SRC - Space Robotics Technologies

Proposals shall address one of the following six specific robotic building blocks:

a) Space Robot Control Operating System: an open source space robot control operating system (RCOS) that can provide adequate features and performance with space-grade Reliability, Availability, Maintainability and Safety (RAMS) properties. RCOS control any robot/spacecraft systems whether for orbital or planetary applications, for all phases and modes of the mission.

b) Autonomy framework Time/Space/Resources planning and scheduling: a software framework for the development of highly autonomous space robotics missions. In these a robot system, given a high level goal, will (re)plan, schedule and oversee the execution of elementary actions to attain the goal, considering Time/Space/Resources constraints, interleaving planning with execution and providing formal verification capabilities of the functional layer.. The activities will comprise planning/scheduling capabilities to decompose high level commands into sub-tasks; resource management to fulfil in a dynamic way the high level mission/goals; Fault management with reconfiguration capability; Interaction management with other robotic systems to allow cooperation and tasks sharing, guidance, navigation and control to attain execution.

c) Common data fusion framework: a software framework implementing data fusion techniques for various sensors such as LIDAR, Imagers, radar, sonar, IMUs, and sun sensors capable of localising robots in natural and man-made environments, geometrical/topological reconstruction of environment, map making. Robots need to perceive their environment and to understand where they are with respect to their operational goals. No single sensor can convey reliably localisation and mapping information in all conditions of space.

d) Inspection Sensor Suite: a suite of perception sensors that allow localisation and map making for robotic inspection of orbital assets (under space representative conditions and taking into account in-orbit inspection scenario requirements) and for planetary surface exploration. The activities comprise the identification of suitable

sensors which may include imaging sensors for inspection operations, stereo imaging sensors, holographic sensors, zoom cameras for inspection and proximity operations, infrared sensors, imaging radar and LIDAR as well as illumination integrated solution considering data processing, realisation of common interfaces for data provision, mechanical and electrical integration.

e) Modular interfaces for Robotic handling of Payloads: a set of interfaces (mechanical, data, electrical, thermal) that allow coupling of payload to robot manipulators and payload to other payload (or to a platform) enabling manipulation of payload by robots in orbital and planetary environment assembly of structures out of elemental blocks, spacecraft deployment aid.

f) Validation Platforms and Field Tests: test vehicles (platforms or facilities) and validation environment for common testing of building blocks reference implementations. Relying upon existing assets, this would include the provision of test means (e.g. rovers, robots, dynamic robotics, RVD facilities), the support for integration in these of common building blocks, instrumentation and the execution of tests in realistic or analogue environments.

A detailed description of the above building blocks is included in the corresponding guidelines[[http://ec.europa.eu/growth/sectors/space/research/horizon-2020]].

Each common building block shall be validated in a test scenario by means of a reference implementation (the specific prototype).

A minimum of one proposal per building block (a)-(f) will be selected for funding.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 3.5 million for specific building blocks (a)-(e) and in the range of EUR 1 million for the specific building block (f) would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Grants awarded under this topic will be complementary to each other (""complementary grants""). In order to ensure a smooth and successful implementation of this Strategic Research Cluster (SRC), the beneficiaries of complementary grants (""complementary beneficiaries"") shall conclude a written ""collaboration agreement"". The respective options of Article 2, Article 31.6 and Article 41.4 of the Model Grant Agreement will apply.

The overall challenge of this strategic research cluster (SRC) is to enable major advances in space robotic technologies for future on-orbit satellite servicing (robotics and rendezvous), and the exploration of the surfaces of the other bodies in our solar system.

This specific challenge consists of designing, manufacturing and testing of reliable and high performance common robotic building blocks for operation in space environments (orbital and/or planetary), which will be useful for the SRC (demonstrations of on-orbit satellite servicing and planetary surface exploration). It can also be useful for (i) the wider European space robotics goals; and (ii) potential spin-off and spill-over effects to other areas of robotic activity on Earth (such as automotive or underwater but not limited to those).

Through the mastering of common building blocks, which allow inexpensive re-use across multiple applications, European actors will have a competitive advantage and industrial partnering will be facilitated. For the common building blocks to be successful, particular effort must be made in systems engineering, system performance analysis, reliability, availability, maintainability and safety improvement, rather than an approach based on pure technology development.

For each specific building block, the expected impacts are:

a) Technologies compliant with very high standards of RAMS which can be usable in future space robotics missions;

b) Technologies useful for space robots (especially the planetary ones) requiring autonomy to cope with the potential inability to communicate to the Earth and in terrestrial applications needing autonomy for environmental monitoring and security purposes;

c) Navigation/localisation and map making applications for robots whether in space or on planetary surfaces while coping with the performance and reliability issues of sensors;

d) Availability of a standard reliable sensor suite which will be an enabler for space robotics missions in general;

e) Experimentation on deployment of very large structures (e.g. antenna reflectors and active telescope mirrors);

f) Validation of common building block in the most relevant environment with minimal duplication of means and activities.

Ostatnia aktualizacja: 12 Kwietnia 2024

Permalink: https://cordis.europa.eu/programme/id/H2020_COMPET-4-2016/pl