Structural Health Monitoring 2019:

Enabling Intelligent Life-cycle Health Management for Industry Internet of Things (IIOT)

Fu-Kuo Chang (Editor)
Organizing Chairman
Department of Aeronautics and Astronautics
Stanford University
Stanford, CA 94305, USA

Fotis Kopsaftopoulos (co-Editor)
Department of Mechanical,
Aerospace and Nuclear Engineering
Rensselaer Polytechnic Institute
Troy, NY, USA

Preface

These proceedings is a collection of papers presented at the 12th International Workshop on Structural Health Monitoring (IWSHM) on September 10–12, 2019, detailing the most recent technology developments in the field of Structural Health Monitoring (SHM) from around the world since 2017. We have seen considerable growth in the number of abstracts received compared to 2017, particularly in the areas of quantification in reliability toward SHM implementation, novel sensing techniques, multifunctional materials in fabrication and design, digital twins with sensor data, and machine learning for SHM diagnostics. Due to space limitation, 421 papers were selected and included in the Workshop proceedings with applications expanding from traditional aerospace, civil and marine/wind power infrastructure to oil/gas infrastructure, high-speed railway transportation, and autonomous vehicles. Recent advances in networked sensor technology and "big data" science provides significant opportunities to further advance the science and technology in diagnostics and prognostics for detection and monitoring of the health of structures. The 2019 International Workshop on Structural Health Monitoring will emphasize new technology gaps in research/development areas and seek a consensus among experts from industry, government, and academia to further develop the roadmap for SHM technology implementation across various industry platforms.

The main theme of IWSHM 2019 is "**Enabling Intelligent Life-cycle Health Management for Industry Internet of Things (IIOT)**". The technology could fundamentally change the paradigm of conventional philosophy of separating maintenance from design/analysis consideration. Traditional structural maintenance procedures are typically derived from maintenance manuals, which are produced mostly by manufacturers based primarily on laboratory coupon data and analytical predictions in the design and manufacturing stages. Limited or no in-service data is used in developing the manuals.

Special topics were also organized to address novel concepts and emerging technologies in SHM. The committee would like to extend its appreciation to the Special Sessions organizers whose contributions are listed below:

Guided Waves in Structures for SHM	Prof. Wieslaw Ostachowicz
SHM Technology in Wind Turbines	Prof. Wieslaw Ostachowicz
Probabilistic SHM	Prof. Daniele Zonta
Human Performance Monitoring	Prof. Ken Loh
Multifunctional Materials and Structures	Prof. Ken Loh, Prof. Donghyeon Ryu and Prof. Nathan Salowitz
Dynamic Data Driven Applications Systems	Dr. Erik Blasch and Prof. Fotis Kopsaftopoulos
Recent Advances on Data Processing Techniques for Ultrasonics-based SHM	Prof. Salvatore Salamone
Diagnostics and Prognostics of Composite Structures towards a Condition-based Maintenance Framework	Prof. Dimitrios Zarouchas and Prof. Theodoros Loutas
Assessment of the Value of SHM Information	Prof. Sebastian Thöns, Prof. Michael Todd and Prof. Maria Pina Limongelli
Seismic Structural Health Monitoring for Civil Structures	Prof. Maria Pina Limongelli and Dr. Mehmet Celebi
Vision-based Studies for SHM	Prof. Mohammad Jahanshahi
Sensing Technologies for Evaluation and Characterization of Concrete Materials	Prof. Jinying Zhu and Prof. Ying Zhang
Acoustic Emission and Hybrid SHM	Prof. Victor Giurgiutiu
Structural Health Monitoring and Condition-based Maintenance of High-speed and Intercity Railways	Prof. Yi-Qing Ni, Prof. Hua-Peng Chen and Prof. Qingsong Feng
Integration of physical modeling, monitoring and machine learning for SHM	Prof. Elói J. F. Figueiredo and Prof. Ionut Moldovan
Nonlinear Acoustic and Ultrasonic Techniques for Structural Health Monitoring	Prof. Tribikram Kundu
Use of Optical, MEMS/NEMS and CNT sensors for structural health monitoring systems	Prof. Jayantha Epaarachchi
Distributed and Quasi-distributed Fiber-optic and Electrical Sensors, and Associated Data Analysis and Management	Prof. Branko Glisic and Prof. Daniele Zonta
SHM for Heavy and Critical Equipment	Dr. Keqin Ding
Digital Twin of Civil Infrastructure	Prof. Kamyab Zandi and Prof. Vahid Nik
Human-Machine Interfaces for Structural Inspection	Prof. Fernando Moreu
Higher Level Inspection by Instrumenting Bridges - Implementing SHM into the Codes	Dr. Douglas Thomson
The Impact of Engineering Informatics: The Law Legacy in the Field of Structural Health Monitoring	Prof. Jerome Lynch
A state-wide focus on SHM	Mr. Tal Yehoshua

This workshop is co-sponsored by the Air Force Office of Scientific Research (Les Lee and Eric Blasch) and Office of Naval Research (Ignacio Perez). The Workshop could not have been successfully organized without the support of the International Organizing Committee, which includes the following members:

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Fu-Kuo Chang
Organizing Chairman
Department of Aeronautics and Astronautics
Stanford University
Stanford, CA 94305, USA

Alfredo Güemes
Organizing Co-Chairman
E.T.S.I. Aeronauticos
Universidad Politecnica de Madrid
Madrid, Spain

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