Software

Software For Displaying Data From Planetary Rovers

Science Activity Planner (SAP) DownlinkBrowser is a computer program that assists in the visualization of processed telemetric data [principally images, image cubes (that is, multispectral images), and spectra] that have been transmitted to Earth from exploratory robotic vehicles (rovers) on remote planets. It is undergoing adaptation to (1) the Field Integrated Design and Operations (FIDO) rover (a prototype Mars-exploration rover operated on Earth as a test bed) and (2) the Mars Exploration Rover (MER) mission. This program has evolved from its predecessor — the Web Interface for Telescience (WITS) software — and surpasses WITS in the processing, organization, and plotting of data. SAP DownlinkBrowser creates Extensible Markup Language (XML) files that organize data files, on the basis of content, into a sortable, searchable product database, without the overhead of a relational database. The data-display components of SAP DownlinkBrowser (descriptively named ImageView, 3DView, OrbitalView, PanoramaView, ImageCubeView, and SpectrumView) are designed to run in a memory footprint of at least 256MB on computers that utilize the Windows, Linux, and Solaris operating systems.

This program was written by Mark Powell, Paul Backes, Jeffrey Norris, Marsette Vona, and Robert Steinke 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-30673.

Software for Refining or Coarsening Computational Grids

A computer program performs calculations for refinement or coarsening of computational grids of the type called "structured" (signifying that they are geometrically regular and/or are specified by relatively simple algebraic expressions). This program is designed to facilitate analysis of the numerical effects of changing structured grids utilized in computational fluid dynamics (CFD) software. Unlike prior grid-refinement and -coarsening programs, this program is not limited to doubling or halving: the user can specify any refinement or coarsening ratio, which can have a noninteger value. In addition to this ratio, the program accepts, as input, a grid file and the associated restart file, which is basically a file containing the most recent iteration of flow-field variables computed on the grid. The program then refines or coarsens the grid as specified, while maintaining the geometry and the stretching characteristics of the original grid. The program can interpolate from the input restart file to create a restart file for the refined or coarsened grid. The program provides a graphical user interface that facilitates the entry of input data for the grid-generation and restart-interpolation routines.

This program was written by Russell Daines and Jody Woods of Lockheed Martin Corp. for **Stennis Space Center**.

Inquiries concerning rights for the commercial use of this invention should be addressed to the Intellectual Property Manager, Stennis Space Center, (228) 688-1929. Refer to SSC-00167.

Software for Diagnosis of Multiple Coordinated Spacecraft

Distributed Real-Time Model-Based Diagnosis (DRMD) is a computer program for diagnosing faults in multiple spacecraft cooperating in a specific task (e.g., flying in formation to constitute an interferometer). DRMD takes advantage of both (1) the superiority of model-based software for representing complex hardware systems (though not necessarily for making diagnoses in real time) and (2) the ability of rule-based software to provide diagnoses in real time. A multiple-spacecraft system is modeled as a set of interacting subsystems that comprise interacting components, each of which operates in one of a number of modes that define the relationships between its inputs and outputs. Then diagnosis is performed following a knowledge-compilation approach implemented in a three-step process: (1) A representation of the system is expanded into a network of processed components at compilation time; (2) a Boolean equation for the system is constructed at compilation time; and (3) the equation is evaluated iteratively at run time. The programming language used to express the model of the system defines observables and commands local to each subsystem, thereby facilitating the distribution of portions of the Boolean equation to multiple computers on the multiple spacecraft.

This program was written by Anthony Barrett of Caltech and Seung Chung of MIT 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-30876.

Software Helps Retrieve Information Relevant to the User

The Adaptive Indexing and Retrieval Agent (ARNIE) is a code library, designed to be used by an application program, that assists human users in retrieving desired information in a hypertext setting. Using ARNIE, the program implements a computational model for interactively learning what information each human user considers relevant in context. The model, called a "relevance network," incrementally adapts retrieved information to users' individual profiles on the basis of feedback from the users regarding specific queries. The model also generalizes such knowledge for subsequent derivation of relevant references for similar queries and profiles, thereby, assisting users in filtering information by relevance. ARNIE thus enables users to categorize and share information of interest in various contexts. ARNIE encodes the relevance and structure of information in a neural network dynamically configured with a genetic algorithm. ARNIE maintains an internal database, wherein it saves associations, and from which it returns associated items in response to a query. A C++ compiler for a platform on which ARNIE will be utilized is necessary for creating the