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Experimental Characterization of a Damage Detection and Localization System for Composite Structures

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Abstract

Structural health monitoring aims to reduce life-cycle costs as well as design constraints of composites due to unforeseen events like impacts with objects. Guided waves are effectively employed in this process because they show a great sensitivity to flaws in the structure and are able to provide a continuous monitoring. However, the complexity of wave propagation in composites suggests a detailed analysis of the diagnostic methodology in every critical aspect to achieve an effective and reliable implementation of the monitoring system.

This paper presents the results of the experimental characterization of a methodology for damage identification and localization where permanently-installed sensors are employed to create a network for structural health monitoring. A statistical approach is adopted to select the nodes in the network that are affected by the emerging flaw. Different techniques have then been compared to locate the damage. Results are generally in good agreement with the actual location of the damage, although the best performance is obtained with a density-based algorithm applied to the nodes affected by the damage. Furthermore, measurement uncertainty strongly affects measurement of the damage position, and it is shown that its value depends on the specific detection and lo-

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