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

from the line segments. The images are also processed by a feature-extraction algorithm that performs a wavelet analysis, then performs a pattern-recognition operation in the wavelet-coefficient space to determine matches to a texture feature measure derived from the horizontal, vertical, and diagonal coefficients. The centroids from the ellipse finder and the wavelet feature matcher are then fused to determine co-location. In the event that a match is found, the centroid (or centroids if multiple matches are present) is reported. If no match is found, the process reports the results of the analyses for further examination by human experts.

This program was written by Terrance Huntsberger, Yang Cheng, Robert Liebersbach, and Ashitey Trebi-Ollenu 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-43470.

Implementation of a Point Algorithm for Real-Time Convex Optimization

The primal-dual interior-point algorithm implemented in G-OPT is a relatively new and efficient way of solving convex optimization problems. Given a prescribed level of accuracy, the convergence to the optimal solution is guaranteed in a predetermined, finite number of iterations. G-OPT Version 1.0 is a flight software implementation written in C. Onboard application of the software enables autonomous, real-time guidance and control that explicitly incorporates mission constraints such as control authority (e.g. maximum thrust limits), hazard avoidance, and fuel limitations.

This software can be used in planetary landing missions (Mars pinpoint landing and lunar landing), as well as in proximity operations around small celestial bodies (moons, asteroids, and comets). It also can be used in any spacecraft mission for thrust allocation in six-degrees-of-freedom control.

This program was written by Behçet Açikmeşe, Shui Motaghedi, and John Carson 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-44352.

Handling Input and Output for COAMPS

Two suites of software have been developed to handle the input and output of the Coupled Ocean Atmosphere Prediction System (COAMPS), which is a regional atmospheric model developed by the Navy for simulating and predicting weather. Typically, the initial and boundary conditions for COAMPS are provided by a flat-file representation of the Navy's global model. Additional algorithms are needed for running the COAMPS software using global models. One of the present suites satisfies this need for running COAMPS using the Global Forecast System (GFS) model of the National Oceanic and Atmospheric Administration. The first step in running COAMPS — downloading of GFS data from an Internet file-transfer-protocol (FTP) server computer of the National Centers for Environmental Prediction (NCEP) — is performed by one of the programs (SSC-00273) in this suite. The GFS data, which are in gridded binary (GRIB) format, are then changed to a COAMPS-compatible format by another program in the suite (SSC-00278). Once a forecast is complete, still another program in the suite (SSC-00274) sends the output data to a different server computer.

The second suite of software (SSC-00275) addresses the need to ingest up-to-date land-use-and-land-cover (LULC) data into COAMPS for use in specifying typical climatological values of such surface parameters as albedo, aerodynamic roughness, and ground wetness. This suite includes (1) a program to process LULC data derived from observations by the Moderate Resolution Imaging Spectroradiometer (MODIS) instruments aboard NASA's Terra and Aqua satellites, (2) programs to derive new climatological parameters for the 17-land-use-category MODIS data; and (3) a modified version of a FORTRAN subroutine to be used by COAMPS. The MODIS data files are processed to reformat them into a compressed American Standard Code for Information Interchange (ASCII) format used by COAMPS for efficient processing.

These programs were written by Patrick Fitzpatrick, Nam Tran, Yongzuo Li, and Valentine Anantharaj of Mississippi State University for Stennis Space Center.

Inquiries concerning rights for its commercial use should be addressed to:
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Refer to SSC-00273/4/5/8, volume and number of this NASA Tech Briefs *issue, and the page number.*

Modeling and Grid Generation of Iced Airfoils

SmaggIce Version 2.0 is a software toolkit for geometric modeling and grid generation for two-dimensional, single- and multi-element, clean and iced airfoils. A previous version of SmaggIce was described in "Preparing and Analyzing Iced Airfoils," *NASA Tech Briefs*, Vol. 28, No. 8 (August 2004), page 32. To recapitulate: Ice shapes make it difficult to generate quality grids around airfoils, yet these grids are essential for predicting ice-induced complex flow. This software efficiently creates high-quality structured grids with tools that are uniquely tailored for various ice shapes.

SmaggIce Version 2.0 significantly enhances the previous version primarily by adding the capability to generate grids for multi-element airfoils. This version of the software is an important step in streamlining the aeronautical analysis of ice airfoils using computational fluid dynamics (CFD) tools. The user may prepare the ice shape, define the flow domain, decompose it into blocks, generate grids, modify/divide/merge blocks, and control grid density and smoothness. All these steps may be performed efficiently even for the difficult glaze and rime ice shapes. Providing the means to generate highly controlled grids near rough ice, the software includes the creation of a wrap-around block (called the "viscous sublayer block"), which is a thin, C-type block around the wake line and iced airfoil. For multi-element airfoils, the software makes use of grids that wrap around and fill in the areas between the viscous sub-layer blocks for all elements that make up the airfoil. A scripting feature records the history of interactive steps, which can be edited and replayed later to produce other grids.

Using this version of SmaggIce, ice shape handling and grid generation can become a practical engineering process, rather than a laborious research effort.

This program was written by Mary B. Vickerman, Marivell Baez, Donald C. Braun, Anthony W. Hackenberg, James A. Pennline, and Herbert W. Schilling of Glenn