

IMPLEMENTING THE GERMAN SPACE ROBOTICS PROGRAM. Arianit Preci¹ and Bernd Sommer²,
¹German Aerospace Center DLR Space Administration (Königswinterer Str. 522-524, 53227 Bonn, arianit.preci@dlr.de), ²German Aerospace Center DLR Space Administration (Königswinterer Str. 522-524, 53227 Bonn, bernd.sommer@dlr.de).

Introduction: As humans continue to expand into space various challenges emerge, many of which require technological solutions. Automation and robotics continue to play an important and necessary role in tackling some of these challenges, such as increasing infrastructure and debris in orbit due to increasing space activities or long distances from Earth to the exploration sites and the need for increased autonomy or the demand for assembling very large structures in space, which require multiple launches.

In the last decade, the expansion of the economic sphere into space has become a key driver for space related activities. The trend of a sustainable commercialization demands innovative approaches, for example on-orbit servicing, manufacturing and assembly. These approaches require a specific set of technological capabilities, such as rendezvous and docking, manipulation, planning, guidance and control and system interconnects. Furthermore, effort needs to be invested additionally into standardization and a novel design paradigm for building modular and reconfigurable structures that are capable of being assembled directly on orbit.

Organizations worldwide, national states or international entities have identified the field of automation and robotics as a key technology. The Space Administration of the German Aerospace Centre (DLR) has formulated a roadmap to integrate and focus the German activities in space robotics, in order to enable the German industry and research environment to participate in international endeavors. The roadmap is implemented through two funding announcements, which will be described briefly in the paper. As Germany is a member of the European Space Agency (ESA) and also European Union (EU), both of which invest substantial financial amounts in space technology research and development, the national activities are harmonized with these activities. In the paper it is outlined how the harmonization is achieved, with a focus on the EU program support activity PERASPERA.

The paper will give an overview of the activities in the field of space robotics in Germany and Europe by describing the implementation of the roadmap on chosen and recent research grants and technology developments. The goals, achieved results and the exploitation of these developments will be discussed.

Projects: Some of the ongoing projects and research activities in the national program, which will be presented in the paper, are:

Astrone. Development of GNC-algorithms for trajectory planning and navigation in unknown terrains for an agile autonomous science platform with extended surface mobility.

FOM. Development of a multi-axis manipulator with an adaptable and flexible tool for applications in LEO and GEO.

Nucleus. Conceptual development of a modular, scalable, standardized, and cost effective standard satellite platform for future institutional LEO space missions of the VEGA class.

ViTOS-II. Simulation assisted methods and processes in the Virtual Testbed for optical sensors in robotic space systems.

iBOSS. Development of concepts and solutions for modular satellites.

In the paper, also activities in the European PERASPERA grants will be briefly discussed.