Software

PPC750 Performance Monitor

The PPC750 Performance Monitor (Perfmon) is a computer program that helps the user to assess the performance characteristics of application programs running under the Wind River VxWorks real-time operating system on a PPC750 computer. Perfmon generates a user-friendly interface and collects performance data by use of performance registers provided by the PPC750 architecture. It processes and presents run-time statistics on a per-task basis over a repeating time interval (typically, several seconds or minutes) specified by the user.

When the Perfmon software module is loaded with the user's software modules, it is available for use through Perfmon commands, without any modification of the user's code and at negligible performance penalty. Per-task run-time performance data made available by Perfmon include percentage time, number of instructions executed per unit time, dispatch ratio, stack "high water" mark, and level-1 instruction and data cache miss rates. The performance data are written to a file specified by the user or to the serial port of the computer.

This program was written by Donald Meyer and Igor Uchenik 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 (626) 395-2322. Refer to NPO-35237.

Application-Program-Installer Builder

A computer program builds application programming interfaces (APIs) and related software components for installing and uninstalling application programs in any of a variety of computers and operating systems that support the Java programming language in its binary form. This program is partly similar in function to commercial (e.g., InstallShield) software. This program is intended to enable satisfaction of a quasi-industry-standard set of requirements for a set of APIs that would enable such installation and uninstallation and that would avoid the pitfalls that are commonly encountered during installation of software. The requirements include the following:

- Properly detecting prerequisites to an application program before performing the installation;
- Properly registering component requirements;
- Correctly measuring the required hard-disk space, including accounting for prerequisite components that have already been installed; and
- Correctly uninstalling an application program. Correct uninstallation includes (1) detecting whether any component of the program to be removed is required by another program, (2) not removing that component, and (3) deleting references to requirements of the to-be-removed program for components of other programs so that those components can be properly removed at a later time.

This program was written by Paul Wolgast and Martha Demore of Caltech and Paul Lovvik of Sun Microsystems 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 (626) 395-2322. Refer to NPO-30778.

Using Visual Odometry to Estimate Position and Attitude

A computer program in the guidance system of a mobile robot generates estimates of the position and attitude of the robot, using features of the terrain on which the robot is moving, by processing digitized images acquired by a stereoscopic pair of electronic cameras mounted rigidly on the robot. Developed for use in localizing the Mars Exploration Rover (MER) vehicles on Martian terrain, the program can also be used for similar purposes on terrestrial robots moving in sufficiently visually textured environments: examples include low-flying robotic aircraft and wheeled robots moving on rocky terrain or inside buildings.

In simplified terms, the program automatically detects visual features and tracks them across stereoscopic pairs of images acquired by the cameras. The 3D locations of the tracked features are then robustly processed into an estimate of overall vehicle motion. Testing has shown that by use of this software, the error in the estimate of the position of the robot can be limited to no more than 2 percent of the distance traveled, provided that the terrain is sufficiently rich in features. This software has proven extremely useful on the MER vehicles during driving on sandy and highly sloped terrains on Mars.

This program was written by Mark Maimone, Yang Cheng, Larry Matthies, Marcel Schoppers, and Clark Olson 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-41886.

Design and Data Management System

The Design and Data Management System (DDMS) was developed to automate the NASA Engineering Order (EO) and Engineering Change Request (ECR) processes at the Propulsion Test Facilities at Stennis Space Center for efficient and effective Configuration Management (CM). Prior to the development of DDMS, the CM system was a manual, paper-based system that required an EO or ECR submitter to walk the changes through the acceptance process to obtain necessary approval signatures. This approval process could take up to two weeks, and was subject to a variety of human errors. The process also requires that the CM office make copies and distribute them to the Configuration Control Board members for review prior to meetings. At any point, there was a potential for an error or loss of the change records, meaning the configuration of record was not accurate.

The new Web-based DDMS eliminates unnecessary copies, reduces the time needed to distribute the paperwork, reduces time to gain the necessary signatures, and prevents the variety of errors inherent in the previous manual system. After implementation of the DDMS, all EOs and ECRs can be automatically checked prior to submittal to ensure that

the documentation is complete and accurate. Much of the configuration information can be documented in the DDMS through pull-down forms to ensure consistent entries by the engineers and technicians in the field.

The software also can electronically route the documents through the signature process to obtain the necessary approvals needed for work authorization. The workflow of the system allows for backups and timestamps that determine the correct routing and completion of all required authorizations in a more timely manner, as well as assuring the quality and accuracy of the configuration documents.

This program was written by Elizabeth Messer and Brad Messer of Stennis Space Center, Judy Carter of Computer Sciences Corp., Todd Singletary of Lockheed Martin, Colby Albasini of SAITECH, and Tammy Smith of ERC Incorporated.

Inquiries concerning rights for the commercial use of this invention should be addressed to the Intellectual Property Manager at Stennis Space Center (228) 688-1929. Refer to SSC-00208-1, volume and number of this NASA Tech Briefs *issue, and the page number.*

Simple, Script-Based Science Processing Archive

The Simple, Scalable, Script-based Science Processing (S4P) Archive (S4PA) is a disk-based archival system for remote-sensing data. It is based on the data-driven framework of S4P and is used for data transfer, data preprocessing, metadata generation, data archive, and data distribution. New data are automatically detected by the system.

S4P provides services such as data access control, data subscription, metadata publication, data replication, and data recovery. It comprises scripts that control the data flow. The system detects the availability of data on an FTP (file transfer protocol) server, initiates data transfer, preprocesses data if necessary, and archives it on readily available disk drives with FTP and HTTP (Hypertext Transfer Protocol) access, allowing instantaneous data access. There are options for plug-ins for data preprocessing before storage. Publication of metadata to external applications such as the Earth Observing System Clearinghouse (ECHO) is also supported.

S4PA includes a graphical user interface for monitoring the system operation and a tool for deploying the system. To ensure reliability, S4P continuously checks stored data for integrity, Further reliability is provided by tape backups of disks made once a disk partition is full and closed. The system is designed for low maintenance, requiring minimal operator oversight.

This work was done by Christopher Lynnes, Mahabaleshwara Hegde, and C. Wrandle Barth of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-15040-1

Automated Rocket Propulsion Test Management

The Rocket Propulsion Test-Automated Management System provides a central location for managing activities associated with Rocket Propulsion Test Management Board, National Rocket Propulsion Test Alliance, and the Senior Steering Group business management activities. A set of authorized users, both on-site and off-site with regard to Stennis Space Center (SSC), can access the system through a Web interface. Web-based forms are used for user input with generation and electronic distribution of reports easily accessible.

Major functions managed by this software include meeting agenda management, meeting minutes, action requests, action items, directives, and recommendations. Additional functions include electronic review, approval, and signatures. A repository/library of documents is available for users, and all items are tracked in the system by unique identification numbers and status (open, closed, percent complete, etc.). The system also provides queries and version control for input of all items.

This program was written by Ian Walters of SaiTech and Cheryl Nelson and Helene Jones of Computer Sciences Corporation 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-00250, volume and number of this NASA Tech Briefs *issue, and the page number.*

Online Remote Sensing Interface

BasinTools Module 1 processes remotely sensed raster data, including multi- and hyper-spectral data products, via a Web site with no downloads and no plug-ins required. The interface provides standardized algorithms designed so that a user with little or no remote-sensing experience can use the site. This Web-based approach reduces the amount of software, hardware, and computing power necessary to perform the specified analyses. Access to imagery and derived products is enterprise-level and controlled. Because the user never takes possession of the imagery, the licensing of the data is greatly simplified.

BasinTools takes the "just-in-time" inventory control model from commercial manufacturing and applies it to remotely-sensed data. Products are created and delivered on-the-fly with no human intervention, even for casual users. Well-defined procedures can be combined in different ways to extend verified and validated methods in order to derive new remote-sensing products, which improves efficiency in any well-defined geospatial domain. Remote-sensing products produced in BasinTools are self-documenting, allowing procedures to be independently verified or peer-reviewed. The software can be used enterprise-wide to conduct low-level remote sensing, viewing, sharing, and manipulating of image data without the need for desktop applications.

This program was written by Joel Lawhead of NVision Solutions, Inc. for Stennis Space Center.

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

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Refer to SSC-00251, volume and number of this NASA Tech Briefs *issue, and the page number.*

Fusing Image Data for Calculating Position of an Object

A computer program has been written for use in maintaining the calibration, with respect to the positions of imaged objects, of a stereoscopic pair of cameras on each of the Mars Explorer Rovers Spirit and Opportunity. The program identifies and locates a known object in the images. The object in question is part of a Mössbauer spectrometer located at the tip of a robot arm, the kinematics of which are known.

In the program, the images are processed through a module that extracts edges, combines the edges into line segments, and then derives ellipse centroids