ABSTRACT

Cognitive Radio has been proposed as a solution for spectrum scarcity with such capabilities that make it work as an intelligent wireless communication system. To achieve full functionalities of cognitive radio systems is rather difficult and firstly, we have to solve the problem of spectrum sensing in which secondary or unlicensed users can sense free spectrum to start communication without disturbing primary or licensed users.

In the following research, we derive a detector which is based on sequential probability ratio test (SPRT) and uses energy detector (ED) which is followed by cyclostationary feature detector (CFD). Simulation results have shown that sequential detector reduces the sensing time compared to fixed sample size detector for the same detection performance. ED as a blind sensing technique does not require any prior knowledge of a PU's waveform and is easy to implement while conceptually simple. However, it is highly affected by interference and noise uncertainties. Therefore, CFD is applied for fine sensing as researches have shown that cyclostationary feature detection is more suitable than the energy detection when noise uncertainties are unknown. There have been researches in two stage spectrum sensing using energy detector and cyclostationary detector but as far as our knowledge is concerned our method is novel in trying to derive a sequential energy detector and combine it with cyclostationary feature detector for low SNR region where average sample number (ASN) as a random variable may take very high value to achieve a desired performance level for sequential energy detector. For this sequential energy detector is terminated after it reaches certain cut-off sample number, making it truncated sequential energy detector.

In this thesis, we apply the method of sequential energy detection to achieve reduction in average sensing time and for the low SNR regime we use CFD for detection as unwantedly high number of samples is needed by sequential energy detection in such scenario.