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ROLE OF MEMS COMPONENTS FOR UNIVERSITY SPONSORED NANO-SATELLITE APPLICATIONS

Abstract

Micro Electromechanical Systems (MEMS) are systems that utilize elements of micro-fabrication to fabricate various sensors using simple mechanical principles and electronics circuits. The use of MEMS has seen an exponential growth in the past 5 years due to advances in microelectronics as well as nanotechnology. Nano-satellites are a new genre of satellite having weight less than 10kg which consume less power and are used as piggybacks on launch vehicles. These types of satellites are often undertaken by universities involving undergraduates and graduate both. They are built taking into consideration constraints such as power, cost, size, placement, electromagnetic interference etc. The need of the hour is the development of compact, power efficient and intelligent devices which are tailor made for the application. MEMS provide a suitable platform for implementation satisfying all these constraints and have emerged as a frontline technology for these applications. The Attitude Determination And Control Subsystem is a major part of all satellite missions and which highly relies on the accuracy and dependability of the components used. MEMS qualify as the most dependable and accurate for such mission critical uses. MEMS chips like HMC 6343, ADXR401 series have already been used in space applications and proved space worthy. Using multiple components decreases the error and increases the redundancy of the system keeping in mind the power as well as size constraints. This increases innovation in standardized ADCS designs. Nowadays MEMS devices have come up with multiple input and multiple output in a single package. HMC6343 gives the magnetic field reading in the X,Y,Z frame ,accelerometer in 2 frames and the compass heading of the object(for on ground). Also most MEMS come with a microcontroller and an EEPROM inbuilt. This increases the buffer memory for the readings obtained as well as increases the data transfer by reducing the interfaces by employing a simple Master-Slave interface. This increases the ease of switching MEMS are mostly in SMD(surface mount design) form and compact size, which can be easily mounted on a PCB. Thus, the paper demonstrates various MEMS components and their specific interfacing and testing for Attitude Determination and Control system which increased the accuracy as well as efficiency.