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Application of Optimization Based Finite Element Model Updating Method On 3d Printed Model Structures

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Abstract

Nowadays it becomes trend in studying of dynamic behavior on complex structure. Model updating is one of the tools developed for verifying accuracy of finite element models. In this paper, method for computing model updating on finite element model and effective the experimental modal analysis of structural systems is developed. The identification method developed in this study is based on time-domain system identification numerical techniques. The case study considered in this work is a 3D printed structure that be modeled as a two-story shear building system with irregular torsion. A preliminary numerical model of the two-story shear building system is developed by using SAP2000 and the experimental modal parameters data are collected in the laboratory buy some test then are modeled by Artemis modal pro. After obtaining the results from numerical modal and experimental modal, it was brought to FEMtools software to improve the match between the dynamic properties of an initial structure and the experimentally estimated modal data for updating. After updating, it's shown that optimization was done, that some unknown material parameters (such as mass density and young modulus) of materials and/or boundary conditions were optimized by FEMtools Optimization that provides the possibility to perform design optimization on updated finite element models.

Keywords: Frame; Model calibration; Sensitivity analysis; System Identification; Irregular torsion