Software

Further Improvement in 3DGRAPE

"3DGRAPE/AL:V2" denotes version 2 of the Three-Dimensional Grids About Anything by Poisson's Equation with Upgrades from Ames and Langley computer program. The preceding version, 3DGRAPE/AL, was described in "Improved 3DGRAPE" (ARC-14069) *NASA Tech Briefs*, Vol. 21, No. 5 (May 1997), page 66. These programs are so named because they generate volume grids by iteratively solving Poisson's Equation in three dimensions. The grids generated by the various versions of 3DGRAPE have been used in computational fluid dynamics (CFD). The main novel feature of 3DGRAPE/AL:V2 is the incorporation of an optional scheme in which anisotropic Lagrange-based trans-finite interpolation (ALBTFI) is coupled with exponential decay functions to compute and blend interior source terms. In the input to 3DGRAPE/AL:V2 the user can specify whether or not to invoke ALBTFI in combination with exponential-decay controls, angles, and cell size for controlling the character of grid lines. Of the known programs that solve elliptic partial differential equations for generating grids, 3DGRAPE/AL:V2 is the only code that offers a combination of speed and versatility with most options for controlling the densities and other characteristics of grids for CFD.

This program was written by Stephen Alter of **Langley Research Center**. *Further information is contained in a TSP (see page 1).*
LAR-16415

Ground Support Software for Spaceborne Instrumentation

ION is a system of ground support software for the ion and neutral mass spectrometer (INMS) instrument aboard the Cassini spacecraft. By incorporating commercial off-the-shelf database, Web server, and Java application components, ION offers considerably more ground-support-service capability than was available previously. A member of the team that operates the INMS or a scientist who uses the data collected by the INMS can gain access to most of the services provided by ION via a standard point-and click hyperlink interface generated

by almost any Web-browser program running in almost any operating system on almost any computer. Data are stored in one central location in a relational database in a non-proprietary format, are accessible in many combinations and formats, and can be combined with data from other instruments and spacecraft. The use of the Java programming language as a system-interface language offers numerous capabilities for object-oriented programming and for making the database accessible to participants using a variety of computer hardware and software.

This program was written by Vincent Anicich, Rob Thorpe, Greg Fletcher, Hunter Waite, Julia Xu, Erin Walter, Kristie Frick, Greg Farris, Dave Gell, Jufy Furman, Butch Carruth, and John Parejko 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 Don Hart of the California Institute of Technology at (818) 393-3425. Refer to NPO-40282.

MER SPICE Interface

MER SPICE Interface is a software module for use in conjunction with the Mars Exploration Rover (MER) mission and the SPICE software system of the Navigation and Ancillary Information Facility (NAIF) at NASA's Jet Propulsion Laboratory. (SPICE is used to acquire, record, and disseminate engineering, navigational, and other ancillary data describing circumstances under which data were acquired by spaceborne scientific instruments.) Given a Spacecraft Clock value, MER SPICE Interface extracts MER-specific data from SPICE kernels (essentially, raw data files) and calculates values for Planet Day Number, Local Solar Longitude, Local Solar Elevation, Local Solar Azimuth, and Local Solar Time (UTC). MER SPICE Interface was adapted from a subroutine, denoted m98SpiceIF written by Payam Zamani, that was intended to calculate SPICE values for the Mars Polar Lander. The main difference between MER SPICE Interface and m98SpiceIf is that MER SPICE Interface does not explicitly call CHRONOS, a time-conversion program that is part of a library of utility subprograms within SPICE. Instead, MER SPICE Interface mimics some portions of the CHRONOS

code, the advantage being that it executes much faster and can efficiently be called from a pipeline of events in a parallel processing environment.

This program was written by Elias Sayfi of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1)..*

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Simulating Operation of a Planetary Rover

Rover Analysis, Modeling, and Simulations (ROAMS) is a computer program that simulates the operation of a robotic vehicle (rover) engaged in exploration of a remote planet. ROAMS is a rover-specific extension of the DARTS and Dshell programs, described in prior *NASA Tech Briefs* articles, which afford capabilities for mathematical modeling of the dynamics of a spacecraft as a whole and of its instruments, actuators, and other subsystems. ROAMS incorporates mathematical models of kinematics and dynamics of rover mechanical subsystems, sensors, interactions with terrain, solar panels and batteries, and onboard navigation and locomotion-control software. ROAMS provides a modular simulation framework that can be used for analysis, design, development, testing, and operation of rovers. ROAMS can be used alone for system performance and trade studies. Alternatively, ROAMS can be used in an operator-in-the-loop or flight-software closed-loop environment. ROAMS can also be embedded within other software for use in analysis and development of algorithms, or for Monte Carlo studies, using a variety of terrain models, to generate performance statistics. Moreover, taking advantage of real-time features of the underlying DARTS/Dshell simulation software, ROAMS can also be used for real-time simulations.

This program was written by Abhinandan Jain, Jeng Yen, Garrett Sohl, Robert Steele, and J. Balaram 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 Don Hart of the California Institute of Technology at (818) 393-3425. Refer to NPO-30722.