

Abstract

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Y Stiffened Panel Multi-objective Optimazation Using Genetic Algorithm

Abstract The aim of this paper is to design an optimum Y-stiffener plate combination using multi-objective optimization with real-coded genetic algorithms under the action of uniaxial compressive loads, because the most important loads applied on stiffened plates in ship hull is longitudinal in-plane axial compression arising for instance due to longitudinal bending because the cargo is not distributed equally in holds due to grounding, stranding collision. Five of the Y-stiffened panel dimensions were ed to be the independent design variables of the optimization problem. The objective functions are the ultimate buckling load and the volume per unit area of the Y-stiffener plate combination. Nonlinear finite element analysis was used to calculate the ultimate buckling load of 35 different sets of the design variables, with certain range for each of the design variables. The effects of independent design variables on the ultimate buckling load and the volume per unit area for Y-stiffener plate combination were studied and discussed. A new surrogate function to predict the ultimate buckling load of Y-stiffener plate combination is created and validated using the values of the ultimate buckling loads calculated using nonlinear finite element analysis. The proposed surrogate function is valid only in the specific ranges of the design variables. The Pareto optimal sets were calculated using multi-objective optimization with real-coded genetic algorithms and the optimum set of the independent design variables which is associated with the optimal geometric dimensions of the Y-stiffened panel was ed as the set which has the maximum ultimate buckling load to volume per unit area ratio. The optimum set was tested and validated using sensitivity analysis technique.