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Vibration-based spatial damage identification in honeycomb-core sandwich composite structures using wavelet analysis

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Abstract

Due to the growing interest to apply sandwich composites in various industrial fields, more and more attention is paid to the development novel non-destructive testing (NDT) techniques, which will be suitable for detection, precise localization and identification of damages characteristic for these materials. In this study the author proposed novel approach of two-step damage detection and evaluation, which consisted of the non-contact vibration analysis and extraction of modal shapes of vibration and then an advanced signal processing algorithm, which is based on 2D signal decomposition using 2D wavelet transform (WT) with B-spline wavelets of fractional order. The damage identification procedure was performed on the honeycomb-core sandwich composite plates, which consisted of all types of damages typical for such structures during their operation (delaminations, cracks of a core and face sheets, impact damages, etc.). Results show that the proposed method can successfully detect, localize and identify the different types of damages.

Keywords: Non-destructive testing, sandwich composites, modal analysis, wavelet analysis, damage identification

1. Introduction

The novel trends in more and more wider application of composites in various industries cause the increased interest to developing the novel NDT

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