應用智慧型演算法於複合材料層板之疊層最佳化

黃一平、王正賢

E-mail: 9315356@mail.dyu.edu.tw

摘 要

在面對產業以及航太工業現況發展，複合材料之對應於金屬零件比率已大幅提高，以複合材料（Composite Material）取代金屬物件為現行航太產業的趨勢，對於現行複合材料產品開發之作業程序，分為結構的分析和結構的設計兩大部份.複合材料之零件整體設計以及生產過程中，疊層排序處理過程佔其相當重要之比例.脫層現象是複合材料常見的破壞現象之一，而脫層（delamination）破壞是因複合材料疊層板因浦松比(Poisson ’ s ratio)差異或剪應力(shear stress)偶合等問題，因為各單層材料性質的不一致，引發自由邊應力(Free-Edge stress)的高梯度變化的現象所致，若能找出疊層角度的順序對脫層的關係或增加抗脫層能力的因素，即可作為疊層角度最佳化的依據. 本研究預計使用啟發式演算法(Heuristic Algorithm)，包括：遺傳基因演算法(Genetic Algorithm)、雙遺傳基因演算法(Double Genetic Algorithm)與複合式遺傳基因演算法(Hybrid Mutation Genetic Algorithm)來找尋複合材料層板之最佳疊層順序(stacking sequence)，應力分析方面，採用有限元素法(Finite Element method)之分析軟體ANSYS來分析研究複材疊層板不同疊層角度與層間應力之關係，利用最佳化搜尋法則來針對所有疊層角度排列組合的可能性中快速搜尋出最佳疊層排列角度.以此法建立自動化之疊層排序設計過程，取代現有之人工疊層排序，達到縮短複合材料設計之人力及工時，進而增加複合材料疊層板之結構可靠度.

關鍵詞 : 啟發式演算法 ; 遺傳基因演算法 ; 雙遺傳基因演算法 ; 複合式遺傳基因演算法

目錄

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