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FUTURE SPACE MISSIONS WITH RECONFIGURABLE MODULAR PAYLOAD MODULES AND STANDARD INTERFACE – AN OVERVIEW OF THE SIROM PROJECT

Abstract

The SIROM (Standard Interface for Robotic Manipulation of payloads in future space missions) project, funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No 730035, aims to develop a standardized and multi-functional interface with capabilities to couple payloads to payloads, payloads to a robotic manipulator and client to server. This interface is designed in an integrated form where mechanical, data, electrical and thermal connections are combined. The possible applications of the developed interface go from on-orbit satellite servicing, satellites re-fueling, assembly of modular and reconfigurable orbital satellites to manipulation of payloads in planetary surface exploration. Within this context different Active Payload Modules (APMs) provided with SIROM interfaces, an End-Effector allowing installation of the interface onto a robotic manipulator arm and an Electronics Ground Support Equipment (EGSE) providing power, data and control communication are also developed to support the demonstration and verification of SIROM capabilities. All developed and incorporated systems will be verified in orbital and planetary test scenarios. The objective for the orbital scenario is to demonstrate the successful transport of an APM from an initial to a final operational location: a robotic arm with a SIROM interface attached to its End-Effector couples an APM equipped with a camera, then it sends a command to take pictures of the test environment and finally it attaches the APM to another APM. The planetary test demonstrates an application of battery pack management with a mobile rover. Here an APM consisting of an auxiliary battery is to be connected to another APM that consists of a transportable solar based battery charging system. The SIROM thermal interface provides a fluidic port which allows thermal transfer from one APM to another. Thus, a separate close-loop heat exchange system between two APMs is also developed and tested on its own. This paper gives an overall overview of the SIROM project including the development of the interface and its controller, the orbital and planetary APMs, the End-Effector and the EGSE, as well as the verification tests to be performed and first results.