

The Design, Development, and Optimization of a Capacitive Pressure Sensor Utilizing an Existing 9DOF Platform

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Abstract : Nine Degrees of Freedom (9 DOF) systems are already in development in many areas. In this paper, an integrated pressure sensor is proposed that will make use of an already existing monolithic 9 DOF inertial MEMS platform. Capacitive pressure sensors can suffer from limited sensitivity for a given size of membrane. This novel pressure sensor design increases the sensitivity by over 5 times compared to a traditional array of square diaphragms while still fitting within a 2 mm x 2 mm chip and maintaining a fixed static capacitance. The improved design uses one large diaphragm supported by pillars with fixed electrodes placed above the areas of maximum deflection. The design optimization increases the sensitivity from 0.22 fF/kPa to 1.16 fF/kPa. Temperature sensitivity was also examined through simulation.

Keywords : capacitive pressure sensor, 9 DOF, 10 DOF, sensor, capacitive, inertial measurement unit, IMU, inertial navigation system, INS

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