

# SEMINAR NOTICE

Department of Electrical and Systems Engineering

## ADAPTIVE OFDM RADAR FOR TARGET DETECTION IN MULTIPATH SCENARIOS

PhD Preliminary Research Examination

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**Abstract:** We develop methods for detecting a moving target in the presence of multipath reflections, which exist, for example, in urban environments. We take advantage of the multipath propagation that increases the spatial diversity of the radar system and provides different Doppler shifts over different paths. We employ a broadband orthogonal frequency division multiplexing (OFDM) signal to increase the frequency diversity of the system as different scattering centers of a target resonate at different frequencies. First, we develop a parametric measurement model that accounts for the multipath components at multiple frequencies as well as Doppler shifts. Then, we develop a statistical detection test and analytically evaluate its performance characteristics. Based on asymptotic performance analysis, we propose an algorithm to optimally design the parameters of the OFDM transmitting waveform for the next coherent processing interval. To analyze the performance of a more realistic system, we incorporate the effects of undesired clutter returns into our measurement models. We also extend our models to study the aspects of temporal correlations in the measurement noise. In addition, to overcome the peak-to-average power ratio (PAPR) problem of the conventional OFDM, we propose to use two alternative techniques: constant-envelope OFDM (CE-OFDM) and slow-time OFDM (ST-OFDM) signaling schemes. We provide a few numerical examples to illustrate the performance characteristics of the proposed detectors and demonstrate the achieved performance improvement due to adaptive OFDM waveform design.

DATE: Tuesday, October 6, 2009  
TIME: 10:00 a.m.  
PLACE: Bryan Hall, Room 305

Advisor:  
Dr. Arye Nehorai

This seminar is in partial fulfillment  
of the Doctor of Philosophy degree