

Nonlinear dynamics of a planar beam–spring system: a 2:1 internal transversal-axial resonance

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Abstract: The nonlinear dynamics of a planar system consisting of a hinged simply supported beam with an embedded spring along the axis are investigated. Attention is focused on coupled axial-transversal oscillations, where double of a natural frequency of bending mode is tuned by axial spring to be close to the longitudinal natural frequency, thus realizing a 2:1 internal resonance. The effect of the spring on forced-damped vibrations of the system is investigated analytically by the multiple time scales method. The approximate frequency response curve is obtained, and for selected cases numerical validation by explicit finite element method is provided.

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