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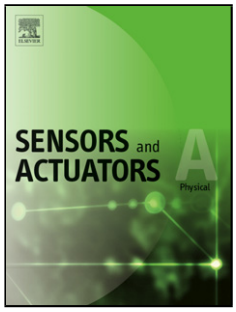

Title: Bio-Inspired Fluidic Thermal Angular Accelerometer with Inherent Linear Acceleration Rejection

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ACCEPTED MANUSCRIPT

Bio-Inspired Fluidic Thermal Angular Accelerometer with Inherent Linear Acceleration Rejection

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Highlights

- Demonstration of angular acceleration sensor mimicking the mammalian semicircular canals with thermal transduction principle and simple two-mask fabrication process.
- Suppression of undesired linear acceleration signals even in the presence of buoyancy effects stemming from the locally heated fluid by proper arrangement of the resistive temperature sensors of multiple linear, thermal flow sensors in a Wheatstone bridge arrangement.

Abstract: This paper reports on the design, simulation, fabrication and characterization of a bio-inspired angular accelerometer. The sensor mimics the semicircular canals in mammalian vestibular systems. The device pairs a fluid-filled microtorus with a thermal detection principle based on thermal convection. The microtorus is intersected by a set of heaters surrounded with temperature detectors on either side, which sense a temperature profile asymmetry upon applied angular acceleration. The device fabrication is based on a two-mask process. Proper arrangement of four resistive temperature sensors in a Wheatstone bridge reduces the impact of heater-induced buoyancy effects. The toroidal microchannel results in inherent geometric linear acceleration insensitivity. The sensor demonstrates a sensitivity of 124 μV/deg/s^2 for in-plane angular acceleration, two orders of magnitude suppression of cross-axis angular accelerations, three orders

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