Software

EOS MLS Level 1B Data Processing, Version 2.2

A computer program performs level-1B processing (the term "1B" is explained below) of data from observations of the limb of the Earth by the Earth Observing System (EOS) Microwave Limb Sounder (MLS), which is an instrument aboard the Aura spacecraft. This software accepts, as input, the raw EOS MLS scientific and engineering data and the Aura spacecraft ephemeris and attitude data. Its output consists of calibrated instrument radiances and associated engineering and diagnostic data. [This software is one of several computer programs, denoted product generation executives (PGEs), for processing EOS MLS data. Starting from level 0 (representing the aforementioned raw data, the PGEs and their data products are denoted by alphanumeric labels (e.g., 1B and 2) that signify the successive stages of processing.]

At the time of this reporting, this software is at version 2.2 and incorporates improvements over a prior version that make the code more robust, improve calibration, provide more diagnostic outputs, improve the interface with the Level 2 PGE, and effect a 15-percent reduction in file sizes by use of data compression.

This program was written by Vincent Perun, Robert Jarnot, Herbert Pickett, Richard Cofield, Michael Schwartz, and Paul Wagner for 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-44841.

Auto-Generated Semantic Processing Services

Auto-Generated Semantic Processing (AGSP) Services is a suite of software tools for automated generation of other computer programs, denoted cross-platform semantic adapters, that support interoperability of computer-based communication systems that utilize a variety of both new and legacy communication software running in a variety of operating-system/computer-hardware combinations. AGSP has numerous potential uses in military, space-exploration, and other government applications as well as in commercial telecommunications. The cross-platform semantic adapters take advantage of common features of computer-based communication systems to enforce semantics, messaging protocols, and standards of processing of streams of binary data to ensure integrity of data and consistency of meaning among interoperating systems.

The auto-generation aspect of AGSP Services reduces development time and effort by emphasizing specification and minimizing implementation: In effect, the design, building, and debugging of software for effecting conversions among complex communication protocols, custom device mappings, and unique data-manipulation algorithms is replaced with metadata specifications that map to an abstract platform-independent communications model. AGSP Services is modular and has been shown to be easily integrable into new and legacy NASA flight and ground communication systems.

This program was written by Rodney Davis and Greg Hupf of Command and Control Technologies Corp. for Kennedy Space Center. For further information, contact:

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Inquiries concerning rights for the commercial use of this invention should be addressed to the Kennedy Innovative Partnerships Office at (321) 861-7158. Refer to KSC-13072.

Geospatial Authentication

A software package that has been designed to allow authentication for determining if the rover(s) is/are within a set of boundaries or a specific area to access critical geospatial information by using GPS signal structures as a means to authenticate mobile devices into a network wirelessly and in real-time has been developed. The advantage lies in that the system only allows those with designated geospatial boundaries or areas into the server.

The Geospatial Authentication software has two parts — Server and Client. The server software is a virtual private network (VPN) developed in Linux operating system using Perl programming language. The server can be a stand-alone VPN server or can be combined with other applications and services. The client software is a GUI Windows CE software, or Mobile Graphical Software, that allows users to authenticate into a network. The purpose of the client software is to pass the needed satellite information to the server for authentication.

This work was done by Stacey D. Lyle of Geospatial Research Innovation Design for NASA's Stennis Space Center.

Inquiries concerning rights for its commercial use should be addressed to:

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Refer to SSC-00282, volume and number of this NASA Tech Briefs *issue, and the page number*

Maneuver Automation Software

The Maneuver Automation Software (MAS) automates the process of generating commands for maneuvers to keep the spacecraft of the Cassini-Huygens mission on a predetermined prime mission trajectory. Before MAS became available, a team of approximately 10 members had to work about two weeks to design, test, and implement each maneuver in a process that involved running many maneuver-related application programs and then serially handing off data products to other parts of the team. MAS enables a three-member team to design, test, and implement a maneuver in about one-half hour after Navigation has process-tracking data. MAS accepts more than 60 parameters and 22 files as input directly from users.

MAS consists of Practical Extraction and Reporting Language (PERL) scripts that link, sequence, and execute the maneuver-related application programs: "Pushing a single button" on a graphical user interface causes MAS to run navigation programs that design a maneuver; programs that create sequences of commands to execute the maneuver on the spacecraft; and a program that generates predictions about maneuver performance and generates reports and other files that enable users to quickly review and verify

the maneuver design. MAS can also generate presentation materials, initiate electronic command request forms, and archive all data products for future reference.

This program was written by Hal Uffelman, Troy Goodson, Michael Pellegrin, Lynn Stavert, Thomas Burk, David Beach, Joel Signorelli, Jeremy Jones, Yungsun Hahn, Ahlam Attiyah, and Jeannette Illsley 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-42137.

Event Driven Messaging With Role-Based Subscriptions

Event Driven Messaging with Role-Based Subscriptions (EDM-RBS) is a framework integrated into the Service Management Database (SMDB) to allow for role-based and subscription-based delivery of synchronous and asynchronous messages over JMS (Java Messaging Service), SMTP (Simple Mail Transfer Protocol), or SMS (Short Messaging Service). This allows for 24/7 operation with users in all parts of the world. The software classifies messages by triggering data type, application source, owner of data triggering event (mission), classification, sub-classification and various other secondary classifying tags. Messages are routed to applications or users based on subscription rules using a combination of the above message attributes.

This program provides a framework for identifying connected users and their applications for targeted delivery of messages over JMS to the client applications the user is logged into. EDM-RBS provides the ability to send notifications over e-mail or pager rather than having to rely on a live human to do it. It is implemented as an Oracle application that uses Oracle relational database management system intrinsic functions. It is configurable to use Oracle AQ JMS API or an external JMS provider for messaging. It fully integrates into the event-logging framework of SMDB (Subnet Management Database).

EDB-RBS is currently integrated into the SMDB component of the Service Preparation Subsystem of the DSN (Deep Space Network). Users worldwide rely on this service for notification confirming acceptance or denial of submitted products in support of mission tracking activities. DSN operations rely on this service for asynchronous notifications of problems needing human intervention. This innovation is a core service supporting the concept of lights-out operations and operations with human intervention by exception, a plan to improve the level of service while reducing operations costs.

This work was done by Tung Bui, Bach Bui, Shantanu Malhotra, Fannie Chen, Rachel Kim, Christopher Allen, Ivy Luong, George Chang, and Silvino Zendejas of Caltech and Syed Sadaqathulla of Raytheon for NASA's Jet Propulsion Laboratory.

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Refer to NPO-45015, volume and number of this NASA Tech Briefs *issue, and the page number.*

Estimating Relative Positions of Outer-Space Structures

A computer program estimates the relative position and orientation of two structures from measurements, made by use of electronic cameras and laser range finders on one structure, of distances and angular positions of fiducial objects on the other structure. The program was written specifically for use in determining errors in the alignment of large structures deployed in outer space from a space shuttle.

The program is based partly on equations for transformations among the various coordinate systems involved in the measurements and on equations that account for errors in the transformation operators. It computes a least-squares estimate of the relative position and orientation. Sequential least-squares estimates, acquired at a measurement rate of 4 Hz, are averaged by passing them through a fourth-order Butterworth filter. The program is executed in a computer aboard the space shuttle, and its position and orientation estimates are displayed to astronauts on a graphical user interface.

This program was written by Harry Balian, William Breckenridge, and Paul Brugarolas 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-45071.