# RECENT DEVELOPMENTS IN STRUCTURAL HEALTH MONITORING

Charles R. Farrar

The Engineering Institute
Los Alamos National Laboratory

## Abstract

The process of implementing a damage detection strategy for aerospace, civil and mechanical engineering infrastructure is referred to as structural health monitoring (SHM). The SHM process compliments traditional nondestructive evaluation by extending these concepts to online, in situ system monitoring on a more global scale. For long term SHM, the output of this process is periodically updated information regarding the ability of the structure to perform its intended function in light of the inevitable aging and degradation resulting from operational environments. After extreme events, such as earthquakes or blast loading, SHM is used for rapid condition screening and aims to provide, in near real time, reliable information regarding the integrity of the structure.

This presentation will briefly summarize the historical developments of SHM technology, which have been primarily driven by four applications: rotating machinery, offshore oil platforms, civil infrastructure, and aerospace structures. Next, the current state of the art is summarized where the SHM problem is described in terms of a statistical pattern recognition paradigm. In this paradigm, the SHM process can be broken down into four parts: (1) Operational Evaluation, (2) Data Acquisition and Cleansing, (3) Feature Extraction and Data Compression, and (4) Statistical Model Development for Feature Discrimination. This talk will then focus on recent developments related to both the sensing hardware and data analysis aspects of SHM. Some final comments will be made on outstanding technology development and validation needs that are necessary for more widespread adoption of SHM.