SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

SOCIAL NETWORK MODELS FOR PREDICTING AND INFLUENCING SMART- GRID USER BEHAVIOR

Ph.D. Preliminary Research Examination

Alex Cassidy
Ph.D. Candidate

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

Abstract: As emerging smart grid technologies seek to make the electrical grid more sophisticated and efficient, user behavior is more important than ever. Many of the benefits of smart grid technology rely upon the actions of individual power consumers to be fully realized. Therefore, it is useful to consider ways that these actions can be predicted and influenced.

We present two contributions towards this end. In the first, we propose a novel framework for modelling adoption of a demand response program. We place the users in a social network and model the spread of attitudes towards the technology. These attitudes are combined with psychological models of individual personality and game-theoretic models of pricing under a demand response program to derive adoption decisions. Our second contribution is a mathematical formulation of one possible method to influence user behavior in a positive way. Specifically, we study the case of promoting the behavior of "best users" in the context of load rescheduling. The objective is to make the overall load curve as smooth as possible. Users are again given attitudes towards the relevant technology and its performance, and these attitudes propagate through the network. We further use the smart grid to make available the usage patterns of the users with the lowest load variance. We simulate this effect through added edges from these users to the rest of the network. Numerical examples are used to demonstrate the efficacy of the models presented.

DATE: Tuesday, May 5, 2015
TIME: 10:10 a.m.
PLACE: Green Hall, Room 0120

Thesis advisor:
Dr. Arye Nehorai

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

Washington University in St.Louis
SCHOOL OF ENGINEERING & APPLIED SCIENCE