

SEMINAR NOTICE

Department of Electrical and Systems Engineering

ADAPTIVE MIMO RADAR FOR TARGET DETECTION AND ESTIMATION

PhD Preliminary Research Examination

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Abstract: We develop target detection and estimation algorithms for distributed Multiple Input Multiple Output (MIMO) radar systems. MIMO systems enable viewing the target from different angles, thereby providing spatial diversity gain. Thus, MIMO radar significantly outperforms Single-Input Single-Output (SISO) radar. First, we detect a single stationary target by employing multiple arbitrarily polarized transceivers. We analyze the detection performance of this system and propose optimal polarimetric design of the transmit waveforms based on the properties of the target scattering matrix. This significantly enhances the detection performance when compared with conventional systems that transmit waveforms with only fixed horizontal or vertical polarizations. Then, we develop estimation methods for multiple moving targets using sparse modeling. We exploit the sparsity in the target delay-Doppler space to estimate the unknown target positions and velocities. We also introduce a new sparsity based metric to analyze the performance. We propose an adaptive mechanism for optimal energy allocation at the different transmit antennas. This design helps us achieve significant improvement in estimation accuracy. Further, we employ compressive sensing to achieve accurate estimation results from very few received samples. We demonstrate our analytical results using numerical simulations.

DATE: Friday, February 4, 2011
TIME: 3:00 p.m.
PLACE: Bryan Hall, Room 305

Thesis advisor:
Dr. Arye Nehorai

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