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MISSION DESIGN OF ON-ORBIT EDUCATIONAL NANOSATELLITE PLATFORM USING RADIATION HARDENED RASPBERRY PI-BASED DIGITAL VIDEO TRANSMITTER, WITH ECHO MODE.

Abstract

Scientific exploitation of Nanosatellites has garnered interest in recent years, primarily due to the low cost, faster realization time, COTS availability, and modular design. Educational satellites have been flown demonstrating in-house capabilities of various subsystems, similarly many satellites are put as platforms in space to openly experiment and operate to learn. Such a system of open satellite systems that can be controlled and learned upon will provide a more refined overview of satellite systems and operations. This can be a futuristic frontier to teach the space generation of spacecraft systems and satellite dynamics, this can revolutionize the way we teach space science.

Mission architectures for providing an on-orbit educational platform and innovative techniques for carrying out learning operations in space have not been majorly researched in recent years. The research methodology utilized involves a detailed literature review and background research of existing missions and concepts that enable such on-orbit educational platforms, fixating upon a base mission design and developments on the advantages, the feasibility of the required architecture.

This paper proposes an innovative design for establishing an on-orbit educational platform. The paper elaborates on the possibilities it can open for systematic learning of spacecraft operations. To make the educational experience simpler a mission design is proposed that involves the use of a radiation-hardened Raspberry Pi, with a GPIO driven radio transmit capacity, which can be used for providing a learning platform for understanding digital video broadcasting technologies. The proposed system includes a digital video transmitter sending pictures of the Earth with suitable resolution settings on request. The paper also discusses the inherent advantages of having an echo mode of operations to make it a full-fledged training platform. The paper also showcases the potential to improve upon existing designs and/ or employ a combination of existing designs for designing next-generation on-orbit educational platforms.