Model Updating Based on Modal Parameters Using Hybrid Pattern Search Technique

Authors : N. Guo, C. Xu, Z. C. Yang

Abstract : In order to ensure the high reliability of an aircraft, the accurate structural dynamics analysis has become an indispensable part in the design of an aircraft structure. Therefore, the structural finite element model which can be used to accurately calculate the structural dynamics and their transfer relations is the prerequisite in structural dynamic design. A dynamic finite element model updating method is presented to correct the uncertain parameters of the finite element model of a structure using measured modal parameters. The coordinate modal assurance criterion is used to evaluate the correlation level at each coordinate over the experimental and the analytical mode shapes. Then, the weighted summation of the natural frequency residual and the coordinate modal assurance criterion residual is used as the objective function. Moreover, the hybrid pattern search (HPS) optimization technique, which synthesizes the advantages of pattern search (PS) optimization technique and genetic algorithm (GA), is introduced to solve the dynamic FE model updating problem. A numerical simulation and a model updating experiment for GARTEUR aircraft model are performed to validate the feasibility and effectiveness of the present dynamic model updating method, respectively. The updated results show that the proposed method can be successfully used to modify the incorrect parameters with good robustness.

Keywords : model updating, modal parameter, coordinate modal assurance criterion, hybrid genetic/pattern search

Conference Title : ICSDV 2019 : International Conference on Structural Dynamics and Vibration

Conference Location : Sydney, Australia

Conference Dates : March 28-29, 2019