

**CHENNAI – PONDICHERRY**

**Scheduled Sequential Compressed Spectrum Sensing for Wideband Cognitive Radios**

**Abstract:**

The support for high data rate applications with the cognitive radio technology necessitates wideband spectrum sensing. However, it is costly to apply long-term wideband sensing and is especially difficult in the presence of uncertainty, such as high noise, interference, outliers, and channel fading. In this work, we propose scheduling of sequential compressed spectrum sensing which jointly exploits compressed sensing (CS) and sequential periodic detection techniques to achieve more accurate and timely wideband sensing. Instead of invoking CS to reconstruct the signal in each period, our proposed scheme performs backward grouped-compressed-data sequential probability ratio test (backward GCD-SPRT) using compressed data samples in sequential detection, while CS recovery is only pursued when needed. This method on one hand significantly reduces the CS recovery overhead, and on the other takes advantage of sequential detection to improve the sensing quality. Furthermore, we propose (a) an in-depth sensing scheme to accelerate sensing decision-making when a change in channel status is suspected, (b) a block-sparse CS reconstruction algorithm to exploit the block sparsity properties of wide spectrum, and (c) a set of schemes to fuse results from the recovered spectrum signals to further improve the overall sensing accuracy. Extensive performance evaluation results show that our proposed schemes can significantly outperform peer schemes under sufficiently low SNR settings.

**Existing System:**

A wideband can be generally divided into sub-bands or sub-channels, where the occupancy status by PUs can be determined via sensing of the sub-bands one by one. For a wideband with an extremely large bandwidth (thus a large number of sub-channels), this will bring large overhead and sensing delay. Alternatively, to meet the need of Nyquist sampling rate, CRs can sense the wideband directly with some high-end wideband components, including wideband attenna, wideband radio frequency (RF) front-end and highspeed analog-to-digital converter (ADC). This will inevitably introduce high cost, and may not even be feasible with existing devices. To address this challenge, compressed sensing (CS) is exploited in wideband sensing to reduce the number of samples required.

**Proposed System:**

We propose a novel wideband sensing scheduling scheme, sequential compressed spectrum sensing. It incorporates the compressed sensing technique into the sequential periodic sensing framework to take advantage of both for accurate and low-overhead spectrum sensing. Specifically, we perform sequential analysis [9] based on sub-Nyquist samples directly without incurring excessive CS recovery overhead, and exploit the sequential detection to improve the sensing performance.

We investigate a two-stage change-point detection method to quickly and efficiently determine the change in channel usage. In the first stage, sequential sensing is performed to detect the potential change in spectrum occupancy, and in the second stage, intensive in-depth wideband sensing is triggered to make final decisions rapidly on the wideband spectral usage conditions.

\_ We propose a CS recovery algorithm that exploits the block feature of wideband spectrum to further improve the CS reconstruction performance for more accurate determination of wideband power spectrum usage.

\_ We perform extensive simulations to validate and demonstrate the major advantages of our design.