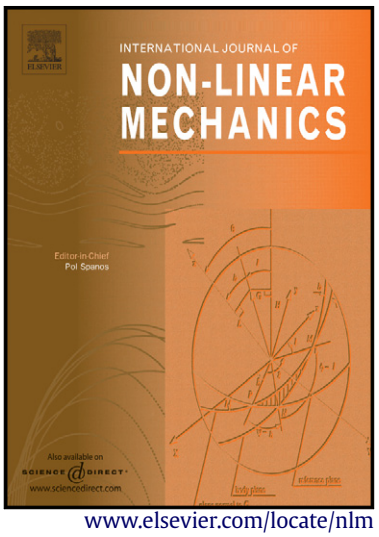

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Nonlinear global dynamics of an axially moving plate

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Abstract

In the present study, the geometrically nonlinear dynamics of an axially moving plate is examined by constructing the bifurcation diagrams of Poincaré maps for the system in the sub and supercritical regimes. The von Kármán plate theory is employed to model the system by retaining in-plane displacements and inertia. The governing equations of motion of this gyroscopic system are obtained based on an energy method by means of Lagrange equations which yields a set of second-order nonlinear ordinary differential equations with coupled terms. A change of variables is employed to transform this set into a set of first-order nonlinear ordinary differential equations. The resulting equations are solved using direct time integration, yielding time-varying generalized coordinates for the in-plane and out-of-plane motions. From these time histories, the bifurcation diagrams of Poincaré maps, phase-plane portraits, and Poincaré sections are