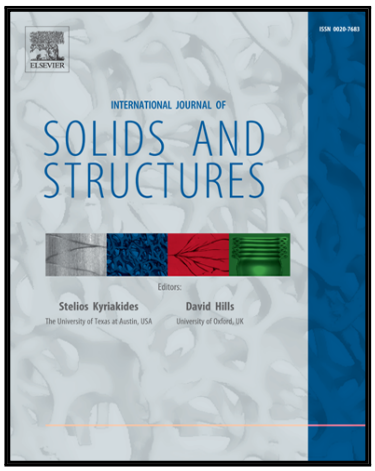

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Nonlinear Dynamic Response of Sandwich Wide Panels

Zhangxian Yuan[1] and **George A. Kardomateas**[2]

Abstract

This work focuses on the general nonlinear dynamic formulation of sandwich panels based on the extended high-order sandwich panel theory. The faces and the core are both considered undergoing large deformation with moderate rotation. In the literature, when it comes to nonlinear dynamic response, various simplifying assumptions are adopted in the nonlinear kinematic relations. A critical assessment of these simplifications, as well as a comprehensive investigation of the geometric nonlinearity effects on the dynamic response of sandwich beams/wide panels is presented. The extended high order sandwich panel theory (EHSAPT)-based finite element is used to formulate the equations of motion, and the time response is obtained by the central difference method. The transient response of a sandwich panel subjected to a distributed blast loading is studied as a numerical example. By neglecting the nonlinear terms, the nonlinear dynamic analysis is reduced to the linear dynamic small deformation analysis, for which a closed-form elasticity solution exists. This, the linear response is first compared with the closed-form linear dynamic elasticity solution. It is shown that the linear EHSAPT yields an identical response to the dynamic elasticity analysis. Subsequently, the dynamic response is evaluated by considering the geometric nonlinearities. Several simplified nonlinear models with partial nonlinear terms included are considered. These models reflect the assumptions commonly adopted in the literature.

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