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Combined and I Indices Based on Principal Component Analysis for Damage Detection and Localization

In this paper, two indices (combined or phi index and / index), different to the presented in [1][2][3] are used to detect damages; these indices are calculated from the information obtained from the projection of the experiments into the PCA models (baseline). They give us a measurement about the difference between the tested and the healthy structure. The experiments are taken from an active piezoelectric system which is excited with lamb waves in different phases and the fact that any defect in the structure changes its vibrational response is exploited.

For localization, five different methods of contribution analysis are used (complete decomposition contribution, partial decomposition contribution, angle based contribution, reconstruction based contribution and diagonal contribution). With these methods, the contribution of each sensor to each index is analyzed, in this way, sensor with largest contribution suggests the path where the damage could be located (from the actuator to this sensor). The combination of all indices and all contributions (a total of 2 x 5) are analyzed and compared. To validate the approaches, they are applied to an aircraft turbine blade instrumented with seven PZT's. Different damages are simulated.

Ключевые слова:

Содержание.
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