Springer
Acta Mechanica Sinica
The Chinese Society of Theoretical and Applied Mechanics (CSTAM)

Acta Mechanica Sinica » 2011, Vol. 27 » Issue (6) :977-985 DOI: 10.1007/s10409-011-0506-0

An extended stress-based method for orientation angle optimization of laminated composite structures

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Abstract Orientation optimization plays an important role in the lay-up design of composite structures. Earlier orientation optimization methods face the main problem of huge number of design variables. Recently, a patch concept is proposed to reduce the number of design variables. However, the traditional stress-based method can not deal with patch orientation optimization of composite structures. In this paper, we propose an extended stress-based method to deal with such problems. The considered problems are to minimize the mean compliance under multiple load cases or to maximize the eigenvalues of a composite structure. Four numerical examples are solved to demonstrate the efficiency of the new method. It is shown that the new method has the ability to deal with constraints on orientation angle, such as symmetric, antisymmetric and discrete orientation angle constraints. The iteration is less time-consuming because no sensitivity analysis is needed and a quick convergence rate can be achieved.

Keywords: Structural optimization Composites Laminates Orientation angle optimization

Received 2010-10-14; published 2011-07-05

Fund:

the National Science Fund for Distinguished Young Scholars(10925212),the National Natural Science Foundation of China (11002113) and the National Basic Research Program of China(2011CB610304).

Cite this article:

Jin Zhang, Wei-Hong Zhang, Ji-Hong Zhu.An extended stress-based method for orientation angle optimization of laminated composite structures[J] Acta Mechanica Sinica, 2011,V27(6): 977-985