

## ANSYS在平板式压电四维力/力矩传感器设计中的应用

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摘要：

针对人机触觉交互系统对四维力/力矩传感器的需求，研制了一种新型平板式压电四维力/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、固有频率等重要性能指标。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、刚度好、固有频率大于30kHz、未使用退耦矩阵时的维间干扰小于3%。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；四维

## Application of ANSYS in the design of parallel piezoelectric 4-axis force/torque sensor

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**Abstract:**

According to the requirements of haptic based human-computer interaction system for the four-axis force/torque sensor, a novel parallel piezoelectric four-axis force/torque sensor is developed. 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 and natural frequency 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 35kHz, the interference error is less than 3% without decoupling matrix. It can satisfy the requirements of sensor's design target.

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

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