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Chaotic Motion of Single-Walled Carbon Nanotube Subject to Damping Effect

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Abstract : In the present study, the effects on chaotic motion of single-walled carbon nanotube (SWCNT) due to the linear and nonlinear damping are investigated. By using the Hamilton's principle, the nonlinear governing equation of the single-walled carbon nanotube embedded in a matrix is derived. The Galerkin's method is adopted to simplify the integro-partial differential equation into a nonlinear dimensionless governing equation for the SWCNT, which turns out to be a forced Duffing equation. The variations of the Lyapunov exponents of the SWCNT with damping and harmonic forcing amplitudes are investigated. Based on the computations of the top Lyapunov exponent, it is concluded that the chaotic motion of the SWCNT occurs when the amplitude of the periodic excitation exceeds certain value, besides, the chaotic motion of the SWCNT occurs with small linear damping and tiny nonlinear damping.

Keywords : chaotic motion, damping, Lyapunov exponents, single-walled carbon nanotube
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