The Optimization of Stacking Sequence for Laminated Composite Plates with Heuristic Algorithms

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ABSTRACT

When we confront the modern development of industry and aviation, the rate between Composite Material and parts has heightened tremendously. There for replacing metal material with Composite Material is the tendency of industry nowadays. As for the present Composite Material production procedure, it is divided into 2 parts --- structural analysis and structural design. In the overall design and production process of Composition Material, the process of stacking sequence has quite important proportion. The occurrence of Delamination destruction is due to the problems such as Poisson''s ratio difference and shear stress coupling. Because the material quality of each level is not correspondent, it caused gradient method variation of free stress. If we can find out the relation between the sequence of stacking angle and Delamination or the factors that could intensify the power against exfoliation, then we can make it as the best basis of stacking angle. In our research, the Heuristic Algorithms which include Genetic Algorithm、Double Genetic Algorithm and Hybrid Mutation Genetic Algorithm had been chosen to find the best stacking sequence order of Composite Material stacks. As for the stress analysis, we adopt the analytic software-ANSYS Finite Element method to analyze the relation between different stacking angle and Interlaminar Stresses. We use Best Search Method to rapidly search for the best stacking arranging combination from the possibility of all stacking angle combination. We can set up automatic stacking arranging process and use it to replace artificial stacking arranging. In this way, we can shorten the manpower and working hours of Composite Material design and increase the reliability of Composite Material stacking structure.

Keywords : Heuristic Algorithm ; Genetic Algorithm ; Double Genetic Algorithm ; Hybrid Mutation Genetic Algorithm

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