SEMINAR ANNOUNCEMENT

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WHAT: Building Energy Doctors:
SPC and Kalman Filter-based Fault Detection

WHEN: Wednesday, 23 November 2011, 8:30–10:30

WHERE: Facoltà di Ingegneria
Via Nuova Agnano
Room I.A.12

Abstract — Buildings worldwide account for nearly 40% of global energy consumption. The biggest energy consumer in buildings is the Heating, Ventilation and Air Conditioning (HVAC) systems. HVAC systems are also plagued by faults, and ranked top in terms of number of complaints by tenants. Maintaining HVAC systems in good conditions through early fault detection is thus a critical issue. The problem, however, is difficult since HVAC systems are large in scale, consisting of many coupling subsystems, building and equipment dependent, and operating under uncertain conditions. In this talk, a model-based and data-driven method is presented for robust system-level fault detection with potential for large-scale implementation. It is a synergistic integration of (1) Statistical Process Control (SPC) for measuring and analyzing variations; (2) Kalman filtering based on gray-box models to provide predictions and determine SPC control limits; and (3) system analysis for analyzing fault propagation. The method has been tested against a simulation model of a 420-meter-high building. It detects both sudden faults and gradual degradation, and differentiates faults within a subsystem or propagated from elsewhere. Furthermore, the method is simple and generic, and should have good replicability and scalability.

Biosketch — Peter B. Luh received his B.S. in Electrical Engineering from National Taiwan University, M.S. in Aeronautics and Astronautics from M.I.T., and Ph.D. in Applied Mathematics from Harvard University. He has been with the University of Connecticut since 1980, and currently is the SNET Professor of Communications & Information Technologies and was the Head of the Department of Electrical and Computer Engineering from 2006 to 2009. He is also a member of the Chair Professors Group, Center for Intelligent and Networked Systems in the Department of Automation, Tsinghua University, Beijing, China. Professor Luh is a Fellow of IEEE, the Vice President for Publication Activities for IEEE Robotics and Automation Society, and was the Editor-in-Chief of IEEE Transactions on Robotics and Automation (1999-2003) and the founding Editor-in-Chief of the IEEE Transactions on Automation Science and Engineering (2003-2007). His interests include optimized operations and fault detection/diagnosis of building equipment for efficiency and sustainability; design of auction methods and optimized operations of power systems with intermittent renewable generation; electricity load and price forecasting with demand response; planning, scheduling, and coordination of design, manufacturing, and service activities; decision-making under uncertain, distributed, or antagonistic environments; and mathematical optimization for large-scale problems.

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