the expense of increased energy consumption. Since the fusion center (FC) has to handle a large set of data, a cluster based approach, specifically fuzzy c-means clustering (FCM), has been extensively used in energy detection based cooperative spectrum sensing (CSS). However, the performance of FCM degrades at low signal-to-noise ratios (SNR) and in the presence of multiple PUs as energy data patterns at the FC are often found to be non-spherical i.e. overlapping. To address the problem, this work explores the scope of kernel fuzzy c-means (KFCM) on energy detection based CSS through the projection of non-linear input data to a high dimensional feature space. Extensive simulation results are shown to highlight the improved detection of multiple PUs at low SNR with low energy consumption. An improvement in the detection probability by $\sim$ 6.78% and $\sim$ 6.96% at -15dBW and -20dBW, respectively, is achieved over the existing FCM method.

Keywords: Cooperative spectrum sensing, Kernel fuzzy c-means, Energy detection, Multiple PU detection

1. Introduction

The present wireless communication services work on the basis of static frequency spectrum allocation i.e. each service is assigned to a fixed frequency spectrum. This static allocation policy results in a spectrum under utilization state that in turn creates a spectrum scarcity problem due to the increased number of wireless devices with data intensive applications such as interactive and multimedia services [1, 2]. The cognitive radio (CR) concept emerges as a

*Santi P. Maity
Email addresses: toanalpaul@gmail.com (Anal Paul), santipmaity@it.iiests.ac.in (Santi P. Maity)