Civil & Environmental Engineering Seminar

January 28, 2014, 305 SH, noon

Title: The Integrated Sensing to Modeling Approach for Understanding Physical State of Large Scale Structures using Waveform-based SHM Methods

Abstract: Understanding the physical state of structural components is essential to diagnose their remaining life and prevent impending failure. Structural Health Monitoring (SHM) methods based on propagating elastic waves, such as guided wave ultrasonics and acoustic emission (AE), are highly popular in large-scale structures as elastic waves may propagate long distances with small amplitude decay depending on wave mode and frequency. However, it is important to understand all layers of measurement from damage source, propagating medium to sensing level for extracting the relationship between the measured data and the physical quantity while the complexity and scale of civil structural systems cause such approach difficult. In the first part of the talk, effective formulation of high frequency wave propagation in structures using high order spectral elements and perfectly match layer will be presented to mimic the wave propagation in large-scale structures with sub-scale models. In the second part of the talk, new Micro-Electro-Mechanical-System (MEMS) device accommodating acoustic emission, accelerometer and strain sensor on a small footprint will be introduced for a complete SHM approach. The talk ends with some examples of wave propagation based SHM methods to measure physical quantities such as cumulative stress in gusset plates and leak rate in pipelines.

Biography: Dr. Ozevin is an assistant professor of Civil and Materials Engineering Department at the University of Illinois at Chicago. Before this appointment, she worked as a research scientist at Physical Acoustics Corporation over four years, and gained expertise in many NDE methods such as acoustic emission, ultrasonics and eddy currents. Her current research is quantitative understanding of acoustic emission method, numerical modeling of elastic wave problem, nonlinear ultrasonics for stress measurement at gusset plates, MEMS sensors for multi-sensor fusion capability, and crack detection at helicopter gearboxes. She is currently sole PI of two National Science Foundation grants, and NCHRP IDEA grant. Her two research projects are related to nonlinear ultrasonics to measure stress tensor including normal and shear stresses at complex loaded civil engineering systems. She recently received NAVAIR STTR Phase II grant in collaboration with Metis Design Inc to detect the early stage of damage in gearbox components using hybrid guided wave ultrasonics and acoustic emission methods. She is a member of ASCE, ISHMII and ACI. She has twelve peer-reviewed journal papers, and numerous conference papers. Dr. Ozevin received her PhD from Lehigh University in 2005.