



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 future surface-based exploration missions. The current challenge involves simulated tasks using the R5 robot, developed with Game Changing Development support in the past.

During the first quarter of 2016, NASA's Human Robotic Systems (HRS) awarded two U.S. university research groups with an R5 humanoid robot. Selections were made through a competitive review based on the results of the DARPA Robotics Challenge (DRC) and a written proposal. The top challenge teams will have access to these hosted robots as a prize for testing their simulation-based software applications.

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 surface-based 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.

Space Robotics Challenge

In FY15, HRS focused on upgrading the existing R5 robot and building two additional units. HRS, in conjunction with STMD's Centennial Challenges Program, also initiated the SRC in FY15. The challenge consists of a virtual challenge of a simulated R5 robot completing tasks in a "day in the life" of a humanoid



NASAfacts

robot on Mars. NASA is currently working with the Open Source Robotics Foundation (OSRF) to develop Gazebo simulations needed for the challenge.

R5 is a bipedal humanoid robot designed to function in surface-based environments, and specifically can function in environments developed for humans. It is envisioned to deploy, checkout and maintain habitats and/or bases for a human Mars mission.

The Space Robotics Challenge is being conducted by Space Center Houston, NASA Johnson Space Center's official visitor center. More details can be found at <https://ninesights.ninesigma.com/web/space-robotics-challenge>.

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.

The GCD Program investigate ideas and approaches that could solve significant technological problems and revolutionize future space endeavors. GCD projects develop



R5 closing a valve.



R5 demonstrating balance capabilities.



R5 public demonstration.

technologies through component and subsystem testing on Earth to 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

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

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