传感技术学报
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一种新型平板式压电六维力/力矩传感器及仿真实验

作　者：刘俊, 秦岚, 李敏, 刘京诚, 薛联

单　位：重庆大学光电工程学院

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摘　要：

针对弹性体式六维力/力矩传感器存在的瓶颈矛盾，提出了一种新型平板式压电六维力/力矩传感器。首先，介绍了传感器的结构和工作原理。然后，推导了传感器的数学模型，建立了传感器的有限元模型。最后，得到了传感器输出的电荷灵敏度、维间干扰、固有频率、载荷传递系数、退耦矩阵等重要参数。研究结果表明：传感器结构简单合理、数学模型正确、加工工艺性好、线性度好、刚度高、固有频率大于25KHz、使用退耦矩阵后的维间干扰小于1%。基本满足传感器的设计指标。

关键词：压电传感器；力/力矩传感器；有限元；六维

A novel parallel piezoelectric six-axis force/torque sensor and its simulation

Author's Name:

Institution:

Abstract:

According to the bottleneck contradictions of elastic style six-axis force sensor. A novel parallel piezoelectric six-axis force/torque sensor is proposed. First, the sensor’s structure and operating principle are presented. Then its mathematic model is derived, and finite element model of sensor is established analyzed by ANSYS software. Finally, the sensor’s input charge sensitivity, coupling interference, natural frequency, load transfer coefficient and decoupling matrix are obtained. Research results indicate that the sensor has advantages in simple and rational structure, correct mathematic model, nice manufacturability, good linearity, good rigidity, and natural frequency is more than 25KHz, the interference error is less than 1% with decoupling matrix. It can satisfy the requirements of sensor’s design target.

Keywords: Piezoelectric sensor; Force/torque sensor; Finite element; Six-axis

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