Departments of Mechanical Engineering and Automatic Control & Systems Engineering would like to announce the following seminar:

Using Evolutionary Algorithms to Tailor or Optimize Dynamic Systems for Applications in Structural Health Monitoring

By

Prof Michael Todd

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Time: Monday 7 July 2008
at 11.00am

Location: Sir Frederick Mappin Building LT14

Coffee and Biscuits will be served afterwards.

Abstract: Evolutionary algorithms are optimization schemes that mimic mechanisms of biological evolution by using the principles of natural selection and survival of the fittest to "evolve" candidate solutions to a given problem and seek out an optimum. In this work, we explore how such algorithms may be used to tackle a number of inverse dynamics problems—ranging from finding parameters of a dynamic system to breeding entire systems from scratch—that meet some desired dynamic criterion (e.g., a prescribed Lyapunov spectrum, matched dynamic evolution as measured by a comparison metric, etc.). We show that in a master-slave dynamical system the master may be modified or even created from scratch such that changes in the slave dynamics are amplified. Such a scenario is useful, for example, when the slave system is a structural filter whose response is mined for indicators of change that arise from the onset of damage.

Biographical Sketch

Michael Todd received his B.S.E. (1992), M.S. (1993), and Ph.D. (1996) from Duke University's Department of Mechanical Engineering and Materials Science, where he was an NSF Graduate Research Fellow. In 1996, he began as an A.S.E.E. post-doctoral fellow, then a staff research engineer (1998), and finally Section Head (2000) at the United States Naval Research Laboratory in the Fiber Optic Smart Structures Section. He joined the Structural Engineering Department at the University of California San Diego in 2003, where he currently serves as Associate Professor. To date, he has published over 50 journal papers, three book chapters, over 120 conference papers and proceedings, and has 4 patents. His main research areas are in applying nonlinear time series techniques (such as chaotic interrogation) to vibration-based structural health monitoring, building UAV-enabled RFID sensing systems for structural assessment, developing real-time shape reconstruction strategies for highly flexible structural systems, designing and testing fiber optic measurement systems, and developing noise propagation models for fiber optic measurement systems. With partners at Los Alamos National Laboratory, he helped create the country's first graduate degree program in structural health monitoring, damage prognosis, and validated simulations at UCSD, and he serves as Campus Director of the subsequent Engineering Institute. He has won the 1999 Alan Berman NRL Publication Award, the 2003 and 2004 NRL Patent Award, was a 2004-2005 UCSD Hellman Fellow, was an invited speaker at the 2003 National Academy of Engineering Japan-America Frontiers of Engineering Symposium where he was runner-up for the Galbraith Distinguished Lectureship, was nominated for the 2005 SEM Durelli Award, was named to 2005 Academic Keys' 'Who's Who in Engineering Education,' was an invited speaker for the 2005 SOM National Building Science and Design Research Symposium in New York, and was a 2004 William J. Von Leibig Center for Entrepreneurism and Technology Advancement fellowship winner. Most recently, he won the 2005 Structural Health Monitoring Person-of-the-Year Award, presented at Stanford University in September 2005. He also serves on the editorial board of *Structural Health Monitoring: An International Journal*.