Stanford University

TomKat Center for Sustainable Energy
Precourt Institute for Energy
SLAC National Accelerator Laboratory
Energy and Environment Affiliates Program
Civil and Environmental Engineering
Department of Electrical Engineering

Stanford SmartGrid Seminar

TRUST-TECH: A Novel Paradigm for Nonlinear Optimization and Practical Applications

Hsiao-Dong Chiang

Cornell University

1:00pm-2:00pm, Monday, Nov 17th, Y2E2 101

Abstract: Optimization technology has practical applications in almost every branch of science, business and technology. Indeed, a large variety of the quantitative issues such as decision-making, design, operation, planning, and scheduling arising in science, engineering, and economics can be perceived and modeled as nonlinear optimization problems. The solution space (i.e. search space) of nonlinear optimization problems generally contains only one global optimal solution and many local optimal solutions. The values of an objective function at local optimal solutions and at the global optimal solution may differ significantly. Hence, from a practical viewpoint, there are strong motivations to develop effective methods for finding the global optimal solution. In this talk, I will present a novel paradigm, termed Trust-Tech, for nonlinear optimization. The theoretical basis for and practical applications of Trust-Tech to Optimal Power Flow of two major utilities will also be presented.

Bio: Dr. Chiang's research effort is focused on nonlinear theory, nonlinear computation and applications to electric circuits, systems, signals and images over several years, Dr. Chiang and his team collectively develop a practical package, called SecureSuite[tm], for power grid security assessment, enhancement and applications. The SecureSuite, currently applicable to 100,000-bus power systems, include TEPCO-BCU, BCU-DSA package, VSA&E package. VSA&E is an integrated package developed for voltage security assessment, enhancement and preventive control in real-time mode or on-line study mode, VSA &E has been operational for several years at the top two utilities in the USA. Dr. Chiang and his research team have published over 350 refereed papers and been awarded 11 US patents and 4 oversea patents. His book, "Direct Methods for Power System Stability Analysis: Theoretical Foundations, BCU Methodology and Practical Applications" was published by Wiley and IEEE Press in 2010. His second book, "Stability Regions of Nonlinear Dynamical Systems: Theory, Estimation and Applications" will be published by Cambridge Press.