

By utilizing an input file provided by the lander team, along with a managed configuration file, the MRO relay SASF/PTF generation software runs MRO's MTT (Mars Target Tool) software recursively to construct the Relay PTF. It also references these same input products to generate the SASFs needed to support the overflight. Each SASF has

all of the parameters and commanding required to instruct MRO to initiate the relay session and to configure the on-board radio to transfer data to and from the landed asset. In addition, the software performs version checking on the current input file and determines any modifications to the file from any previous version. If instructed, it will output

only that information which is relevant to the changed entries.

This work was done by Roy E. Gladden and Teerapat Khanampornpan of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-46512.

GlastCam: A Telemetry-Driven Spacecraft Visualization Tool

Goddard Space Flight Center, Greenbelt, Maryland

Developed for the GLAST project, which is now the Fermi Gamma-ray Space Telescope, GlastCam software ingests telemetry from the Integrated Test and Operations System (ITOS) and generates four graphical displays of geometric properties in real time, allowing visual assessment of the attitude, configuration, position, and various cross-checks. Four windows are displayed: a "cam" window shows a 3D view of the satellite; a second window shows the standard position plot of the

satellite on a Mercator map of the Earth; a third window displays star tracker fields of view, showing which stars are visible from the spacecraft in order to verify star tracking; and the fourth window depicts Sun sensor measurements, enabling verification of the solar array deployment state. Each of these windows has telltales showing useful information applicable to each window, such as spacecraft axes, magnetic field vectors, the Sun-pointing direction, and the like. These can be tog-

gled on or off as desired. By breaking up the data into applicable windows, it is easier to monitor specific data of interest. Because the displays operate in real time and visually, any changes to the spacecraft's configuration or attitude are seen immediately. This allows for fast and intuitive spacecraft geometry assessment.

This work was done by Eric T. Stoneking and Dean Tsai of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-15572-1

Robot Vision Library

NASA's Jet Propulsion Laboratory, Pasadena, California

The JPL Robot Vision Library (JPLV) provides real-time robot vision algorithms for developers who are not vision specialists. The package includes algorithms for stereo ranging, visual odometry and unsurveyed camera calibration, and has unique support for very wide-angle lenses (as used on the Mars Exploration Rover HazCams). JPLV gathers these algorithms into one uniform, documented, and tested package with a con-

sistent C API (application programming interface). The software is designed for real-time execution (10–20 Hz) on COTS (commercial, off-the-shelf) workstations and embedded processors.

This package incorporates algorithms developed over more than ten years of research in ground and planetary robotics for NASA, DARPA (Defense Advanced Research Projects Agency) and the Army Research Labs, and is cur-

rently being used in applications as diverse as legged vehicle navigation and large-scale urban modeling.

This work was done by Andrew B. Howard, Adnan I. Ansari, and Todd E. Litwin of Caltech and Steven B. Goldberg of Indelible Systems for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-46532.

Mission Operations and Navigation Toolkit Environment

NASA's Jet Propulsion Laboratory, Pasadena, California

MONTE (Mission Operations and Navigation Toolkit Environment) Release 7.3 is an extensible software system designed to support trajectory and navigation analysis/design for space missions. MONTE is intended to replace the current navigation and trajectory analysis

software systems, which, at the time of this reporting, are used by JPL's Navigation and Mission Design section. The software provides an integrated, simplified, and flexible system that can be easily maintained to serve the needs of future missions in need of navigation services.

MONTE has an integrated case management system that allows users to create taxonomies to describe and categorize runs. It has the ability to plot and display multiple cases and scenarios simultaneously, using color to differentiate, allowing for side-by-side analysis. Users can define

their own plots with minimal effort, and can gain access to all of the features of the case management system. Users can also define their own models (including gravitational and non-gravitational force models), types of measurement, and optimizers, using software hooks that are made available in the scripting layer of the tool. This enables users to extend the functionality of MONTE without restriction.

MONTE provides maneuver optimization as well as re-optimization capability that includes support for particular constraints, such as cones and directions. The software has integrated support to help satisfy planetary quarantine requirements.

This work was done by Richard F. Sunseri, Hsi-Cheng Wu, Robert A. Hanna, Michael P. Mossey, Courtney B. Duncan, Scott E. Evans,

James R. Evans, Theodore R. Drain, Michelle M. Guevara, Tomas J. Martin Mur, and Ahlam A. Attiyah of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-46083.

➤ Extensible Infrastructure for Browsing and Searching Abstracted Spacecraft Data

NASA's Jet Propulsion Laboratory, Pasadena, California

A computer program has been developed to provide a common interface for all space mission data, and allows different types of data to be displayed in the same context. This software provides an infrastructure for representing any type of mission data. Existing software requires that each type of mission data be treated separately. The new program's representations provide identifying information, and provide a means

of opening the data for further inspection. This is useful for searching and browsing large quantities of data across multiple databases.

The software is written in Java as part of the MSLICE program, and can be run on any Windows, Mac OS, or Linux computer. The software may be adapted to other mission operation software.

This work was done by Michael N. Wallick, Thomas M. Crockett, Joseph C. Joswig,

Recaredo J. Torres, Jeffrey S. Norris, Jason M. Fox, Mark W. Powell, David S. Mittman, Lucy Abramyan, Khawaja S. Shams, and Michael B. Vaughn of Caltech and Guy Pyrzak and Melissa Ludowise of Ames Research Center for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-46397.

➤ Lossless Compression of Data Into Fixed-Length Packets

NASA's Jet Propulsion Laboratory, Pasadena, California

A computer program effects lossless compression of data samples from a one-dimensional source into fixed-length data packets. The software makes use of adaptive prediction: it exploits the data structure in such a way as to increase the efficiency of compression beyond that otherwise achievable.

Adaptive linear filtering is used to predict each sample value based on past sample values. The difference between predicted and actual sample values is encoded using a Golomb code. The particular Golomb code used is selected using a

method described in "Simpler Adaptive Selection of Golomb Power-of-Two Codes" (NPO-41336), *NASA Tech Briefs*, Vol. 31, No. 11 (November 2007), page 71. As noted therein, the method is somewhat suboptimal (suboptimality $\leq 1/2$ bit per sample) but offers the advantage that it involves significantly less computation than does a prior method of adaptive selection of optimum codes through "brute force" application of all code options to every block of samples. Hence, the computer program is relatively simple and produces packets relatively rapidly.

The method and, hence, the program are robust to loss of packets: All parameters needed to decompress a packet are encoded in the packet. Therefore, the loss of one or more packets does not diminish the ability to reconstruct samples in remaining packets.

This work was done by Aaron B. Kieley and Matthew A. Klimesh of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-45942.

➤ Video-Game-Like Engine for Depicting Spacecraft Trajectories

NASA's Jet Propulsion Laboratory, Pasadena, California

GoView is a video-game-like software engine, written in the C and C++ computing languages, that enables real-time, three-dimensional (3D)-appearing visual representation of spacecraft and trajectories (1)

from any perspective; (2) at any spatial scale from spacecraft to Solar-system dimensions; (3) in user-selectable time scales; (4) in the past, present, and/or future; (5) with varying speeds; and (6) for-

ward or backward in time. GoView constructs an interactive 3D world by use of spacecraft-mission data from pre-existing engineering software tools. GoView can also be used to produce distributable ap-