<u>Notice and Invitation</u>

Oral Defense of Doctoral Dissertation

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Efficient Wideband Temporal Spectrum Sensing from Noisy Measurements

Wednesday, August 12, 2020, 10:00am-12:00pm

Via Zoom Webinar:

(https://gmu.zoom.us/j/98047232167)

All are invited to attend.

Committee

Dr. Brian L. Mark, Co-Chair

Dr. Yariv Ephraim, Co-Chair

Dr. Zhi Tian

Dr. Bernd-Peter Paris

Dr. Parth Pathak

Abstract:

Cognitive radio is regarded as a promising technology for efficient utilization of the spectrum. In general, the licensed users, also known as primary users (PUs), frequently leave a substantial portion of the purchased spectrum unoccupied or idle. Cognitive radio technology has the potential to utilize the wasted spectrum resource without causing harmful interference to the PUs. The two most important aspects of cognitive radio technology are spectrum sensing and dynamic spectrum access. To guarantee the performance of dynamic spectrum access for the unlicensed users or secondary users (SUs), accurate spectrum sensing of the licensed spectrum is required. Many of the narrowband and wideband spectrum sensing approaches proposed in the literature are based on measurements of signal features such as the energy within a band or the cyclostationary spectrum, but do not capture the temporal dynamics of spectrum usage. There have been relatively few works on spectrum sensing based on stochastic models. In this dissertation, we model the temporal dynamics of the received signal from a PU by a Markov modulated Gaussian process (MMGP). We propose a method to estimate the parameter of this process and to use the parameter to estimate and predict the channel states of each PU. When taking power measurements as observations, the spectrum sensing accuracy of our model-based approach is demonstrated to be better than that of the energy detector.

In this dissertation, we develop temporal spectrum sensing schemes for both the wideband and multiband scenarios. For the wideband case, we propose a model-based spectrum sensing scheme using cepstral feature vectors as observations. The scheme is able to detect changes in the transmission configuration on an identified PU band. This allows multiband sensing techniques to be applied to the wideband case. For the multiband case, we propose a parameter estimation scheme based on the MMGP. An optimal computing budget allocation approach is developed to allocate sensing time to PU bands in a multiband setup. Numerical results are provided to evaluate the performance of the proposed wideband and multiband temporal spectrum sensing schemes.