

Homotopy perturbation method for N/MEMS oscillator

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Abstract

The nano/micromechanical systems (N/MEMS) have been caught much attention in the past few decades for their attractive properties such as small size, high reliability, batch fabrication, and low power consumption. The dynamic oscillatory behavior of these systems is very complex due to strong nonlinearities in these systems. The basic aim of this manuscript is to investigate the nonlinear vibration property of N/MEMS oscillators by the homotopy perturbation method coupled with Laplace transform (also called as He-Laplace method in literature). A generalized N/MEMS oscillator is systematically studied, and a fairly accurate analytic solution is obtained. Three special cases for electrically actuated MEMS, multi-walled Carbon nanotubes-based MEMS, and MEMS subjected to van der Waals attraction are considered for comparison, and a good agreement with exact solutions is observed.

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