Structural Monitoring and Maintenance, *Vol. 3, No. 1 (2016) 33-49*
DOI: http://dx.doi.org/10.12989/smm.2016.3.1.033

A review of recent research advances on structural health monitoring in Western Australia

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(Received December 31, 2015, Revised February 28, 2016, Accepted March 3, 2016)

Abstract. Structural Health Monitoring (SHM) has been attracting numerous research efforts around the world because it targets at monitoring structural conditions and performance to prevent catastrophic failure, and to provide quantitative data for engineers and infrastructure owners to design a reliable and economical asset management strategy. In the past decade, with supports from Australian Research Council (ARC), Cooperative Research Center for Infrastructure and Engineering Asset Management (CIEAM), CSIRO and industry partners, intensive research works have been conducted in the School of Civil, Environmental and Mining Engineering, University of Western Australia and Centre for Infrastructural Monitoring and Protection, Curtin University on various techniques of SHM. The researches include the development of hardware, software and various algorithms, such as various signal processing techniques for operational modal analysis, modal analysis toolbox, non-model based methods for assessing the shear connection in composite bridges and identifying the free spanning and supports conditions of pipelines, vibration based structural damage identification and model updating approaches considering uncertainty and noise effects, structural identification under moving loads, guided wave propagation technique for detecting debonding damage, and relative displacement sensors for SHM in composite and steel truss bridges. This paper aims at summarizing and reviewing the recent research advances on SHM of civil infrastructure in Western Australia.

Keywords: research advances; structural health monitoring; review; Western Australia

1. Introduction

Structural Health Monitoring (SHM) provides practical means to assess and predict the structural performance under operational conditions. SHM is usually referred as the measurement of the operating and loading environment and the critical responses of a structure to track and evaluate the symptoms of operational incidents, anomalies, and deterioration or damage indicators that may affect operation, serviceability, or safety (Aktan *et al.* 2000). The main objectives of SHM are to: (1) validate design assumptions and assess structural performance; (2) identify the possible damages at an early stage to ensure structural and operational safety; (3) provide real-time information for safety assessment immediately after disasters and extreme events; (4) assess the

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http://www.techno-press.org/?journal=smm&subpage=7 ISSN: 2288-6605 (Print), 2288-6613 (Online)

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