Sparse Spectrum Sensing for Cognitive Radio

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Abstract

Spectrum sensing is a method of detecting presence or absence of signal in a licensed spectrum, which is a basic need for cognitive radio. For sensing a wide band frequency range, a corresponding large sampling rate is challenging task for practical implementation. Fortunately, most of the signals are sparse in nature. Recently, compressive sensing theory has emerged for sub-Nyquist sampling for the sparse signals in signal processing community. Two sub-Nyquist algorithms, random demodulator (periodic uniform sampling) and multi coset sampling (non uniform sampling) techniques are widely used in modulated wide band convertor. The major advantage of these methods is prior knowledge of the signals not required. This paper investigates the use of these two sub-Nyquist algorithms to incorporate in the spectrum sensing and compare. The frequency band of interest is divided into a finite number of spectral bands, and the presence and absence of the signal in each spectral band is examined by considering the correlation matrix of the sampled data. Noisy samples are predicted and used by space detector. The minimum description length criterion (MDL) is used to find out the active channels. MUSIC algorithm is used to find out the exact location of those active channels. The performance of both methods is compared with the probability of detecting signal occupancy in terms of the number of samples and the SNR of randomly generated signals. The probability of detection and probability of false alarm are computed for different signal to noise ratio.