DESIGN OF DUAL AXIS FORCE SENSOR FOR AEROSPACE APPLICATION

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DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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I K H Prasanna Date:

The above candidate has carried out research for the Masters Dissertation under my supervision.

Prof. Nalin Wickramarachchi Date:

Abstract

This work reports on the design procedure of a dual axis force sensor for aerospace applications. System functionality of the force sensor should comply with many reliability aspects peculiar to aerospace industry rather than just sensing the applied force. Final design of the dual axis force sensor is based on three preliminary design concepts and test data of fabricated models. This report discusses descriptively how to come up with new ideas through these models. Mathematical model of the sensor is used to verify design outcomes. Furthermore this work presents the practical circumstances faced during fabricating and testing. Analysis of results are also discussed in the report and comparison of the first three models included in the report.

Functional requirements were fine tuned in the final design compared to the first three design concepts. Major requirement was to reduce the cross sensitivity when it came to the final design. As desired cross sensitivity was 2% of the applied load, Final design enabled to achieve 2.21% pitch cross sensitivity and 3.84% roll cross sensitivity. It was considerable reduction of the cross sensitivity. Non linearity value was reduced by 65.79% and 38.46% pitch and roll respectively. Achieved non linearity value was 0.065% and 0.08% in pitch and roll direction respectively. Hysteresis also reduced by 73.91% in pitch direction and 21.43% in roll direction.

Output of the Wheatstone bridge has to be reduced in order to decrease the cross sensitivity. This required more amplification, causing the reading and the noises to be amplified at the same time. It was required to have more signal conditioning that was a drawback of the system developed

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