# NASA STTR 2018 Phase I Solicitation

## T4.01 Information Technologies for Intelligent and Adaptive Space Robotics

**Lead Center: ARC**

**Participating Center(s): JPL, JSC**

**Technology Area: TA4 Robotics, Telerobotics and Autonomous Systems**

The objective of this subtopic is to develop information technologies (algorithms, avionics, and software) that enable robots to better support space exploration. Improving robot information technology is critical to improving the capability, flexibility, and performance of future NASA missions. In particular, the NASA "Robotics and Autonomous Systems" technology roadmap (T04) indicates that extensive and pervasive use of robots can significantly enhance future exploration missions that are progressively longer, complex, and operate with fewer ground control resources.

The performance of space robots is directly linked to the quality and capability of the information technologies that are used to build and operate them. Thus, proposals are sought that address the following technology needs:

- Advanced robot user interfaces that facilitate distributed collaboration, geospatial data visualization, summarization and notification, performance monitoring, and physics-based simulation. The primary objective is to enable more effective and efficient interaction with robots remotely operated with discrete commands or supervisory control. Note: proposals to develop user interfaces for direct teleoperation (manual control) are not being solicited and will be considered non-responsive.
- Navigation systems for mobile robot (free-flying and wheeled) operations in man-made (inside the International Space-Station) and unstructured, natural environments (Earth, Moon, Mars). Emphasis on multi-sensor data fusion, obstacle detection, and localization. The primary objective is to radically and significantly increase the performance of mobile robot autonomous navigation through new sensors, avionics (including COTS processors for use in space), perception algorithms and software. Proposals for small size, weight, and power (SWAP) systems are particularly encouraged.
- Robot software systems that support system-level autonomy, instrument/sensor targeting, downlink data triage, and activity planning. The primary objective is to facilitate the creation, extensibility and maintenance of complex robot systems for use in the real-world. Proposals that address autonomy for planetary rovers operating in rough terrain or performing non-traditional tasks (e.g., non-prehensile manipulation) are particularly encouraged.

Proposers are encouraged to target the demonstration of these technologies to existing NASA research robots or current projects in order to maximize relevance and potential for infusion.

Deliverables to NASA:

- Identify scenarios, use cases, and requirements.
- Define specifications based on design trades.
- Develop concepts and prototypes.
- Demonstrate and evaluate prototypes in real-world settings.
- Deliver prototypes (hardware and/or software) to NASA.