Sensing and analysis of a structure for the purpose of detecting, tracking, and evaluation of damage and deterioration during both regular operation and extreme events is referred to as Structural Health Monitoring (SHM). SHM is a multi-disciplinary field, with a complete system incorporating sensing technology, hardware, signal processing, networking, data analysis, and management for interpretation and decision making. However, many of these processes and subsequent integration into a practical SHM framework is in need of development. In this study, various components of an SHM system will be investigated, with a particular focus being paid to a previously developed damage detection methodology for global condition assessment of a structure. First, a review of some of the current SHM applications, which relate to a current UCF Structures SHM study monitoring a full-scale movable bridge will be presented in conjunction with a summary of the critical components for that project. Studies for structural condition assessment of a bridge using the SHM data collected from a laboratory based 4-span bridge-type steel structure will then be presented. For this purpose, a time series analysis method using ARX (Auto-Regressive with eXogeneous input) models for damage detection with free response vibration data will be expanded upon using both wired and wireless acceleration data. Analysis using wireless accelerometers will implement a sensor roaming technique to maintain a dense sensor field, yet require fewer sensors. Using both data types, this ARX based time series analysis method was shown to be effective for damage detection and locating for this relatively complex laboratory structure. Finally, application of the proposed methodologies on a real-life structure will be discussed, along with conclusions and recommendations for future work.

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The public is welcome to attend.