



Software

Marsviewer 2008

Marsviewer 2008 is designed for quality control, browsing, and operational and science analysis of images and derived image products returned by spacecraft. This program allows all derived products (reduced data records, or RDRs) associated with each original image (experiment data record, or EDR) to be viewed in various ways, including in stereo, depending on the type of image.

The program features a pluggable interface called a “file finder.” This encapsulates knowledge of a specific mission’s filename and directory conventions, hiding the complexity behind each mission from the user, and allowing new missions to be added easily. Within a mission, different directory conventions can also be supported. This file-finder interface presents a similar interface to the user for all these missions and directory structures. All EDRs found for a given Sol are displayed in a list (optionally with thumbnail images) for the user to pick from.

Once an image is picked, a primary (vertical) tab pane allows the user to select the left or right image, left or right thumbnail, or stereo views. A secondary (horizontal) tab pane allows the EDR, or any of its RDRs, to be viewed. Most RDRs may be viewed independently, or as colored overlays on a background image. Each of the 41 RDR types has a display method appropriate for that type, and most have display parameters that can be adjusted.

The program understands two different image geometries (raw and linearized), and can show the actual pixel values under the cursor for every EDR and RDR matching the geometry type at once. Various display manipulations, such as zoom, data range, contrast enhancement, interval selection, and contour controls are available. Metadata (image labels) may be displayed and searched as well. The stereo display shows both left and right images simultaneously. It works either in anaglyph mode (red/blue glasses), or by using dedicated display hardware.

This innovation also covers the applications “jadeviewer” and “jade_overlay,” which are closely related derivatives from Marsviewer. The “jadeviewer”

application reuses the image display and visualization portions of Marsviewer without the file finder. The user directly specifies filenames and RDR type, and can then view the product as with Marsviewer.

This work was done by Nicholas T. Toole and Robert G. Deen of Caltech for NASA’s Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov.

The software used in this innovation is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-46698.

Mission Services Evolution Center Message Bus

The Goddard Mission Services Evolution Center (GMSEC) Message Bus is a robust, lightweight, fault-tolerant middleware implementation that supports all messaging capabilities of the GMSEC API, including publish/subscribe and request/reply. The Message Bus enables NASA to provide an open-source middleware solution, for no additional cost, that is self-configuring, easy to install, and can be used for the development of GMSEC-compliant components. Some professional capabilities provided by this software include failover and fault tolerance, good performance, compression, debugging, and wide platform support.

This architecture is a distributed software system that routes messages based on message subject names and knowledge of the locations in the network of the interested software components. Functional software components register with the message bus, so that a location directory can be maintained. The functional applications then send messages onto the bus with an indication of the message type/subject/etc. Other applications that want to receive data register with the message bus and indicate what message types/subjects they want to receive. The message bus maintains a routing table where routes publish messages to the applications that have requested them. One message may be delivered to many different applications. Use of the message bus eliminates the need for each application to create separate communications paths with each application to which it interfaces.

The nature of the GMSEC Message Bus enables any project or user to quickly take the initial steps for creating or connecting GMSEC-compliant components, and for developing small systems without high license fees and learning curves. This software uses middleware to facilitate cross application or component communication on a software bus.

This work was done by Arturo Mayorga and John O. Bristow of Goddard Space Flight Center and Mike Butschky of Interface and Control Systems. Further information is contained in a TSP (see page 1). GSC-15575-1

Major Constituents Analysis for the Vehicle Cabin Atmosphere Monitor

Vehicle Cabin Atmosphere Monitor (VCAM) can provide a means for monitoring the air within enclosed environments such as the International Space Station, the Crew Exploration Vehicle (CEV), a Lunar habitat, or another vehicle traveling to Mars. Its miniature pre-concentrator, gas chromatograph (GC), and mass spectrometer can provide unbiased detection of a large number of organic species. VCAM’s software can identify whether the chemicals are on a targeted list of hazardous compounds and their concentration. Its performance and reliability on orbit, along with the ground team’s assessment of its raw data and analysis results, will validate its technology for future use and development.

The software processes a sum total spectra (counts vs. mass channel) with the intention of computing abundance ratios for N₂, O₂, CO₂, Ar₂, and H₂O. A brute-force powerset expansion compares a library of expected mass lines with those found within the data. Least squares error is combined with a penalty term for using small peaks. This permits calibration even in the presence of unexpected/unknown system contamination or unknown/novel ratios of atmospheric constituents.

Automated, reliable mass calibration is a substantial improvement beyond other comparable systems. A method of compensation for variable response component spectra has been utilized via a weighted sum based on the central peak for each expected component.