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MOSAR: TECHNOLOGY REVIEW AND CONCEPT OF MODULAR SPACECRAFT ASSEMBLY AND RECONFIGURATION

Abstract

Offering cost effective, performant, reliable, scalable and flexible solutions will be essential to make the European space industry spearheading strategic segments of the commercial space. The development of novel, European technologies that would allow standardizing satellites components, facilitating their assembly, reducing time between customer's orders and commissioning in space, repairing and upgrading components directly in orbit, would provide extremely valuable competitive assets to establish European leadership in a number of key commercial space segments.

In this context, the European Commission has set up the Strategic Research Cluster (SRC) in Space Robotics technologies as part of the H2020 program. Through three successive calls, it aims at developing and demonstrating robotic key technologies for orbital and planetary applications. After the first call initiated in 2016, targeting the development of robotics building blocks, the purpose of the second call is to develop ground demonstrator of advanced orbital and planetary illustrative scenarios.

The purpose of the MOSAR project, started in February 2019, is to develop a sound technology demonstrator of on-orbit modular satellite reconfiguration. The project aims at developing, integrating and demonstrate technologies required to enable a fundamental shift of paradigm with the end-to-end life cycle of satellites (and more widely spacecraft) from their inception to their commissioning, and even covering their maintenance in a completely new business model.

As part of the demonstrator, several components will be developed. A repositionable walking robotic manipulator will allow the capture, accurate and safe motion and placement of Spacecraft Modules. Several Modules will be designed as part of a standardized ecosystem, highlighting different functional purposes. They will also implement a new generation of standard robotic interface for mechanical, data, power and thermal transfer. These components will be integrated in a ground demonstrator of target satellite and cargo servicer with the objective to perform module transfer and reconfiguration between the two entities. This will be supported by a functional engineering simulation environment offering assistance for modules design, system configuration and planning, through multi-physics engine.

This paper presents the review of the state of the art on the relevant technologies as well as the application scenarios, the system architecture and the concepts design of the different constituents.