

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

Table of Contents

封面內頁 簽名頁 授權書	iii
中文摘要	iv
Abstract	vi
Acknowledgements	viii
Table of Contents	ix
Table of Figures	xii
Table of Tables	xiv
Chapter 1. Introduction	1
1.1 Background and Motivations	1
1.2 Objectives of Research	2
1.3 Introductions of Forming Machine	3
1.4 Procedures of Research	4
1.5 Outlines of This Thesis	7
Chapter 2. Paper Review	8
2.1 Literatures Review of Interlaminar stresses	8
2.2 Literatures Review of Heuristic Algorithm	10
2.2.1 Classical Genetic Algorithm (CGA)	11
2.2.1.1 Encoding	12
2.2.1.2 Initial Population	12
2.2.1.3 Fitness Function	13
2.2.1.4 Reproduction	14
2.2.1.5 Crossover	14
2.2.1.6 Mutation	17
2.2.1.7 Process Procedure	18
2.2.2 Double Genetic Algorithm (DGA)	20
2.2.3 Hybrid Mutation Genetic Algorithm (HMGA)	22
Chapter 3. Analysis of Laminated Composite	24
3.1 Analytical Model of Laminated Composite	24
3.1.1 Classical Lamination Theory	24
3.1.2 Free-Edge Stresses	25
3.1.3 Approximate Free-Edge Analysis	26
3.2 The Failure Criterion a of Laminated Composite Plate	29
3.2.1 Strain Energy Theory	29
3.2.1.1 Distortion Energy Theory	30
3.2.1.2 Tsai-Hill Failure Criterion	31
3.2.2 Polynomial Expression Theory	34
3.2.2.1 Tsai-Wu Failure Criterion	34
Chapter 4. Simulation and Optimization	39
4.1 Simulation in Finite Element Method	39
4.1.1 Boundary Condition	42
4.1.2 Pressure load	43
4.2 Reduction of FE Model	45
4.3 Sample Examples	47
4.3.1 CGA	48
4.3.2 HMGA	54
4.3.3 DGA	60
Chapter 5. Numerical Examples	67
5.1 System Information and Objective Function	67
5.2 Application to a Rectangle Plate	67
5.2.1 Symmetric Laminate [± 45, 0, 90]s	67
5.2.2 Symmetric Laminate [± 30, ± 45,0,90]s	69
5.2.3 Symmetric Laminate [± 45, 0, 90]2s	70
5.2.4 Symmetric Laminate [± 45,0,90]4s	72
5.3 Application to a Sandwich Plate	73
Chapter 6. Conclusions and Future Works	77
6.1 Conclusions	77
6.2 Recommendations for Future Works	78
References	80

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