SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

POWER SYSTEM STATE ESTIMATION AND RENEWABLE ENERGY OPTIMIZATION IN SMART GRIDS

DISSERTATION DEFENSE

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Abstract: The future smart grid will benefit from real-time monitoring, automated outage management, increased renewable energy penetration, and enhanced consumer involvement. Among the many research areas related to smart grids, this talk will focus on two important topics: power system state estimation using phasor measurement units (PMUs), and optimization for renewable energy integration.

In the first topic, we consider power system state estimation using PMUs, when phase angle mismatch exists in real measurements. We build a measurement model that takes into account the measurement phase angle mismatch. We then propose algorithms to increase state estimation accuracy based on this model. After that, we derive the posterior Cramèr-Rao bound on the estimation error using this model, and propose a method for PMU placement in the grid. We show that our proposed state-estimation algorithms and the proposed PMU placement strategy can significantly increase the state-estimation accuracy. In the second topic, we consider optimization for renewable energy integration in smart grids. Specifically, we consider the case of a micro-grid with a large penetration of renewable energy. We jointly optimize the capacities of energy storages and renewable generators, in order to ensure an uninterrupted power supply with minimum costs. To handle the large dimensionality of the problem due to large historical datasets used, we reformulate the original optimization problem as a consensus problem, and use the alternating direction method of multipliers to solve for the optimal solution in a distributed manner. The results will improve renewable generation and storage design, and guide policy-making decisions.

DATE:	Monday, April 21, 2014
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

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