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摘要:

基于压电换能器技术设计了一种应用于光学相干层析成像的新型内窥镜式二维光纤扫描探头,即利用两片压电陶瓷片和一片薄导电基片驱动光纤探头.该探头利用光纤悬臂的共振特性,通过对压电陶瓷施加等于光纤共振频率的混频信号,能同时激发光纤悬臂两正交方向上的振动,可以实现光纤悬臂的二维扫描.建立了理论模型并进行了有限元仿真分析,最后搭建了实验系统,验证并获得了扫描图样.实验结果实现了光纤悬臂的二维扫描,扫描范围达到 $(500 \times 500) \mu\text{m}$,调节驱动信号振幅幅值可以调节扫描范围.实验结果与理论分析和仿真相吻合,验证了方案的可行性.

关键词: 光纤探头 二维扫描 压电陶瓷 有限元分析**Endoscope Two Dimensional Scanning Fiber Probe and the Driving Method**

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Abstract:

An endoscope scanning fiber probe was designed to perform two-dimensional (2D) scanning for optical coherence tomography based on the PZT. Two piezoelectric ceramic and a thin conductive substrate were used to drive the optical fiber probe. The probe used the cantilever resonance of optical fiber cantilever, imposed the mixing signals which closed to the resonant frequency of optical fiber on the piezoelectric ceramic, and also stimulated two orthogonal directions vibration of fiber cantilever to achieve two-dimensional scanning. Theoretical model was established and took the finite element simulation analysis was carried out. A practical model was made to carry out experiments and obtain the scan pattern. The experimental results realize the optical fiber cantilever two dimensional scanning, and the scanning scope reaches $(500 \times 500) \mu\text{m}$, adjusting drive signal amplitude can change the scanning range. The theoretical analysis and the simulation was consistent, and verified the feasibility of the scheme.

Keywords: Optical fiber probe Two dimensional scanning Piezoelectric ceramic Finite element analysis

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