**System for Contributing and Discovering Derived Mission and Science Data**

A system was developed to provide a new mechanism for members of the mission community to create and contribute new science data to the rest of the community. Mission tools have allowed members of the mission community to share first order data (data that is created by the mission’s process in command and control of the spacecraft or the data that is captured by the craft itself, like images, science results, etc.). However, second and higher order data (data that is created after the fact by scientists and other members of the mission) was previously not widely disseminated, nor did it make its way into the mission planning process.

This software allows members of the mission community to create and contribute second and higher order data into the set of mission data for use in planning and operations of a mission. This kind of data is indexed and treated in the same way as first order data. The data is discoverable by other users and can be part of the planning process. The system improves the ability to share results, make discoveries, and aid in the operations of a mission. At the time of this reporting, this capability was not available in other software.

This work was done by Michael N. Wallich, Mark W. Powell, Kawkia S. Shams, Megan C. Mickelson, Derrick M. Ohata, James A. Kurien, and Lucy Abramyan of Caltech. For more information, contact iaoffice@jpl.nasa.gov.

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48210.

**Reachability Maps for In Situ Operations**

This work covers two programs that accomplish the same goal: creation of a “reachability map” from stereo imagery that tells where operators of a robotic arm can reach or touch the surface, and with which instruments. The programs are “marsreach” (for MER) and “phreach.” These programs make use of the planetary image geometry (PIG) library. However, unlike the other programs, they are not multi-mission. Because of the complexity of arm kinematics, the programs are specific to each mission.

In each case, the input consists of XYZ and surface normal data. The output is a multiband image, co-registered to the input image. Each band represents a predefined combination of arm instrument and arm configuration (e.g., elbow up, elbow down), and the value indicates whether or not the instrument can observe (see or touch) the surface at the corresponding pixel.

This software models the arm precisely, using the same algorithms as the flight software. It is thus uniquely suited to determining reachability and safety of robot arm operations. The MER RAT instrument provides additional information beyond just a flag — it supplies a “preload” value, which indicates how much force the arm can apply at that spot. The MER reachability program considers collisions of the arm with terrain in determining reachability; the PHX program does not.