

CE 890 Graduate Seminar

DATE: December 3, 2008

TIME: 4:00 p.m. (refreshments served at 3:45 p.m.)

PLACE: Rathbone 1052

SPEAKER: Long Qiao, Ph.D. candidate

TOPIC: “Structural Damage Detection Using Signal-Based Pattern Recognition Method”

ABSTRACT

Deterioration significantly affects the structure performance and safety. A signal-based pattern-recognition procedure is applied for structural damage detection with a limited number of input/output signals. The method is based on extracting and selecting the sensitive features of the structure response to form a unique pattern for any particular damage scenario, and recognizing the unknown damage pattern against the known database to identify the damage location and level (severity). In this study, three types of transformation algorithms are implemented separately for feature extraction: (1) Fast Fourier Transform (FFT); (2) Continuous Wavelet Transform (CWT); and (3) Wavelet Packet Transform (WPT). Three pattern-matching algorithms are also implemented separately for pattern recognition: (1) correlation, (2) least square distance, and (3) Cosh spectral distance. To demonstrate the validity and accuracy of the procedure, experimental studies are conducted on a simple three-story steel structure. The results show that the features of the signal for different damage scenarios can be uniquely identified by these transformations, and correlation algorithms can best perform pattern recognition to identify the unknown damage pattern. It is suitable for structural health monitoring, especially for online monitoring applications.