

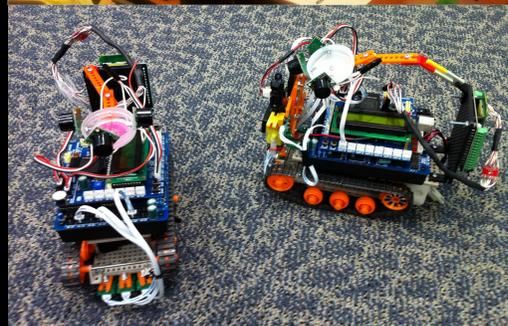


ROBOTICS MISSION SUPPORT



MSL

Support for the Mars Science Laboratory (MSL) IV&V Project primarily consisted of development and teaching of training materials focused on robotic capabilities applicable to the Curiosity rover. The classes held and topics covered are described below.



Introduction to Robotics (August, 2011)

Topics: Fundamentals of robotics, NASA robotics technology plan, current & future robotic missions, International Space Station (ISS) Mobile Servicing System (MSS), robotics primer

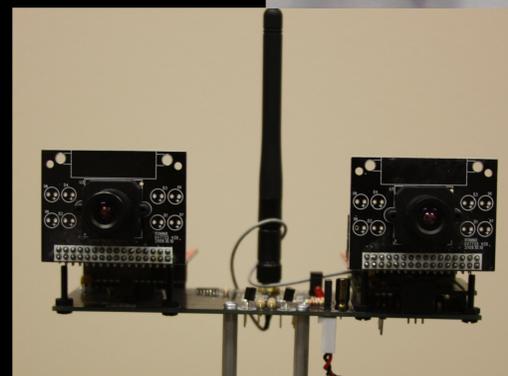
Lab: Robotic rover simulation (Swarm) & Tankbot teleoperation



MSL Mobility & Manipulation (November, 2011)

Topics: MSL robotic arm (forward kinematics, inverse kinematics, singularities, hardware architecture & components), MSL basic mobility navigation, engineering camera, surface systems behavior & coordination

Lab: Robotic arm forward & inverse kinematic control, Simulation of teleoperation (turn in place, arc steer control primitives, and programmed sequences)



MSL Stereo Vision & Visual Target Tracking (January, 2012)

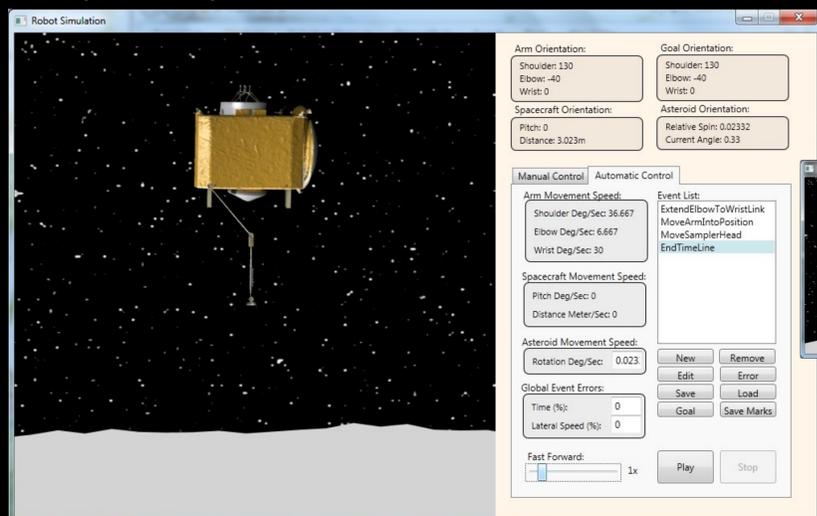
Topics: MSL autonomous navigation & traversal, visual odometry, slip detection, hazard avoidance, camera pointing, visual target tracking, target loss detection

Lab: Color tracking & stereo vision ranging

OSIRIS-REX

Origins Spectral Interpretation Resource Identification Security Regolith Explorer (OSIRIS-REx) is a NASA mission that will study and return a sample of an asteroid back to Earth.

To support the OSIRIS-REx IV&V project, the Robotics Team has developed and presented training materials focused on one of the most critical events of the mission, the "Touch-And-Go" (TAG) sample collection event. This training was used to enhance the IV&V analysts' knowledge prior to beginning their analysis, giving them the foundation and confidence to verify that the software for these systems will operate reliably and safely.



Touch-And-Go (TAG) Simulation

A 2-Dimensional simulation of the TAG event was developed to be used as a tool for the IV&V analysts to experiment and test the dynamics and kinematics involved with this critical mission objective.



Touch-And-Go Sample Acquisition Mechanism (TAGSAM) Physical Model

OSIRIS-REx uses a 3 degree of freedom robotic arm to obtain the regolith sample from the asteroid. To assist in understanding the TAGSAM and its kinematics, a scaled, manually controlled model was created.

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