عنوان مقاله:

Finite Volume Method for Buckling Analysis of Columns with Piezoelectric Layers

محل انتشار:

چهارمین کنفرانس بین المللی مقاوم سازی (سال: 1391)

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خلاصه مقاله:

The main objective of this study is to develop a finite volume based formulation for the instability analysis of columns with piezoelectric patches bonded on their faces. The piezoelectric layers are implemented in order to increase the buckling capacity of the column. For the columns with piezoelectric Layers and different boundary conditions, the variation of the buckling capacity is discussed through the numerical simulations. The mathematical formulation is presented and solved numerically based on the cell-centered finite volume method, in which the shear effects are taken into account. A constant gain feedback control algorithm is used which increases the critical buckling load over the piezoelectric actuation period. In this way, the equilibrium equations of control volumes are expressed and used with the boundary conditions to obtain the eigenvalue equation in the standard format. Then, the buckling loads of columns are obtained by solving the eigenvalue equations. The formulation is tested on a number of benchmark problems.The results obtained from the finite volume buckling analysis of an axial compressed simply supported, fixed-fixed and fixed-pinned columns show that active control can be used to stabilize compressive members against buckling, allowing them to be loaded well in excess of critical buckling load of bare columns

کلمات کلیدی:

Piezoelectric layer, Composite column, Buckling, Finite volume method

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