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Editorial

Sensors for Structural Health Monitoring in Civil Infrastructure

Yinan Zhang,[1] **Lei Yuan**,[2] **Zhi Zhou**,[3] **and Amardeep Kaur**[1]

[1]*Department of Electrical and Computer Engineering, Missouri University of Science and Technology, Rolla, MO 65409, USA*
[2]*Department of Electrical and Computer Engineering, Clemson University, Clemson, SC 29634, USA*
[3]*Department of Civil Engineering, Dalian University of Technology, Dalian, China*

Correspondence should be addressed to Yinan Zhang; yzfyc@mst.edu

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Our lives rely heavily on the civil infrastructure such as bridges, buildings, tunnels, power plants, and dams. Maintenance and monitoring of civil infrastructure for an accurate estimation of infrastructure age, usability, and also the probable causes of concern are of great importance. Malfunctioning and reckless, negligence, and unconscious human actions over civil infrastructure have caused tremendous economic loss and claimed numerous human lives. The development of effective structural health monitoring (SHM) methods has gained traction amongst the research community in recent years. A typical health monitoring system is composed of a network of sensors that measure the parameters relevant to the state of the structure and its environment, such as temperature, stress, delamination, strain, vibration, and humidity. Accurate, robust, fast response, and long-term reliable sensors are necessary for in situ structural health monitoring. Although many types of sensors have been developed and demonstrated, the potential for innovative high-performance in situ sensors is increasingly evident.

This special issue seeks to attract researchers to contribute their original articles and review articles on sensor development and application for structural health monitoring. The special issue consists of 9 papers whose brief summaries are listed below.

"Dielectric Characteristics of Unsaturated Loess and the Safety Detection of the Road Subgrade Based on GPR" by G. Lv et al. presents a moisture content and permittivity model to simultaneously detect and estimate defects in loess subgrade. The model can be applied in the engineering practices to provide guidance for determining the qualitative research of defects in the roadbed.

"Performance Deterioration of Heavy-Haul Railway Bridges under Fatigue Loading Monitored by a Multisensor System" by Z. Yu et al. studied the performance deterioration of the scale models of a typical heavy-haul railway bridge under fatigue loading based on a multisensor system including the fiber-reinforced polymer optical fiber Bragg grating and electrical resistance strain gauges, linear variable displacement transducer, and accelerometer.

"Water Level Sensing in a Steel Vessel Using A_0 and Quasi-Scholte Waves" by P. Guo et al. presents a water level sensing method using guided waves of A_0 and quasi-Scholte modes. A laboratory experiment using a pitch-catch configuration with two piezoelectric transducers is designed for sensing the water level in a steel vessel. The experimental results show that the travelling time between the two transducers linearly increases with the increase of the water level and agree well with the theoretical predictions.

"Mechanism of Subordinate Peak Skewing of FBG Sensor during Cracks Propagation Monitoring on Aluminum Alloy Structure" by B. Jin et al. investigates the variety of the spectrum features of fiber Bragg grating (FBG) around the crack tip during fatigue crack propagation.

"Decision Matrix Analysis of Impact Sounding Test Method to Determine Interlayer Condition of Concrete Bridge Deck" by C. A. Rosales et al. focused on analysis of the frequency spectra of the impact sounding test performed on composite slabs with different interlayer conditions.

The proposed analysis was capable of detecting intermediate condition interlayer, which emphasized the transition of damage in the interlayer section.

"A Highly Sensitive Intensity-Modulated Optical Fiber Magnetic Field Sensor Based on the Magnetic Fluid and Multimode Interference" by Y. Huang et al. demonstrated an optical fiber magnetic field sensor based on a single-mode-multimode-single-mode (SMS) structure immersed into the magnetic fluid (MF). This optical fiber sensor possesses advantages of low cost, ease of fabrication, high sensitivity, simple structure, and compact size, with great potential applications in measuring the magnetic field.

"Experimental Verification for Cable Force Estimation Using Handheld Shooting of Smartphones" by X. Zhao et al. proposed a vision-based approach for cable force estimation using handheld shooting of a smartphone camera. This study demonstrates the feasibility of cable force measurement using handheld shooting of a smartphone camera.

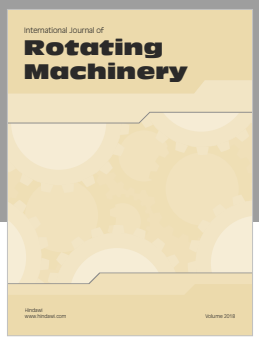
"A Study for Optimum Survey Method of Underwater Structure Using the Dual Sonar Sensor" by Y. Kim et al. developed the equipment to investigate damage of underwater structures effectively using the dual sonar and studied the operation method to improve the resolution of sonar data.

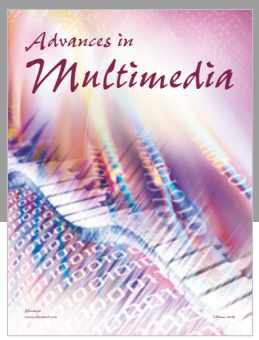
"Feasibility Study of Interlayer Slide Monitoring Using Postembedded Piezoceramic Smart Aggregates" by J. Wu et al. demonstrated that the postembedded smart aggregate-based technique for interlayer slide monitoring was feasible and effective in detecting a slide damage. Experimental results demonstrated that SAs installed through a postembedding process are an innovative yet effective approach to monitor the interlayer slide.

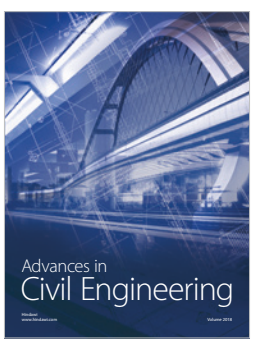
Acknowledgments

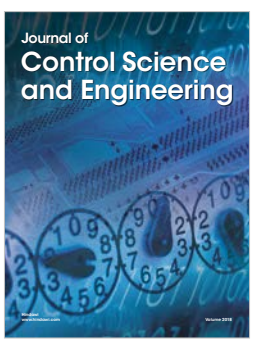
Introducing this special issue to this journal, we would like to thank all the researchers for their contributions and reviewers for their help in achieving a high technical quality of papers in this special issue. The Lead Guest Editor Yinan Zhang would like to thank all the Guest Editors for their valuable contribution to this special issue. We hope all the readers can enjoy the papers in the special issue as we do.

Yinan Zhang
Lei Yuan
Zhi Zhou
Amardeep Kaur









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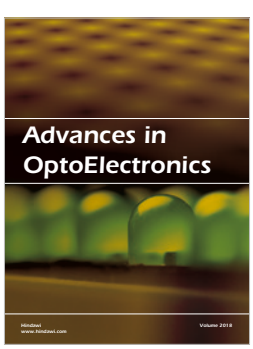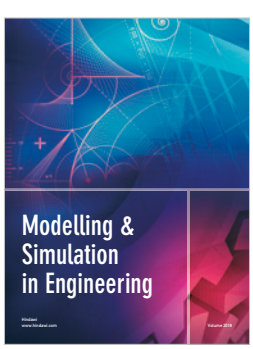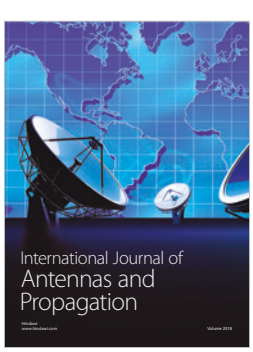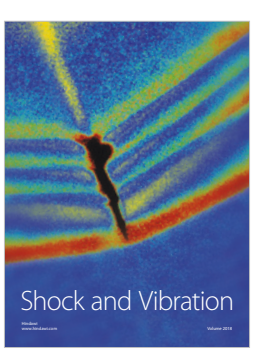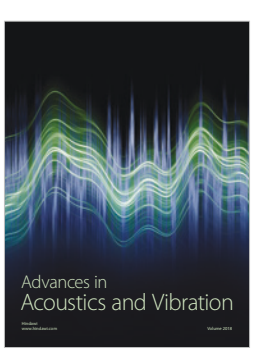
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