Special Issue: Real World Application of SHM in Australia

Andy Nguyen[1], Tommy H.T. Chan[2], Xinqun Zhu[3]

[1] University of Southern Queensland, Springfield Central, Queensland 4300

[2] Queensland University of Technology, Brisbane, Queensland 4000

[3] University of Technology Sydney, Ultimo, New South Wales 2007

Australian Network of Structural Health Monitoring (ANSHM) was established in 2009 to promote and advance the field of SHM in Australia and the association has grown considerably since then. By November of 2018, ANSHM has the membership made of 45 organisations including 20 universities, 16 private companies, 6 road authorities and 3 research institutions. Every year ANSHM organises an annual workshop and/or conference sessions for members to exchange their research and practical developments in SHM. One edited book[1] and nine journal special issues have been produced since the establishment of ANSHM. One of these special issues was organised in Structural Health Monitoring - an International Journal (SHMIJ) in 2014[2].

On 6–7 December 2017, ANSHM held its 9th annual workshop as part of the prestigious 8th International Conference on Structural Health Monitoring of Intelligent Infrastructures (SHMII-8) in Brisbane, Queensland, Australia. The main focus of both SHMII-8 and the 9th ANSHM workshop was SHM in real-world application. Interestingly, all sessions of SHMII-8 and ANSHM workshop were held within the P block building at Gardens Point Campus of Queensland University of Technology (QUT) that was instrumented with Australia's first ever long-term full-scale SHM system[3]. Inspired by this theme and high-quality presentations at the workshop, a special issue named "Real World Application of SHM in Australia" was established in SHMIJ and the 9th ANSHM workshop speakers were invited to submit enhanced and extended versions of their papers to this Special Issue. After rigorous pre-screening, peer review and revision processes, fourteen papers were accepted for inclusion in the Special Issue. The contributions include deterioration assessment of the instrumented P block building at QUT using hybrid model updating and long-term vibration monitoring data[4], reliability-based load-carrying capacity assessment of bridges using SHM and non-linear analysis[5], and innovative vibration based damage identification methods with applications to cable-stayed, steel-truss or timber bridges[6-9] as well as to frame, utility-pole or building structures[10-12]. The Special

Issue also includes new research on non-destructive evaluation of (i) incipient pitting corrosion in reinforced concrete structures[13], (ii) gaps between carbon fibre reinforced polymer composite and concrete surfaces[14], (iii) fatigue cracks in pipes[15], (iv) bolted joints[16], and (v) in-situ stress[17]. Most studies were verified on real civil structures or large-scale laboratory models well reflecting the high applicability of the developed methods to solve real-world problems.

As the guest editors of this Special Issue, we thank the authors for their contribution and all the anonymous reviewers who provided constructive review comments to the manuscripts submitted to this Special Issue. We would also like to express our sincere gratitude to the Managing Editor Professor Michael Todd and the journal executive committee for their support and assistance during the submission and review process. Finally, we would like to thank the SAGE Publications team for their diligence in assuring the efficient and timely production of the papers toward the publication of this Special Issue.

1. Chan T and Thambiratnam DP. *Structural health monitoring in Australia*. Nova Science Publishers, Inc., 2011, p.1-229.
2. Ng C-T and Chan THT. Special Issue on Structural Health Monitoring of Civil Structures. *Structural Health Monitoring* 2014; 13: 345-346. DOI: 10.1177/1475921714542895.
3. Nguyen T, Chan THT, Thambiratnam DP, et al. Development of a cost-effective and flexible vibration DAQ system for long-term continuous structural health monitoring. *Mechanical Systems and Signal Processing* 2015; 64-65: 313-324.
4. Nguyen A, Kodikara KATL, Chan THT, et al. Deterioration assessment of buildings using an improved hybrid model updating approach and long-term health monitoring data. *Structural Health Monitoring* 2018: 1475921718799984. DOI: 10.1177/1475921718799984.
5. Jamali S, Chan THT, Nguyen A, et al. Reliability-based load-carrying capacity assessment of bridges using structural health monitoring and nonlinear analysis. *Structural Health Monitoring* 2018: 1475921718808462. DOI: 10.1177/1475921718808462.
6. Alamdari MM, Dang Khoa NL, Wang Y, et al. A multi-way data analysis approachfor structural health monitoring of a cable-stayed bridge. *Structural Health Monitoring* 2018: 1475921718790727. DOI: 10.1177/1475921718790727.
7. Nguyen K-D, Chan THT, Thambiratnam DP, et al. Damage identification in a complex truss structure using modal characteristics correlation method and sensitivity-weighted search space. *Structural Health Monitoring* 2018: 1475921718809471. DOI: 10.1177/1475921718809471.
8. Ay A, Khoo S and Wang Y. Probability Distribution of Decay Rate: a statistical time-domain damping parameter for structural damage identification. *Structural Health Monitoring* 2018: 1475921718817336. DOI: 10.1177/1475921718817336.
9. Dackermann U, Smith WA, Alamdari MM, et al. Cepstrum-based damage identification in structures with progressive damage. *Structural Health Monitoring* 2018: 1475921718804730. DOI: 10.1177/1475921718804730.

10. Pathirage CSN, Li J, Li L, et al. Development and application of a deep learning–based sparse autoencoder framework for structural damage identification. *Structural Health Monitoring* 2018: 1475921718800363. DOI: 10.1177/1475921718800363.
11. Yu Y, Dackermann U, Li J, et al. Wavelet packet energy–based damage identification of wood utility poles using support vector machine multi-classifier and evidence theory. *Structural Health Monitoring* 2018: 1475921718798622. DOI: 10.1177/1475921718798622.
12. Yu Y, Wang C, Gu X, et al. A novel deep learning-based method for damage identification of smart building structures. *Structural Health Monitoring* 2018: 1475921718804132. DOI: 10.1177/1475921718804132.
13. Sriramadasu RC, Lu Y and Banerjee S. Identification of incipient pitting corrosion in reinforced concrete structures using guided waves and piezoelectric wafer transducers. *Structural Health Monitoring* 2018: 1475921718809151. DOI: 10.1177/1475921718809151.
14. Giri P, Kharkovsky S, Zhu X, et al. Characterization of carbon fiber reinforced polymer strengthened concrete and gap detection with a piezoelectric-based sensory technique. *Structural Health Monitoring* 2018: 1475921718803790. DOI: 10.1177/1475921718803790.
15. Guan R, Lu Y, Wang K, et al. Fatigue crack detection in pipes with multiple mode nonlinear guided waves. *Structural Health Monitoring* 2018: 1475921718791134. DOI: 10.1177/1475921718791134.
16. Yang Y, Ng C-T and Kotousov A. Bolted joint integrity monitoring with second harmonic generated by guided waves. *Structural Health Monitoring* 2018: 1475921718814399. DOI: 10.1177/1475921718814399.
17. Hughes JM, Vidler J, Ng C-T, et al. Comparative evaluation of in situ stress monitoring with Rayleigh waves. *Structural Health Monitoring* 2018: 1475921718798146. DOI: 10.1177/1475921718798146.