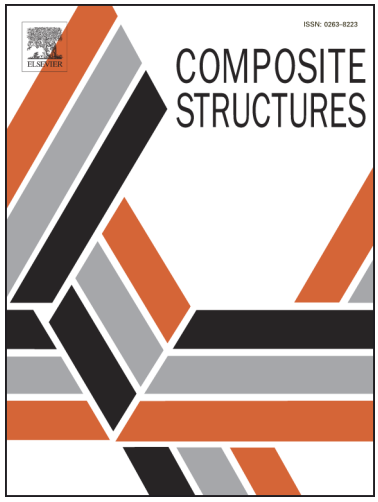

Assessment of Delaminated Smart Composite Laminates via System Identification and Supervised Learning

Asif Khan, Heung Soo Kim

PII: S0263-8223(18)31493-4
DOI: https://doi.org/10.1016/j.compstruct.2018.08.014
Reference: COST 10064

To appear in: *Composite Structures*

Received Date: 23 April 2018
Revised Date: 10 July 2018
Accepted Date: 7 August 2018

Please cite this article as: Khan, A., Kim, H.S., Assessment of Delaminated Smart Composite Laminates via System Identification and Supervised Learning, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.08.014

Assessment of Delaminated Smart Composite Laminates via System Identification and Supervised Learning

Asif Khan[1], Heung Soo Kim[1,*]

[1]Department of Mechanical, Robotics and Energy Engineering, Dongguk University-Seoul, 30 Pil-dong 1 Gil, Jung-gu, Seoul, 04620, Republic of Korea

Abstract

This paper proposes the synergetic integration of system identification and artificial intelligence for the detection and assessment of delamination damages in smart composite laminates. An electromechanically coupled mathematical model is developed for the healthy and delaminated smart composite laminates on the basis of improved layerwise theory, higher order electric potential field and finite element method. A discriminative feature space is constructed for the healthy and delaminated structures via system identification from their structural vibration responses. The discriminative features are used for the training and cross-validation of various supervised machine learning classifiers and an optimal classifier is identified. The optimal classifier is employed to make predictions on unseen test delamination cases, and its predictions are validated via a dimensionality reduction tool. The obtained results show that the proposed technique could be employed as a reliable tool for nondestructive evaluation of smart composite laminates.

Keywords: system identification; artificial intelligence; smart composite laminates; delamination damage; optimal classifier

* Corresponding author: heungsoo@dgu.edu; Tel: +82-2-2260-8577, Fax: +82-2-2263-9379