Software

3D Orbit Visualization for Earth-Observing Missions

This software visualizes orbit paths for the Orbiting Carbon Observatory (OCO), but was designed to be general and applicable to any Earth-observing mission. The software uses the Google Earth user interface to provide a visual mechanism to explore spacecraft orbit paths, ground footprint locations, and local cloud cover conditions. In addition, a drill-down capability allows for users to point and click on a particular observation frame to pop up ancillary information such as data product filenames and directory paths, latitude, longitude, time stamp, column-average dry air mole fraction of carbon dioxide, and solar zenith angle.

This software can be integrated with the ground data system for any Earth-observing mission to automatically generate daily orbit path data products in Google Earth KML format. These KML data products can be directly loaded into the Google Earth application for interactive 3D visualization of the orbit paths for each mission day. Each time the application runs, the daily orbit paths are encapsulated in a KML file for each mission day since the last time the application ran. Alternatively, the daily KML for a specified mission day may be generated.

The application automatically extracts the spacecraft position and ground footprint geometry as a function of time from a daily Level 1B data product created and archived by the mission's ground data system software. In addition, ancillary data, such as the column-averaged dry air mole fraction of carbon dioxide and solar zenith angle, are automatically extracted from a Level 2 mission data product. Zoom, pan, and rotate capability are provided through the standard Google Earth interface. Cloud cover is indicated with an image layer from the MODIS (Moderate Resolution Imaging Spectroradiometer) aboard the Aqua satellite, which is automatically retrieved from JPL's OnEarth Web service.

This work was done by Joseph C. Jacob, Lucian Plesea, Brian G. Chafin, and Barry H. Weiss of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-47316.

MaROS: Web Visualization of Mars Orbiting and Landed Assets

Mars Relay operations currently involve several e-mails and phone calls between lander and orbiter teams in order to settle on an agreed time for performing a communication pass between the landed asset (i.e. rover or lander) and orbiter, then back to Earth. This new application aims to reduce this complexity by presenting a visualization of the overpass time ranges and elevation angle, as well as other information. The user is able to select a specific overflight opportunity to receive further information about that particular pass.

This software presents a unified view of the potential communication passes available between orbiting and landed assets on Mars. Each asset is presented to the user in a graphical view showing overpass opportunities, elevation angle, requested and acknowledged communication windows, forward and back latencies, warnings, conflicts, relative planetary times, ACE Schedules, and DSN information.

This software is unique in that it is the first of its kind to visually display the information regarding communication opportunities between landed and orbiting Mars assets. The software is written using ActionScript/FLEX, a Web language, meaning that this information may be accessed over the Internet from anywhere in the world.

This work was done by Michael N. Wallick, Daniel A. Allard, Roy E. Gladden, and Franklin H. Hy of Caltech for NASA's Jet Propulsion Laboratory. 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-47413.

RAPID: Collaborative Commanding and Monitoring of Lunar Assets

RAPID (Robot Application Programming Interface Delegate) software utilizes highly robust technology to facilitate commanding and monitoring of lunar assets. RAPID provides the ability for inter-center communication, since these assets are developed in multiple NASA centers.

RAPID is targeted at the task of lunar operations; specifically, operations that deal with robotic assets, cranes, and astronaut spacesuits, often developed at different NASA centers. RAPID allows for a uniform way to command and monitor these assets. Commands can be issued to take images, and monitoring is done via telemetry data from the asset.

There are two unique features to RAPID: First, it allows any operator from any NASA center to control any NASA lunar asset, regardless of location. Second, by abstracting the native language for specific assets to a common set of messages, an operator may control and monitor any NASA lunar asset by being trained only on the use of RAPID, rather than the specific asset.

RAPID is easier to use and more powerful than its predecessor, the Astronaut Interface Device (AID). Utilizing the new robust middleware, DDS (Data Distribution System), developing in RAPID has increased significantly over the old middleware. The API is built upon the Java Eclipse Platform, which combined with DDS, provides platform-independent software architecture, simplifying development of RAPID components. As RAPID continues to evolve and new messages are being designed and implemented, operators for future lunar missions will have a rich environment for commanding and monitoring assets.

This work was done by Recaredo J. Torres, David S. Mittman, Mark W. Powell, Jeffrey S. Norris, Joseph C. Joswig, Thomas M. Crockett, Lucy Abramyan, Khawaja S. Shams, and Michael N. Wallick of Caltech; Mark Allan of Ames Research Center; and Robert Hirsh of Johnson Space Center for NASA's Jet Propulsion Laboratory. 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-46332.

Image Segmentation, Registration, Compression, and Matching

A novel computational framework was developed of a 2D affine invariant matching exploiting a parameter space. Named