Standard Interface for robotic manipulation – SIROM application for future space missions

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Abstract (300 word limit)

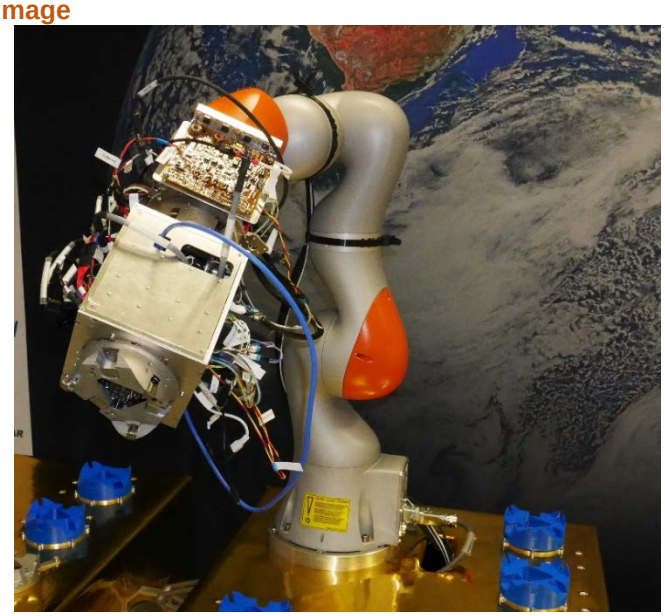
The development of standard payload modules for applications such as on-orbit satellite servicing or planetary exploration, strongly depends on the realization of a standard space interface (IF) that allows the necessary mechanical interconnections with the possibility of electrical and data connection as well as thermal or fluid transfer between these "building blocks". Such technology could allow long duration with no logistic support missions, reparability, upgrades and reconfiguration of satellites, cost efficiency and simplification of the tool exchange in scientific exploration missions, among others.

Within this context the developed IF in the SIROM (Standard Interface for Robotic Manipulation of payloads in future space missions) project is a solution that combines the four required functionalities in an integrated and compact form.

This multi-functional IF is based on an androgynous design to allow replacement and reconfiguration of the individual modules in any combination desired. It consists of the following sub-assemblies: mechanical IF, electrical IF, data IF, thermal IF and IF controller. A clear advantage of SIROM design is that its mechanical IF consists of a latching and a guiding system for misalignment correction capable of withstanding certain robotic arm positioning inaccuracies: +/-5mm translation and +/-1.5° rotation in all axes. Regarding the electrical and data IFs, SIROM transfers up to 150W electrical power and provides a data rate transfer of 100Mbit/s via SpaceWire and a command communication with a speed up to 1Mbit/s via CAN bus. The thermal IF provides fluidic ports for flow transfer and has the potential to transfer 2500W between APMs provided with the corresponding close-loop heat exchange system.

SIROM project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730035.

Image



Recent Publications (minimum 5)

1. Javier Vinals, Eduardo Urgoiti, Gonzalo Guerra et al "Multi-functional interface for flexibility and reconfigurability of Future European Space Robotic Systems", Advanced in Astronautics Science and Technology – Special Issue with Selected Papers from IAC-2018, Springer, page 119-133, https://doi.org/10.1007/s42423-018-0009-1, published online: 6 September 2018.
2. Wiebke Brinkmann, Marko Jankovic, Christoph Stoeffler, Gonzalo Guerra, Eduardo Urgoiti, Javier Vinals, Sebastian Bartsch, "Modular Active Payload Modules for Robotic Handlings in Future Orbital Missions", IAC-18-D1.6.5. In Proceedings of the 69th International Astronautical Congress (IAC 2018), October 1-5, Bremen, Germany, International Astronautical Federation (IAF), 2018.
3. Javier Vinals, Eduardo Urgoiti, Gonzalo Guerra et al "Future space missions with reconfigurable modular payload modules and Standard interface – an overview of the SIROM project", IAC-18-D3.2: 45699. In Proceedings of the 69th International Astronautical Congress (IAC 2018), October 1-5, Bremen, Germany, International Astronautical Federation (IAF), 2018.
4. Marko Jankovic, Wiebke Brinkmann, Sebastian Bartsch, Roberto Palazzetti, Xiu Yan, "Concepts of active payload modules and end-effectors suitable for Standard Interface for Robotic Manipulation of Payloads in Future Space Missions (SIROM) interface", Proceedings of the 2018 IEEE Aerospace Conference, March 3-10, Big Sky, Montana, USA, IEEE, 2018.
5. Brinkmann, W. and Roehr, T. M. and Natarjan, S. and Cordes, F. and Sonsalla, R. U. and Szczuka, R. and Bartsch, S. and Kirchner, F, "Design and Evaluation of an End-Effector for a Reconfigurable Multi-Robot System for Future Planetary Missions", Proceedings of the 2018 IEEE Aerospace Conference, March 3-10, Big Sky, Montana, USA, IEEE, 2018.

Photograph



Biography (150 word limit)

Javier has thirty two (32) years of work experience. One and a half (1.5) of them working in design aspects and the rest of them performing stress and structural analysis activities. Twenty (20) years as Project Manager and Technical Director of projects and developments related with the simulation of materials behavior and processes, space, new technologies, aeronautical and vehicles business and actuation and control systems, space, new technologies, aeronautical and vehicles business and actuation and control systems. Main projects:

ESA/ASTRIUM: FDM SOLAR ORBITER -Feedtroughs, doors and mechanism subsystem: through-wall filters (non-hermetic protective covering for its remote sensing instruments).

ESA/ASTRIUM: SM MTG Breadboard Elegant Model. Design and development of a scan mechanism model representative of the flight model performance of Meteosat Third Generation (MTG).

PPF Project. Antenna Pointing Mechanism (DRSAM).

SIROM OG5 Project Manager: Standard Interface for Robotic Manipulation of Payloads in Future Space Missions OG5 (SIROM).

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Notes/Comments: