

静电梳齿驱动结构的稳定性分析

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摘要：

静电梳齿驱动结构的最大驱动位移主要受限于其侧向不稳定性，即当驱动电压接近吸合电压时，静电梳齿驱动结构的动梳齿与固定梳齿发生吸合，导致静电驱动器失效。本文建立了典型静电梳齿驱动结构的稳定性分析模型，研究梳齿驱动结构稳定性的影响因素，并进行了理论分析、仿真分析和实验验证。结果表明支撑梁结构的纵/横刚度比是影响静电梳齿驱动结构稳定性的关键因素，其比值越大，静电梳齿驱动结构的稳定性越好。

关键词：静电梳齿驱动结构；稳定性；侧向吸合；刚度

Analysis of Lateral Stability of Electrostatic Comb-drive Structure

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Abstract:

Electrostatic comb-drive actuators have been widely used in MEMS field. In general, the traveling ranges of comb-drive actuators are limited by the lateral instabilities which cause a sudden snap between the movable comb fingers and the fixed fingers, resulting in functional failure. In this paper, the lateral stability of the typical electrostatic comb-drive structure was investigated. From theoretical simulations and experimental verifications, it was found that the ratio of lengthwise stiffness to transverse stiffness of the suspensions is a key factor for lateral stability. With increased stiffness ratio, the lateral stability of comb-drive structure is improved.

Keywords: Electrostatic comb-drive structure, lateral stability, side pull-in, stiffness

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