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梳齿分布结构对静电驱动二维微扫描镜机械转角的影响

作　者：乔大勇, 杨璇, 夏长锋, 曾琪, 潘春晖, 练彬

单　位：西北工业大学

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摘　要：

为增大静电驱动二维微扫描镜的机械转角，本文基于非线性动力学理论研究了不同梳齿结构对其振幅的影响，理论上得到发散型梳齿分布相较于平行型梳齿分布具有更大的机械转角。此外，本文采用绝缘体上硅(SOI)加工工艺设计并制作了这两种结构的微扫描镜，并对其相关特性进行了测试。测试结果表明：在相同的驱动电压下，发散型结构始终都比平行型结构具有更大的机械转角，与仿真结果基本一致；当加载驱动电压为42V的方波信号时，发散型结构扫描镜的可动框架和镜面的最大机械转角可以达到12.3°、13.49°，而平行型结构扫描镜的可动框架和镜面的最大机械转角则为10.25°、11.68°。

关键词：微机电系统；扫描镜；非线性动力学；梳齿分布；大转角

Influence of comb distribution on the twisting amplitude of two-dimensional microscanner actuated electrostatically

Author's Name:

Institution:

Abstract:

In order to increase the deflection, the effect of comb structure on the twisting amplitude for two-dimensional (2D) microscanner is researched on basis of the nonlinear dynamics theory in this paper, and it can be obtained that the effect of the divergent distribution is superior to parallel distribution. Besides, the samples are fabricated based on silicon-on-insulator (SOI) technology, and then the electromechanical characteristic is tested. The test results demonstrate the microscanner with divergent comb distribution has greater twisting amplitude, which agrees with the theoretical analysis. The microscanner with divergent distribution could generate maximum twisting angles of 12.3° and 13.49° under the square wave of 42V, while the sample with parallel distribution could generate maximum twisting angles of 10.25° and 11.68° under the same square wave.

Keywords: MEMS; microscanner; nonlinear dynamics theory; comb distribution; large deflection

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