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Abstract

In this paper, we propose a novel multistage DFT based polyphase filter bank technique using center of mass approach for estimating center frequency, detecting spectral edges and identifying spectral holes in wideband cognitive radio (CR) for efficient utilization of radio frequency spectrum. Spectral holes are identified by measuring energy at the output of individual subband of filter banks. Accuracy of spectral holes detection depends on frequency resolution of subbands and can be increased with an increase in number of DFT points, however, at the expense of computational complexity. In order to reduce complexity our algorithm starts with a coarser spectral resolution in the first stage. If a primary user appears over more than one subband, center frequency can be estimated in the first stage using proposed approach. However, if the primary user appears exclusively within a single subband, center frequency can be estimated at the second stage. For center frequency estimation, we propose a novel center of mass approach to achieve better precision, where mass is related to energy and distance is related to frequency. Exhaustive simulation results show that center frequency estimation using proposed multistage polyphase filter bank based on center of mass reduces computational complexity and has higher precision compared to conventional filter bank methods.

Keywords:
Filter bank, Cognitive radio, Spectrum sensing, Center frequency, Spectral edges, Center of mass