

Performance Analysis of the Time-Based and Periodogram-Based Energy Detector for Spectrum Sensing

Authors : Sadaf Nawaz, Adnan Ahmed Khan, Asad Mahmood, Chaudhary Farrukh Javed

Abstract : Classically, an energy detector is implemented in time domain (TD). However, frequency domain (FD) based energy detector has demonstrated an improved performance. This paper presents a comparison between the two approaches as to analyze their pros and cons. A detailed performance analysis of the classical TD energy-detector and the periodogram based detector is performed. Exact and approximate mathematical expressions for probability of false alarm (Pf) and probability of detection (Pd) are derived for both approaches. The derived expressions naturally lead to an analytical as well as intuitive reasoning for the improved performance of (Pf) and (Pd) in different scenarios. Our analysis suggests the dependence improvement on buffer sizes. Pf is improved in FD, whereas Pd is enhanced in TD based energy detectors. Finally, Monte Carlo simulations results demonstrate the analysis reached by the derived expressions.

Keywords : cognitive radio, energy detector, periodogram, spectrum sensing

Conference Title : ICCE 2017 : International Conference on Communications Engineering

Conference Location : Vienna, Austria

Conference Dates : June 21-22, 2017