



City Research Online

City, University of London Institutional Repository

Citation: Chatzi, E. N., Giaralis, A. ORCID: 0000-0002-2952-1171 and Kougioumtzoglou, I. A. (2015). Foreword - Special Issue on Data Acquisition and Processing, Uncertainty Management and Inverse Problem Techniques for Structural Health Monitoring Applications. *International Journal of Sustainable Materials and Structural Systems*, 2(1/2), pp. 1-2.

This is the published version of the paper.

This version of the publication may differ from the final published version.

Permanent repository link: <https://openaccess.city.ac.uk/id/eprint/25349/>

Link to published version:

Copyright and reuse: City Research Online aims to make research outputs of City, University of London available to a wider audience. Copyright and Moral Rights remain with the author(s) and/or copyright holders. URLs from City Research Online may be freely distributed and linked to.

City Research Online:

<http://openaccess.city.ac.uk/>

publications@city.ac.uk

Foreword

Eleni N. Chatzi*

Department of Civil, Environmental and Geomatic Engineering,
ETH Zürich, Stefano-Franscini-Platz 5,
CH-8093 Zürich, Switzerland
Email: chatzi@ibk.baug.ethz.ch
*Corresponding author

Agathoklis Giaralis

Department of Civil Engineering,
City University London,
Northampton Square,
EC1V 0HB, London, UK
Email: agathoklis.giaralis.1@city.ac.uk

Ioannis A. Kougioumtzoglou

Department of Civil Engineering and Engineering Mechanics,
Columbia University,
New York, NY 10027, USA
Email: ikougioum@columbia.edu

This special issue of the *International Journal of Sustainable Materials and Structural Systems (IJSMS)* aims to present recent advances and emerging cross-disciplinary approaches in the broad field of structural health monitoring (SHM) with a focus on novel techniques and applications for data acquisition and processing, uncertainty modelling and quantification, and inverse problems.

The issue is comprised of nine papers arranged according to their objectives and adopted methods and tools. Specifically, the first paper by Dervilis et al. overviews a data-driven approach to SHM, relying on robust statistical methods for removal of inclusive outliers. Next, the paper by Capellari et al. combines recursive Bayesian filtering with reduced order modelling for real-time damage detection of lightweight composite structures. Further, the paper by Al-Hussein and Haldar introduces an enhanced unscented Kalman filter for condition assessment in absence of input (loading) information, relying on a weighted global iteration technique.

Building on methodological developments, the next three papers focus on practical applications of SHM, via fusion of diverse technologies. Bao and Mahadevan propose an automated method for crack detection and damage severity characterisation in concrete structural members, based on statistical analysis of thermal images. Scott et al. report the outcomes of a field application of fibre optics sensors for SHM of a railway bridge in India, offering a comparison of performance to electrical resistance strain gauges, and accounting for a range of acting environmental conditions. Kampas and Makris develop

and compare different signal processing tools, including the prediction error method and a time-frequency wavelet analysis, for system identification based on structural response acceleration signals to detect yielding of bearings in seismic isolated bridges with uneven piers height.

Exploiting the concept of the wavelet transform, the work of Gkoktsi and Giaralis performs vibration-based damage detection and localisation. A relative wavelet entropy index is employed to assess the efficiency of different wavelet bases depending on the achieved level of sparsity in transforming linear response acceleration signals. In related work for reducing the cost of transmission of wireless sensors, Klis and Chatzi adopt a spatio-temporal compressive sensing approach, which relies on the signal's sparsity in the frequency domain. Robust data transmission for vibration-based monitoring applications is ensured via fusion of a minimal number of tethered sensors in the hybrid network. This special issue closes with the paper by Comerford et al., where an analytical approach is developed to quantify the uncertainty and determine the statistics of spectral estimates based on realisations featuring incomplete/missing data, for both stationary and non-stationary time-histories.

Overall, these nine papers cover a wide variety of SHM applications, algorithms, and technologies lying at the forefront of the current state-of-art.

The guest editors gratefully acknowledge the invitation by Prof. Mohammad Noori, Executive Editor of the *IJMSS*, to organise this special issue as well as his help and support during the reviewing process of the submitted papers. Further, the guest editors appreciate the effort made by the authors to contribute research work of high academic merit, as well as the reviewers who significantly enhanced the quality of the final manuscripts with their constructive comments.