ABSTRACT

In this thesis we presented a research test bed for spectrum sensing in cognitive radio systems. We considered spectrum sensing based on Eigen values of sample covariance matrix. When considering the implementation of the algorithm , it will pose a question on how to generate the Eigen values with low complexity. In practice, there is a trade-off between complexity and detection performance. The Eigen values of the sample covariance matrix can be found by using a Discrete Fourier Transform (DFT) , which can be implemented in hardware using Fats Fourier Transform (FFT).

Simulations are performed in MATLAB and real-time measurements carried out in Xilinx Kintex-7 Field Programmable Gate Array (FPGA). The result shows that the probability of detection increased as Signal to Noise Ratio (SNR) increases. For Hardware result it shows less performance because the threshold is being calculated theoretically and the processing delay of FFT causes the distribution under hypothesis 1 (signal + noise) to be delayed from the distribution under hypothesis 0 (noise only).In terms of the computational complexity, the Eigen values method which proposed in [6], is about M times that of the Number of samples Ns , where M is the autocorrelation length of the received signal. However our proposed method only needs 2*M LUT(Look Up Tables) as shown in table 3.

The simulations and implementation show that the proposed method works well with low complexity, without using information of the signal, the channel and noise power compared to the current spectrum sensing state of the art. we present a feasibility study of spectrum sensing using a research test bed platform for exploration and demonstration of development of physical layer functionalities for cognitive radio systems.

Keywords: Cognitive Radio, spectrum sensing, Eigen values, FPGA