Facilitating Navigation Through Large Archives

Automated Visual Access (AVA) is a computer program that effectively makes a large collection of information visible in a manner that enables a user to quickly and efficiently locate information resources, with minimal need for conventional keyword searches and perusal of complex hierarchical directory systems. AVA includes three key components: (1) a taxonomy that comprises a collection of words and phrases, clustered according to meaning, that are used to classify information resources; (2) a statistical indexing and scoring engine; and (3) a component that generates a graphical user interface that uses the scoring data to generate a visual map of resources and topics. The top level of an AVA display is a pictorial representation of an information archive. The user enters the depicted archive by either clicking on a depiction of subject area cluster, selecting a topic from a list, or entering a query into a text box. The resulting display enables the user to view candidate information entities at various levels of detail. Resources are grouped spatially by topic with greatest generality at the top layer and increasing detail with depth. The user can zoom in or out of specific sites or into greater or lesser content detail.

This program was written by Robert O. Shelton of Johnson Space Center, Stephanie L. Smith of LinCom, and Dat Truong and Terry R. Hodgson of Science Applications International Corp.

The code is copyrighted and is available for licensing. For further information, contact the Johnson Technology Transfer Office at (281) 483-3809. MSC-23542

Software

Program for Weibull Analysis of Fatigue Data

A Fortran computer program has been written for performing statistical analyses of fatigue-test data that are assumed to be adequately represented by a two-parameter Weibull distribution. This program calculates the following:

- Maximum-likelihood estimates of the Weibull distribution;
- Data for contour plots of relative likelihood for two parameters;
- Data for contour plots of joint confidence regions;
- Data for the profile likelihood of the Weibull-distribution parameters;
- Data for the profile likelihood of any percentile of the distribution; and
- Likelihood-based confidence intervals for parameters and/or percentiles of the distribution.

The program can account for tests that are suspended without failure (the statistical term for such suspension of tests is “censoring”). The analytical approach followed in this program for the software is valid for type-I censoring, which is the removal of unfailed units at pre-specified times. Confidence regions and intervals are calculated by use of the likelihood-ratio method.

This program was written by Timothy L. Krantz of the Vehicle Technology Center of the U.S. Army Research Laboratory for Glenn Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Commercial Technology Office, Attn: Steve Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-17495-1.

Component-Based Visualization System

A software system has been developed that gives engineers and operations personnel with no “formal” programming expertise, but who are familiar with the Microsoft Windows operating system, the ability to create visualization displays to monitor the health and performance of aircraft/spacecraft. This software system is currently supporting the X38 V201 spacecraft component/system testing and is intended to give users the ability to create, test, deploy, and certify their subsystem displays in a fraction of the time that it would take to do so using previous software and programming methods. Within the visualization system there are three major components: the developer, the deployer, and the widget set. The developer is a blank canvas with widget menu items that give users the ability to easily create displays. The deployer is an application that allows for the deployment of the displays created using the developer application. The deployer has additional functionality that the developer does not have, such as printing of displays, screen captures to files, windowing of displays, and also serves as the interface into the documentation archive and help system. The third major component is the widget set. The widgets are the visual representation of the items that will make up the display (i.e., meters, dials, buttons, numerical indicators, string indicators, and the like). This software was developed using Visual C++ and
The LabVIEW virtual instrument (VI) provides graphical interfaces to support all (1) SpaceWire link functions, including message handling and routing; (2) monitoring as a passive “tap” using specialized hardware; and (3) low-level access to satellite mission-control subsystem functions. The software is supplied in a zip file that contains LabVIEW VI files, which provide various functions of the PCI-SpaceWire card, as well as higher-level functions. The VIs are suitably named according to the matching function names in the driver manual. A number of test programs also are provided to exercise various functions.

This work was done by James Lux, Frank Loya, and Alex Bachmann 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 Karina Edmonds of the California Institute of Technology at (818) 393-2827. Refer to NPO-40703.

Path Following With Slip Compensation for a Mars Rover

A software system for autonomous operation of a Mars rover is composed of several key algorithms that enable the rover to accurately follow a designated path, compensate for slippage of its wheels on terrain, and reach intended goals. The techniques implemented by the algorithms are visual odometry, full vehicle kinematics, a Kalman filter, and path following with slip compensation. The visual-odometry algorithm tracks distinctive scene features in stereo imagery to estimate rover motion between successively acquired stereo image pairs, by use of a maximum-likelihood motion-estimation algorithm. The full-vehicle kinematics algorithm estimates motion, with a no-slip assumption, from measured wheel rates, steering angles, and angles of rockers and bogies in the rover suspension system. The Kalman filter merges data from an inertial measurement unit (IMU) and the visual-odometry algorithm. The merged estimate is then compared to the kinematic estimate to determine whether and how much slippage has occurred. The kinematic estimate is used to complement the Kalman-filter estimate if no statistically significant slippage has occurred. If slippage has occurred, then a slip vector is calculated by subtracting the current Kalman filter estimate from the kinematic estimate. This slip vector is then used, in conjunction with the inverse kinematics, to determine the wheel velocities and steering angles needed to compensate for slip and follow the desired path.

This work was done by Daniel Helmich, Yang Cheng, Daniel Clouse, Larry Matthies, and Stergios Roumeliotis 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 Karina Edmonds of the California Institute of Technology at (818) 393-2827. Refer to NPO-40703.

LabVIEW Interface for PCI-SpaceWire Interface Card

This software provides a LabView interface to the NT drivers for the PCI-SpaceWire card, which is a peripheral component interface (PCI) bus interface that conforms to the IEEE-1395/SpaceWire standard. As SpaceWire grows in popularity, the ability to use SpaceWire links within LabVIEW will be important to electronic ground support equipment vendors. In addition, there is a need for a high-level LabVIEW interface to the low-level device-driver software supplied with the card.