Journal of Vibration and Acoustics

Guest Editorial

Special Issue on Vibration-Based Structural Damage Detection and Health Monitoring

The guest editors are pleased to compile this special issue of the *Journal of Vibration and Acoustics* on vibration-based damage detection and structural health monitoring. This experience has proven to be indeed rewarding and thoroughly exciting.

Structural health monitoring refers to technology employing automated methods for determining adverse changes in the integrity of mechanical systems. This technology is currently being developed to monitor and maintain various classes of systems, such as aerospace and civil structures. This field has experienced a remarkable growth recently in both the commercial and military sectors. The scope of this special issue is by no means designed to comprehensively include the vast body of ongoing work. Rather, the papers are focused primarily on health monitoring methods utilizing vibration characteristics of structural systems.

Perhaps one of the most relied on means of vibration-based damage detection and structural health monitoring is focused on monitoring frequencies of vibration. The paper by Xu, Zhu and Emory discusses that topic, along with the paper by Peairs, Tarazaga and Inman which focuses on frequency range selection for impedance-based monitoring, and the paper by Nichols, Trickey, Seaver, Motley and Eisner where ambient vibrations are used to detect the loosening of a bolt under the presence of strong temperature fluctuations. Next, several issues of built-in sensors for structural health monitoring of composite structures are tackled in the paper by Chang, Markmiller, Ihn and Cheng.

Several following papers address aspects of guided waves for damage detection. The paper by Olson, DeSimio and Derriso discusses beam forming and Lamb waves, the paper by Raghavan and Cesnik proposes novel 3-D models for anisotropic transducers used for guided waves, and the paper by Santoni, Yu, Xu and Giurgiutiu deals with Lamb wave mode tuning using piezoelectric wafer active sensors. One of the critical current issues for structural health monitoring is increasing sensitivity of detection. Several solutions for increasing sensitivity are proposed in this special issue. The paper by Yin and Epureanu exploits chaotic dynamics and active system interrogation for increasing sensitivity. The paper by Jiang, Tang and Wang presents optimal sensitivity enhancing control via eigenstructure assignment. The paper by Olson, Todd, Worden and Farrar discusses excitations for active sensing using evolutionary programming. Finally, the paper by Park, Namachchivaya and Neogi addresses stochastic aspects of damage detection as a system identification problem by tackling the broader question of stochastic averaging and optimal predictions.

We hope that the reader will find this special issue informative, exciting and thought provoking. We certainly have.

Bogdan I. Epureanu
Guest Editor
Mark M. Derriso
Co-Guest Editor

