World Academy of Science, Engineering and Technology
International Journal of Computer and Systems Engineering
Vol:14, No:12, 2020

Using Analytical Hierarchy Process and TOPSIS Approaches in Designing a Finite Element Analysis Automation Program

Authors : Ming Wen, Nasim Nezamoddini

Abstract : Sophisticated numerical simulations like finite element analysis (FEA) involve a complicated process from model setup to post-processing tasks that require replication of time-consuming steps. Utilizing FEA automation program simplifies the complexity of the involved steps while minimizing human errors in analysis set up, calculations, and results processing. One of the main challenges in designing FEA automation programs is to identify user requirements and link them to possible design alternatives. This paper presents a decision-making framework to design a Python based FEA automation program for modal analysis, frequency response analysis, and random vibration fatigue (RVF) analysis procedures. Analytical hierarchy process (AHP) and technique for order preference by similarity to ideal solution (TOPSIS) are applied to evaluate design alternatives considering the feedback received from experts and program users.

Keywords : finite element analysis, FEA, random vibration fatigue, process automation, analytical hierarchy process, AHP, TOPSIS, multiple-criteria decision-making, MCDM
Conference Title : ICCAET 2020 : International Conference on Computer Aided Engineering and Technology
Conference Location : Tokyo, Japan
Conference Dates : December 03-04, 2020