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SPACE SYSTEMS SYMPOSIUM (D1)
Enabling Technologies for Space Systems (2)

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INTEGRATED SENSOR INTERFACE AND ACTUATION CONTROL FOR LUNAR SURFACE EXPLORATION

Abstract

This research focuses on designing an integrated sensor interface and actuation control for lunar surface exploration. The 21st century space exploration roadmap calls for returning man to the moon between 2015 to 2020, and fostering future manned exploration of Mars and other bodies in the solar system. The rims of permanently shadowed lunar craters have been suggested as the best locations for lunar bases due to the amount of sunlight which can be used to generate necessary solar energy and are adjacent to possible sources of minerals for production of fuel and other resources. The temperature swings at proposed location for lunar bases offer conditions that exceed the limits of operation of ordinary electronic systems. Improved and efficient technologies ranging from robotics, rovers, communication systems, in-situ sampling systems, to life support systems that can operate reliably in such extreme lunar conditions are required. Our integrated system will consist of a multi-channel analog front-end for sensor signal acquisition as well as a control system for space qualified actuators. Part of this integrated system will be fabricated using IBM silicon germanium (SiGe) BiCMOS 5AM technology and will consist the following modules: 8031 microcontroller, EEPROM, analog interface, serial communication, and motor controller interface. This system will be tested to reliably operate at ambient conditions on the surface of the Moon without thermal protection. It will be applicable on lunar rovers, in-situ sampling instrumentation, and other surface exploration systems.

Keywords: Lunar exploration systems, extreme space electronics, lunar surface electronics, integrated sensors, actuation, Moon resource utilization.