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Structural damage localization and quantification using electromechanical impedance and sparse regularization

Electromechanical impedance (EMI)-based Structural Health Monitoring (SHM) methods have been rapidly developed in recent years for condition monitoring of civil structures. However, most of those methods are based on using various damage indices to monitor structural condition changes and locate structural damage. Using EMI based SHM techniques to quantify structural damage is still a challenging task, since a very fine finite element model is required and a large number of parameters are required to be identified. This will make the damage identification as a significantly under determined inverse problem. This talk will present a new damage index based on time frequency analysis of impedance responses to increase the sensitivity to detect minor damage, and will propose a novel approach based on model updating with impedance resonance frequency shifts and sparse regularization technique to provide damage quantification results for structural condition monitoring. The coupled finite element model of piezoelectric transducer and host structure is developed and calibrated for damage identification. Numerical and experimental investigations are conducted on beam and plate-like structures to demonstrate the accuracy and performance of the proposed approach for structural damage localization and quantification.

Biography

Jun Li received his PhD degree from Hong Kong Polytechnic University, China, in 2012. He is currently a senior lecturer in School of Civil and Mechanical Engineering at Curtin University, Australia. He has published over 115 technical papers including more than 65 journal papers, with a H-index of 16. He is currently an Associate Editor of International Journal of Lifecycle Performance Engineering, and has been serving as an editorial board member of several reputed international journals. He was a recipient of Australian Research Council Discovery, Early Career Researcher Award in 2014, and was one of the finalists of the prestigious Western Australia Premier's Science Awards, Early Career Scientist of the Year for 2016 and 2017.

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