



Space Technology

Game Changing Development

Human Robotic Systems: Space Robotics Challenge (SRC)

Overview

The Space Robotics Challenge (SRC) seeks to advance autonomy in humanoid robotics. The challenge will benefit the robotics community at large, while focusing on development of robotic skills needed for Mars-based exploration missions. The current timeline for the challenge has competitors testing software development on either a Robonaut 5 (R5) robot, focusing on planetary-surface tasks, or on a Robonaut 2, focusing on in-transit vehicle tasks. Both robots have been supported by Game Changing Development projects in the past.

During the first quarter of 2016, NASA's Human Robotic Systems (HRS) will award two U.S. university research groups with an R5 humanoid robot. Selections will be made through a competitive review based on the results of the DARPA Robotics Challenge (DRC) and a written proposal. These hosted robots will be used to validate SRC tasks and provide access to challenge participants.

Background

In FY13, recognizing a national need for robotic disaster response (after the Fukushima disaster), NASA used its investment in Robonaut 2 and its expertise in remotely controlling robots over difficult networks to create the advanced bipedal humanoid robot R5. The robot was designed, built and developed in 15 months with the objective of performing disaster-response tasks, which are similar in nature to space exploration tasks for humanoid robots.

R5 competed in the DRC trials in December 2013. After the trials, NASA and the National Science Foundation continue to support the robot for space exploration mission development.

During FY14, HRS partnered with the Florida Institute for Human Machine Cognition (IHMC) to apply IHMC's walking algorithms to R5. Throughout FY14, IHMC improved R5's mobility software to allow balancing, walking and mobile manipulation.



NASAfacts

Space Robotics Challenge

In FY15, HRS is focusing on upgrading the existing R5 robot and building two additional units. HRS also initiated the SRC in FY15.

The SRC will be conducted in partnership with NASA's Centennial Challenges program. The challenge will have two components: a virtual challenge in simulation and a physical challenge with R5 and Robonaut 2 robots. NASA is currently working with the Open Source Robotics Foundation (OSRF) to develop tools needed for the virtual component of the challenge.

R5 is a bipedal humanoid robot designed to work in human engineered environments on surfaces. It is envisioned to deploy, checkout and maintain surface for a human Mars mission. Robonaut 2 is a humanoid robot designed to work in a microgravity environment, offloading tedious or hazardous work from astronauts and to serve as a human spacecraft caretaker during extended dwell periods where humans are not present. A Robonaut 2 is currently on the International Space Station developing tasks to save crew time.

Partnerships

Human Robotic Systems is led by NASA's Johnson Space Center, with many partnerships across the nation at other NASA centers and

with numerous industry and academic partners through the National Robotics Initiative, including IHMC and OSRF. HRS resides within the Game Changing Development (GCD) Program. Projects under GCD investigate ideas and approaches that could solve significant technological problems and revolutionize future space endeavors. GCD projects develop technologies through component and subsystem testing on Earth to



R5 public demonstration.



R5 closing a valve.



R5 demonstrating improved balance.

prepare them for future use in space. GCD is part of NASA's Space Technology Mission Directorate.

For more information about HRS please visit http://www.nasa.gov/directorates/spacetech/game_changing_development/human-robotic-systems.html (public)

For more information about GCD, please visit <http://gameon.nasa.gov/>

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