Software

Automatic Focus Adjustment of a Microscope

AUTOFOCUS is a computer program for use in a control system that automatically adjusts the position of an instrument arm that carries a microscope equipped with an electronic camera. In the original intended application of AUTOFOCUS, the imaging microscope would be carried by an exploratory robotic vehicle on a remote planet, but AUTOFOCUS could also be adapted to similar applications on Earth. Initially control software other than AUTOFOCUS brings the microscope to a position above a target to be imaged. Then the instrument arm is moved to lower the microscope toward the target: nominally, the target is approached from a starting distance of 3 cm in 10 steps of 3 mm each. After each step, the image in the camera is subjected to a wavelet transform, which is used to evaluate the texture in the image at multiple scales to determine whether and by how much the microscope is approaching focus. A focus measure is derived from the transform and used to guide the arm to bring the microscope to the focal height. When the analysis reveals that the microscope is in focus, image data are recorded and transmitted.

This program was written by Terrance Huntsberger 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-30531.

FastScript3D — a Companion to Java 3D

FastScript3D is a computer program, written in the Java 3D™ programming language, that establishes an alternative language that helps users who lack expertise in Java 3D to use Java 3D for constructing three-dimensional (3D)-appearing graphics. The FastScript3D language provides a set of simple, intuitive, one-line text-string commands for creating, controlling, and animating 3D models. The first word in a string is the name of a command; the rest of the string contains the data arguments for the command. The commands can also be used as an aid to learning Java 3D. Developers can extend the language by adding custom text-string commands. The commands can define new 3D objects or load representations of 3D objects from files in formats compatible with such other software systems as X3D. The text strings can be easily integrated into other languages. FastScript3D facilitates communication between scripting languages [which enable programming of hyper-text markup language (HTML) documents to interact with users] and Java 3D. The FastScript3D language can be extended and customized on both the scripting side and the Java 3D side.

This program was written by Patti Koenig 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-30592.

Generating Mosaics of Astronomical Images

"Montage" is the name of a service of the National Virtual Observatory (NVO), and of software being developed to implement the service via the World Wide Web. Montage generates science-grade custom mosaics of astronomical images on demand from input files that comply with the Flexible Image Transport System (FITS) standard and contain image data registered on projections that comply with the World Coordinate System (WCS) standards. "Science-grade" in this context signifies that terrestrial and instrumental features are removed from images in a way that can be described quantitatively. "Custom" refers to user-specified parameters of projection, coordinates, size, rotation, and spatial sampling. The greatest value of Montage is expected to lie in its ability to analyze images at multiple wavelengths, delivering them on a common projection, coordinate system, and spatial sampling, and thereby enabling further analysis as though they were part of a single, multi-wavelength image. Montage will be deployed as a computation-intensive service through existing astronomy portals and other Web sites. It will be integrated into the emerging NVO architecture and will be executed on the TeraGrid. The Montage software will also be portable and publicly available.

This program was written by Attila Bergou, Bruce Berriman, John Good, Joseph Jacob, Daniel Katz, Anastasia Laity, Thomas Prince, and Roy Williams 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-40297.

Simulating Descent and Landing of a Spacecraft

The Dynamics Simulator for Entry, Descent, and Surface landing (DSENDS) software performs high-fidelity simulation of the Entry, Descent, and Landing (EDL) of a spacecraft into the atmosphere and onto the surface of a planet or a smaller body. DSENDS is an extension of the DShell and DARTS 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. DSENDS enables the modeling (including real-time simulation) of flight-train elements and all spacecraft responses during various phases of EDL. DSENDS provides high-fidelity models of the aerodynamics of entry bodies and parachutes plus supporting models of atmospheres. Terrain and real-time responses of terrain-imaging radar and lidar instruments can also be modeled. The program includes modules for simulation of guidance, navigation, hypersonic steering, and powered descent. Automated state-machine-driven model switching is used to represent spacecraft separations and reconfigurations. Models for computing landing contact and impact forces are expected to be added. DSENDS can be used as a stand-alone program or incorporated into a larger program that simulates operations in real time.

This program was written by J. Balaram, Abhinandan Jain, Bryan Martin, Christopher Lim, David Henriquez, Elihu McMahon, Garett Sohl, Pranab Banerjee, Robert Steele, and Timothy Bentley of Caltech, and Scott Striepe and Brett Starr of Langley Research Center 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-30486.