Some Approaches for the Modeling and Monitoring of Complex Nonlinear Systems

by

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Abstract

The need to develop data-based, high-fidelity, reduced-order, and reduced-complexity, mathematical models of complex, uncertain, nonlinear systems arises in many important areas, spanning the fields of applied mechanics, Micro-Electro-Mechanical devices, biological systems, etc. This presentation will provide an overview of some promising data-driven nonparametric system identification techniques that are shown to be capable of reliably detecting and quantifying nonlinearities in uncertain systems. Results from several examples (analytical models, a nonlinear laboratory testbed structure with uncertain parameters, a biological system, and a full-scale structure) are used to demonstrate the range of validity of the proposed modeling approach. It is shown that if the topology of the target system can be exploited, then the proposed data processing methodology is capable of confidently detecting the presence of nonlinearities, accurately locating the structural section where the nonlinear effects were observed, and of providing an estimate of the severity of the nonlinearity.

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About the Speaker:

Sami F Masri is a Professor of Civil and Environmental Engineering, and a Professor of Aerospace and Mechanical Engineering, in the Viterbi School of Engineering, University of Southern California, Los Angeles, California, USA. He received a BS and MS degrees in Aerospace Engineering, from the University of Texas, and an MS and PhD in Mechanical Engineering from the California Institute of Technology. He has been on the faculty of USC since 1966. His research deals with the modeling, monitoring and control of nonlinear systems.

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(Masri photo below)