

عنوان مقاله:

Effects of the asymmetric behavior of the shape memory alloy on nonlinear dynamic responses of thick sandwich plates with embedded SMA wires

محل انتشار:

دو فصلنامه تحقیقات کاربردی در مهندسی مکانیک، دوره 9، شماره 2 (سال: 1398)

تعداد صفحات اصل مقاله: 15

نویسندگان:

Aidin Ghaznavi - *Renewable Energies Department, Niroo Research Institute (NRI), Tehran, Iran*

Mohammad Shariyat - *Faculty of Mechanical Engineering, K.N. Toosi University of Technology, Tehran, Iran*

خلاصه مقاله:

In the present article, the dynamic behavior of sandwich plates with embedded shape memory alloy (SMA) wires is evaluated for two cases wherein (i) the stress-strain curve of the superelastic behavior of the SMA wires is symmetric and (ii) the mentioned curve is non-symmetric. A modified version of Brinson's constitutive model is proposed and used. The high non-linearity in the behavior stems from the SMA wires embedded in the sandwich plate. In this regard, in addition to the proposed advanced algorithm for the determination of the martensite volume fraction, a Picard iterative solution algorithm is used in conjunction with Newmark's numerical time integration method for solving the resulting finite element equations. To improve the accuracy of the results, the variation of martensite volume fraction and material properties of individual points of the structure are updated continuously. Therefore, the kinetic equations of the phase transformation of the SMA are coupled with the motion equations, to accurately model the nonlinear behavior of the sandwich plate. For analysis of the thick sandwich plate, a higher-order global-local theory with novel 3D-equilibrium-based corrections is utilized. One of the features of this theory is the estimation capability of the nonlinear in-plane displacement components, and precise assessment of the transverse shear stresses through satisfying the continuity conditions of the shear stresses at the interfaces between layers. Another advantage of the proposed theory in comparison with the conventional approaches is the ability to simulate changes in the core thickness. This is especially important in cases where the core is relatively thick or soft.

کلمات کلیدی:

Higher-order Global-Local Theory, Nonlinear dynamic analysis, Asymmetric behavior of SMA, Finite element method

لینک ثابت مقاله در پایگاه سیویلیکا:

<https://civilica.com/doc/1006384>

