

عنوان مقاله:

Stability Analysis in Parametrically Excited Electrostatic Torsional Micro-actuators

محل انتشار:

ماهنامه بین المللی مهندسی، دوره 27، شماره 3 (سال: 1392)

تعداد صفحات اصل مقاله: 12

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خلاصه مقاله:

This paper addresses the static and dynamic stabilities of a parametrically excited torsional microactuator. The system is composed of a rectangular micro-mirror symmetrically suspended between two electrodes and acted upon by a steady (dc) while simultaneously superimposed to an (ac) voltage. First, the stability of the system subjected to a quasi-statically applied (dc) voltage is investigated, where the pull-in instability, equilibrium positions, and bifurcation points of the system are determined. Then by superimposing an (ac) voltage and extracting a Mathieu type governing equation the effects of (ac) component on the stability of the system is investigated. By varying excitation parameters (steady (dc) voltage and time-dependent amplitude of (ac) excitation), transition curves and the stability margins of the micro-mirror are demonstrated. Theoretically obtained margins are checked by means of numerical simulations. The results show that superimposing the harmonic (ac) component could have a stabilizing effect and allow an increase of the steady (dc) component beyond the pull-in value. These results could be used in design of micro-actuators.

کلمات کلیدی:

MEMS, Micro-mirror, Electrostatic Actuation, Parametric Oscillation, Perturbation Method

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