Identification of Damage in Plate-Link Structures Using Two Stage Algorithm Combines Non-Model Based and Model Based Techniques

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Abstract

The regular structural integrity monitoring of major engineering structures such as space structures, orbiting spacecrafts, and civil infrastructures have become an urgent necessity to prevent potential catastrophic failures. The evolution of Vibration
Based Damage Identification methods (VBDI) introduced an alternative techniques to
the conventional methods. These methods relate changes in the vibration signature (natural frequencies and mode shapes) to changes in structural physical parameters (mass and stiffness) and thus is used to identify damage. The present research focus on developing a combined algorithm includes a model-based method (optimal matrix
update) and a Non model-based method (frequency response functions difference), to enhance the reliability of the VBDI techniques. The algorithm presented robust sequential scheme of VBDI techniques and has proven a reasonable success when tested through numerical simulation on a large complex space frame. Since, the FEM
of the monitored structure considered as a major constitute of the identification procedure, in the present paper, the ability of the proposed combined algorithm to identify damage in plate-like structure is investigated. A numerical simulation is carried out by introducing several damage scenarios to steel plate and predictions were compared to the known damage. Regardless the assumptions made in the FEM and the introduced simulated random errors introduced at different steps in the algorithm procedures, the algorithm is found to be reliable in identifying damage in plate-like structures.

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