Eigenvalue based Blind Spectrum Sensing Techniques

Author(s) - Institution(s):
Shree Krishna, Sharma, SnT
Symeon, Chatzinotas, SnT
Bjorn, Ottersten, SnT

Corresponding author email: shree.sharma@uni.lu

Corresponding WG group: WG3

Abstract:

Recently, cognitive wireless communications has been considered a promising technology in order to address the spectrum scarcity caused by the increasing demand of high data rates for wireless broadband and multimedia services. The cognitive terminals should be capable of acquiring spectrum usage information by means of some spectrum awareness techniques such as Spectrum Sensing (SS) in order to access the primary licensed spectrum opportunistically. Furthermore, in practical scenarios, the cognitive terminal does not have a priori knowledge of the PU signal, channel and the noise variance. In this context, investigating blind SS techniques is an open research issue. In this document, we s tudy several eigenvalue based blind SS techniques for sensing the presence of a Primary User (PU). The decision statistics of these techniques are calculated based on the eigenvalue properties of the received signal's covariance matrix using Random Matrix Theory (RMT). Several methods such as Scaled Largest Value (SLE), Standard Condition Number (SCN), John's detection and Spherical Test (ST) based detection are considered.
The sensing performance of these techniques is compared in terms of probability of correct decision in Rayleigh and Rician fading channels for the presence of a single PU and multiple PUs scenarios. It is noted that the SLE detector achieves the highest sensing performance for a range of scenarios. Furthermore, it is noted that the sensing performance of these techniques is better in Rician fading channels than in Rayleigh fading channels and is better with equal power case than with different transmit power case for multiple PUs scenario.