National Aeronautics and Space Administration

Intelligent Systems Division

Technologies for Exploration

Ames Research Center

Autonomous Systems and Robotics (ASR)

NASA Vision calls for closer cooperation between humans and aerospace systems than ever before. Creating automated and autonomous behaviors via robotic assistants, robust avionics, intelligent planning and scheduling, and advanced control technologies are the focus of the ASR technical area. This endeavor requires building systems that can adapt their behaviors to environments that are complex, rapidly changing, and not well-understood. Ames Research Center has unique capabilities and agency leadership in applying autonomy and robotics expertise to NASA missions, developing system and sub-system technologies as required, and integrating these pieces into systems for flight missions and terrestrial demonstrations.

Areas of research and development include:

- Avionics software
- Adaptive and optimal control and estimation
- Advanced flight management systems
- Automated planning and scheduling
- Control agent architectures
- Computer vision & digital mapmaking
- Distributed and multi-agent systems
- Drilling automation
- Embedded software systems
- Evolvable systems
- Geospatial data systems
- Space robotics (planetary rovers & free-flyers)

ASR Organization: ASR is organized into 5 technical groups consisting of a total of more than 75 engineers and scientists.

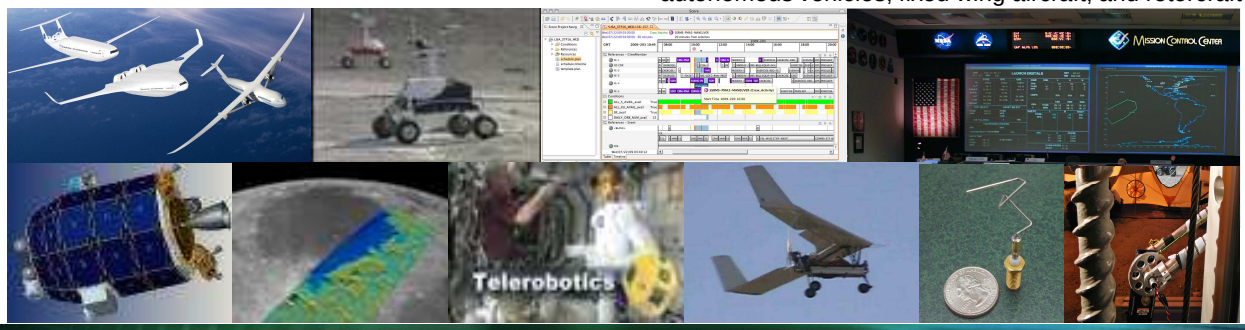
Applied Avionics Software (AAS)
AAS group performs applied research, development, and testing of avionics ITAR NASA Class B software for flight missions. AAS is a part of the TI CMMI L2 organization and practices model-based software engineering. The main focus is on raising the TRL of autonomy technologies and integrating autonomy systems into flight software. The group has experience in developing and deploying avionics software for a wide variety of missions.

Advanced Control and Evolvable Systems (ACES)
The main focus of ACES group is to conduct research and development of advanced flight control architectures and real-time flight simulation capabilities. The core competencies of ACES group include intelligent guidance, navigation, control, modeling and simulation technologies. ACES conducts foundational and applied research in adaptive, robust, and optimal control; trajectory guidance and planning; advanced concept aircraft design; and evolvable systems for automated design.

Deployable Automation Technologies (DAT)
DAT group conducts applied research and development in automated planetary and small-body sample acquisition and handling systems, and instrument automation and health monitoring. Lightspeed communication delays require that space sample acquisition systems, such as drills, must be autonomous and able to self-recover from faults. The focus of the group is in instrument and sampling automation technologies for realizing this need.

Intelligent Robotics Group (IRG)
IRG is dedicated to exploring extreme environments, remote locations, and uncharted worlds. IRG conducts applied research in a range of areas including computer vision, digital mapmaking, geospatial data, ground data systems, human-robot interaction, interactive 3D user interfaces, robot navigation, and robot software architecture.

Planning and Scheduling Group (PSG)
PSG builds automated planning and scheduling systems and discrete control system for NASA missions. These planning and scheduling systems are essential components for the operation and automation of manned spacecraft, deep space probes, planetary rovers, instruments such as drills, autonomous vehicles, fixed wing aircraft, and rotorcraft



Code TI: http://ti.arc.nasa.gov/tech/asr