SEMINAR NOTICE

Department of Electrical and Systems Engineering

WAVEFORM DESIGN
FOR
MULTIPLE-INPUT MULTIPLE-OUTPUT RADAR SYSTEMS

by

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Multiple-input multiple-output (MIMO) radar is quickly becoming a recognized advancement in the field of radar signal processing. This type of radar is characterized by its use of multiple transmit waveforms, possibly different at every aperture. We look at several methods for using this waveform capability.

We present a new and novel method of transmit beamforming through the use of a properly selected waveform correlation matrix. Several optimization problems are solved in which a waveform correlation matrix is chosen so as to produce a transmit beampattern that optimally matches a desired beampattern. These optimization problems are solved using convex optimization, semidefinite programming, and geometric optimization techniques.

A MIMO radar ambiguity function is developed that is similar to P.M. Woodward's celebrated waveform ambiguity function. This new ambiguity function characterizes the local as well as the global target parameter resolution capabilities of a specific set of transmit waveforms.

Finally, we consider how waveforms may be used to improve the performance of target parameter estimators. We calculate the Cramér-Rao bound for our model and show how waveforms may be chosen so as to optimally minimize these bounds, thus improving parameter estimation performance.

DATE: Thursday, September 20, 2007
TIME: 1:00 p.m.
PLACE: Bryan Hall, Room 305

Thesis advisor:
Daniel R. Fuhrmann

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

Washington University in St. Louis
School of Engineering & Applied Science