



不同检测电容结构对MEMS电容传感器性能的影响分析

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摘要:

改进传感器检测电容几何结构能有效改善传感器的性能。本文对梳齿电极结构、栅形电极结构及梳栅电极结构检测电容的性能特点进行分析比较,重点分析了振子质量、空气阻尼、系统阻尼系数比以及灵敏度等特性,得出在相同的外轮廓尺寸、支撑梁、振子厚度以及振子到衬底的距离的条件下,栅形结构传感器的振子质量最大,空气阻尼最小,适合制作高分辨率的传感器;在大气下,梳齿结构灵敏度增加的同时空气阻尼力也会增加,且振子质量较小,适合制作高灵敏度,低分辨率传感器结构;梳栅结构的特点居于两者之间,适合制作需要兼顾分辨率和灵敏度的传感器。通过实例计算,证明了该结果。

关键词: MEMS; 微电容式惯性传感器; 检测电容结构

Effects of different structure of sensing capacitance on performance of MEMS capacitive sensor

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Abstract:

A sensing capacitance with good structure is helpful to its performance. Analyzed and compared the specialty of comb, bar and comb-bar capacitances, focused on their proof masses, air dampers, damping ratio of the system and sensitivities on the condition of same dimension, elastic constant of the spring, thickness of the proof mass, distance between the proof mass and the substrate. The result shows that the proof mass of bar capacitance sensor is largest, and its air damping is least, which is suitable for high-precise sensor. The sensitivity of comb capacitance sensor in air is increased while the air damping is increased too, so it is suitable for high-sensitivity and low-precise sensor. The comb-bar capacitance is suitable for the sensor which need to have both high sensitivity and precise. An example is taken to prove the result.

Keywords: MEMS; Micro capacitive inertial sensor; Structure of detecting capacitance

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