

# SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

## Target Tracking via Recursive Bayesian State Estimation in Cognitive Radar Networks

PhD Preliminary Research Examination

**Yijian Xiang**  
PhD Candidate

Preston M. Green Department of Electrical and Systems Engineering  
Washington University in St. Louis

### Abstract:

Target tracking has long been one of the most relevant and challenging problems in a wide variety of defense and civilian radar systems. The primary objective of a conventional tracking system is to provide accurate estimates of an unknown target's state, for example, its position and velocity. This can be done in a time-sequential manner by utilizing the received radar measurements and assumed target kinematic models. However, to cope with complex environments and stealthier targets, incorporating intelligence and cognition cycles into target tracking is of great importance in modern sensor network management. With recent remarkable advances in sensor techniques and deployable platforms, a modern sensing system has the freedom to select a subset of available radars, plan their trajectories, and transmit designed waveforms. We propose a general framework for single target tracking in cognitive networks of radars, including joint consideration of waveform design, path planning, and radar selection. Previous work considered these aspects separately. We formulate the tracking procedure using the theories of dynamic graphical models (DGM) and recursive Bayesian state estimation (RBSE). Our procedure has two iterative steps: (i) solving a combinatorial optimization problem to select the optimal subset of radars, waveforms, and locations for the next tracking instant, and (ii) acquiring the recursive Bayesian state estimation to accurately track the target. Further, we use an illustrative example to introduce a specific scenario in 2-D space. Simulation results based on this scenario demonstrate that the proposed framework can accurately track the target under the management of a network of radars.

DATE: Wednesday, January 23, 2019

TIME: 3:00 p.m.

PLACE: Green Hall, Room 0120

Dissertation advisor:  
Dr. Arye Nehorai

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