Seminar Series

Thursday April 20th, 2017
11:00AM - 12:00PM
UConn, Storrs Campus – UTEB 476
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Enhancing Electromechanical Impedance-Based Structural Health Monitoring by Integrated Bistable and Adaptive Piezoelectric Circuitry

Structural health monitoring (SHM) has obvious significance since it plays essential role in mechanical, civil, and aerospace system health management. SHM provides structural health assessment data to support making appropriate decisions regarding the system operation and maintenance actions, which can greatly improve life safety and increase economical benefits by mitigating the risks of unexpected catastrophic system failure. Among various SHM approaches, the electromechanical impedance-based method, which utilizes the two-way electromechanical coupling effect of piezoelectric transducers for monitoring damage-induced variations in target structure, has shown great potential in identifying small-sized structural defects at an early stage, while maintaining simplicity in implementation. The independent measurement data sets, however, are generally far fewer than the number of unknown system parameters, which results in a severely underdetermined inverse problem for damage identification. This numerical ill-conditioning undermines the reliability of damage estimation since the inverse solution becomes extremely sensitive to even small amount of error in the measurement data, especially in practical implementation where noise is unavoidable. In this talk, I will present a novel approach that addresses these limitations by fundamentally improving the underdetermined inverse problem via adaptive piezoelectric circuitry and accurately measuring the damage-induced impedance variations under noise influences by leveraging bifurcations in bistable circuitry.

Jinki Kim

Jinki Kim is a Ph.D. candidate of the Department of Mechanical Engineering at the University of Michigan, where he is a member of the Structural Dynamics and Controls Laboratory working with Professor Kon-Well Wang. He received his B.S. and M.S. in Mechanical Engineering from Seoul National University in 2006 and 2008, respectively. Before joining the University of Michigan, he worked as an engineer at Samsung Medison in Seoul, Korea, designing acoustic modules in ultrasound probes for medical imaging. His research interests lie in developing and applying novel sensing and monitoring strategies in various levels of engineering and scientific systems for sustainable and resilient system management. This interest is comprehensive including structural health monitoring, microscale mass detection, and predicting critical transitions in complex systems.

Upcoming Distinguished Lectures

5/08/17 – Ignacio Grossmann
Challenges in the Application of Mathematical Programming Approaches to Enterprise-wide Optimization of Process Industries

Upcoming Seminars

4/17/17 – Dane Boysen
Democratizing Energy TECHNOLOGY
5/22/17 – James Davis

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