

研发、设计、测试

MEMS结构离面微运动测试系统设计与实现

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摘要 利用频闪成像和显微干涉技术设计开发了微机电系统(Micro Electro Mechanical Systems, MEMS)离面微运动测试系统。系统在计算机控制下通过相对延时和五步相移干涉技术自动采集MEMS结构运动周期内各不同时刻的干涉条纹图集,再通过五步相移算法和分割线去包裹算法分别对干涉条纹图和包裹相位图进行分析处理可得到被测MEMS结构的离面微运动情况。为实现浮点型相位图数据的有效存取,提出了一种新的相位图文件格式。通过实验对硅微悬臂梁在不同幅值正弦基础激励下的离面振动响应进行了有效测量,且测量重复性误差小于10 nm。

关键词 [微机电系统结构](#) [频闪成像](#) [显微干涉](#) [离面微运动](#)

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Design and implementation of measurement system for out-of-plane micro-motions of MEMS structures

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Abstract

A measurement system for out-of-plane micro-motions of MEMS structures is developed based on stroboscopic imaging and microscopic interferometry techniques, and it can automatically acquire interferograms at different time in moving periods of MEMS structures with relative-time delay method and five-step-phase-shift interferometry. Out-of-plane motions of MEMS structures can be gained from interferograms and wrapped phase maps by five-step-phase-shift algorithm and branch-cut unwrapping algorithms. A new file format is defined for saving and reading the float style data of phase map effectively. The out-of-plane librations of a si-micro-cantilever under different amplitude sine-base-excitation are efficiently tested, and the error of measurement repeatability for out-of-plane micro-motions is less than 10 nm.

Key words [Micro Electro Mechanical Systems \(MEMS\) structures](#) [stroboscopic imaging](#) [microscopic interferometry](#) [out-of-plane micro-motions](#)

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