

عنوان مقاله:

Isogeometric Analysis of Vibration Characteristics of Nano-scale Beams Based on The Integral Model of Nonlocal Elasticity

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خلاصه مقاله:

Free vibration responses of nano-beams are investigated in the present paper based on an isogeometric analysis (IGA). Eringen's nonlocal continuum theory in conjunction with the Timoshenko beam model is utilized to obtain the natural frequencies of nano-beams. Due to the fact that using the nonlocal elasticity with differential form of constitutive equations leads to paradoxical results in some cases, the general integral model of constitutive relations is employed. The governing equations of motion are derived in matrix-vector form which provides an appropriate opportunity to apply the interpolation-based solution methodologies. Accordingly, a newly developed approach, IGA, is proposed to solve the obtained equations. The stiffness and inertia matrices are consequently determined by the help of Hamilton's principle. For comparison purpose, both integral and differential models have been considered to examine the vibrational behavior of nano-scale beams with different boundary conditions. As a result, it is found that the paradoxes that exist in the differential formulation of nonlocal elasticity are resolved by the implementation of integral model

کلمات کلیدی:

Nano-scale Timoshenko beam, Integral nonlocal constitutive equation, Isogeometric analysis

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