



## 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., Install-Shield) 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