SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

TARGET DETECTION USING MULTI-INPUT MULTI-OUTPUT RADAR

DISSERTATION DEFENSE
by

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Abstract: We develop target-detection methods using multi-input multi-output (MIMO) radar with widely separated antennas under realistic clutter modeling and practical limitations. MIMO radar is useful to discriminate the target from the clutter using the spatial diversity of the scatterers in the illuminated area. We model the clutter with a compound-Gaussian distribution. This model represents the heavy-tailed clutter statistics that are distinctive of several scenarios, e.g., high-resolution and/or low-grazing angle radars in the presence of sea or foliage. Using this model, we develop our target detection algorithm based on the generalized likelihood-ratio test. We demonstrate that the MIMO radar outperforms the detection performance of the conventional phased-array radar. Then, based on the asymptotic statistical characteristics of the detection test, we propose an adaptive power allocation algorithm to maximize the detection performance.

We also analyze the sensitivity of the MIMO radar detection performance to the lack of orthogonality among the received signals. In contrast to the common assumptions on the received signals of MIMO radar, in practice, mutual orthogonality among the received signals cannot be achieved for all delay and Doppler pairs, due to the wide separation of the antennas. We introduce a measurement model considering the correlation among the signals from different transmitter-receiver pairs as non-zero unknown parameters. Using this model, we develop a target detection algorithm based on the Wald decision test. Then employing the asymptotical statistical characteristics and the numerical performance of the Wald test, we demonstrate the sensitivity of the detection performance to changes in the cross-correlation levels of the measurements. We will overview additional work at the end of the presentation.

DATE:	Thursday, December 2, 2010
TIME:	10:00 a.m.
PLACE:	Bryan Hall, Room 305

Dissertation advisor:
Dr. Arye Nehorai

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SCHOOL OF ENGINEERING & APPLIED SCIENCE