Parametric Analysis and Optimal Design of Functionally Graded Plates Using Particle Swarm Optimization Algorithm and a Hybrid Meshless Method

Authors : Foad Nazari, Seyed Mahmood Hosseini, Mohammad Hossein Abolbashari, Mohammad Hassan Abolbashari Abstract : The present study is concerned with the optimal design of functionally graded plates using particle swarm

Abstract : The present study is concerned with the optimial design of functionally graded plates using particle swarm optimization (PSO) algorithm. In this study, meshless local Petrov-Galerkin (MLPG) method is employed to obtain the functionally graded (FG) plate's natural frequencies. Effects of two parameters including thickness to height ratio and volume fraction index on the natural frequencies and total mass of plate are studied by using the MLPG results. Then the first natural frequency of the plate, for different conditions where MLPG data are not available, is predicted by an artificial neural network (ANN) approach which is trained by back-error propagation (BEP) technique. The ANN results show that the predicted data are in good agreement with the actual one. To maximize the first natural frequency and minimize the mass of FG plate simultaneously, the weighted sum optimization approach and PSO algorithm are used. However, the proposed optimization process of this study can provide the designers of FG plates with useful data.

Keywords : optimal design, natural frequency, FG plate, hybrid meshless method, MLPG method, ANN approach, particle swarm optimization

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