عنوان مقاله:

Application of a Force-Based State Space Approach to Geometrically Nonlinear Planar Curved Beams

محل انتشار:

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نویسندگان:

M. Vahidi - *School of Civil Engineering, University of Tehran, Iran*

,V Jafari
SH. Vahdani
M. Rahimian

خلاصه مقاله:

In this paper, a force-based curved beam element is presented for geometrically nonlinear quasi-static analysis. The development is based on the Reissner's exact stress resultant theory and its finite strain field for shear deformable curved beams and arches. The presented technique is found by the flexibility based method in which force interpolation functions are used. The state space approach, where a differential-algebraic equation system is solved simultaneously, is utilized as the system solutionprocedure. In order to improve the element accuracy, a higher order displacement field approximation is utilized based on Lagrange polynomials to evaluate the element flexibility matrix. Finally, the proposed method is validated by nonlinear examples which include some high nonlinear responses as snap backs and steep downward slopes as well as curvilinear beams and shear deformations effects. The comparison of this mixed technique with general displacement-based finite element approach demonstrates some improvement in the accuracy and reliability of the presented formulation with less discritizations. Besides, the shear/membrane locking is alleviated by the element because of using a mixed technique

کلمات کلیدی:

State space approach, force-based method, planar curved beam