Accepted Manuscript

An Efficient Reanalysis Assisted Optimization for Variable-stiffness Composite Design by Using Path Functions

Guanxin Huang, Hu Wang, Guangyao Li

PII: S0263-8223(16)30981-3
DOI: http://dx.doi.org/10.1016/j.compstruct.2016.06.043
Reference: COST 7565

To appear in: *Composite Structures*

Received Date: 19 October 2015
Revised Date: 8 June 2016
Accepted Date: 20 June 2016

An Efficient Reanalysis Assisted Optimization for Variable-stiffness Composite Design by Using Path Functions

Guanxin Huang, Hu Wang[1], Guangyao Li

State Key Laboratory of Advanced Design and Manufacturing for Vehicle Body, Hunan University, China

Joint Center for Intelligent New Energy Vehicle, China

Abstract

An efficient reanalysis assisted optimization method is proposed for variable-stiffness composite design. The contour lines of functions can be used to describe fiber paths by using newly developed path functions. The parameters of path functions are used as design variables, and the initial objective function is evaluated by using Finite Element Method (FEM). The variable-stiffness composite laminate is formulated using FEM based on Mindlin shell theory. Manufacturing constraints are considered by examining the curvature and parallelism of fiber paths, therefore, the optimal solutions should be manufacturable. In order to improve the efficiency of optimization, reanalysis methods are employed instead of popular surrogate models. Compared with the Surrogate Assisted Optimization (SAO), the advantage of reanalysis is that the error can be well controlled, thus the accuracy of optimization should be improved significantly. Two numerical examples are used to verify the performance of the proposed method. The comparison with the linear variation fiber orientation angles shows that the proposed method obtains better solutions by considering the manufacturing constraints simultaneously.

[1] Email: wanghu@hnu.edu.cn, Tel 86-731-88821445, Fax 86-731-88821807