

mesh to the fine mesh uses bilinear interpolation; and prolongation of the coarse grid solution uses bicubic interpolation.

This program was written by Raymond E. Mineck, James L. Thomas, and Robert T. Biedron of Langley Research Center and Boris Diskin of the National Institute of Aerospace. Further information is contained in a TSP (see page 1). LAR-16608-1

Doclet To Synthesize UML

The RoseDoclet computer program extends the capability of Java doclet software to automatically synthesize Unified Modeling Language (UML) content from Java language source code. [Doclets are Java-language programs that use the doclet application programming interface (API) to specify the content and format of the output of Javadoc. Javadoc is a program, originally designed to generate API documentation from Java source code, now also useful as an extensible engine for processing Java source code.] RoseDoclet takes advantage of Javadoc comments and tags already in the source code to produce a UML model of that code. RoseDoclet applies the doclet API to create a doclet passed to Javadoc. The Javadoc engine applies the doclet to the source code, emitting the output format specified by the doclet. RoseDoclet emits a Rose model file and populates it with fully documented packages, classes, methods, variables, and class diagrams identified in the source code. The way in which UML models are generated can be controlled by use of new Javadoc comment tags that RoseDoclet provides. The advantage of using RoseDoclet is that Javadoc documentation becomes leveraged for two purposes: documenting the as-built API and keeping the design documentation up to date.

This program was written by Matthew R. Barry and Richard N. Osborne of United Space Alliance for Johnson Space Center. For further information, contact the Johnson Technology Transfer Office at (281) 483-3809. MSC-23580

Computing Thermal Effects of Cavitation in Cryogenic Liquids

A computer program implements a numerical model of thermal effects of cavitation in cryogenic fluids. The

model and program were developed for use in designing and predicting the performances of turbopumps for cryogenic fluids. Prior numerical models used for this purpose do not account for either the variability of properties of cryogenic fluids or the thermal effects (especially, evaporative cooling) involved in cavitation. It is important to account for both because in a cryogenic fluid, the thermal effects of cavitation are substantial, and the cavitation characteristics are altered by coupling between the variable fluid properties and the phase changes involved in cavitation. The present model accounts for both thermal effects and variability of properties by incorporating a generalized representation of the properties of cryogenic fluids into a generalized compressible-fluid formulation for a cavitating pump. The model has been extensively validated for liquid nitrogen and liquid hydrogen. Using the available data on the properties of these fluids, the model has been shown to predict accurate temperature-depression values.

This program was written by Ashvin Hosangadi, Vineet Ahuja, and Sanford M. Dash of Combustion Research and Flow Technology, Inc., for Marshall Space Flight Center. For further information, contact Ashvin Hosangadi at hosangad@craft-tech.com. MFS-32140

GUI for Computational Simulation of a Propellant Mixer

Control Panel is a computer program that generates a graphical user interface (GUI) for computational simulation of a rocket-test-stand propellant mixer in which gaseous hydrogen (GH₂) is injected into flowing liquid hydrogen (LH₂) to obtain a combined flow having desired thermodynamic properties. The GUI is used in conjunction with software that models the mixer as a system having three inputs (the positions of the GH₂ and LH₂ inlet valves and an outlet valve) and three outputs (the pressure inside the mixer and the outlet flow temperature and flow rate). The user can specify valve characteristics and thermodynamic properties of the input fluids via user-friendly dialog boxes. The user can enter temporally varying input values or temporally varying desired output values. The GUI provides (1) a set-point calculator function for determining fixed valve positions that yield desired output values and

(2) simulation functions that predict the response of the mixer to variations in the properties of the LH₂ and GH₂ and manual- or feedback-control variations in valve positions. The GUI enables scheduling of a sequence of operations that includes switching from manual to feedback control when a certain event occurs.

This program was written by Fernando Figueroa of Stennis Space Center, Hanz Richter of the National Research Council, and Enrique Barbieri and Jamie Granger Austin of Tulane University.

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-00213.

Control Program for an Optical-Calibration Robot

A computer program provides semiautomatic control of a moveable robot used to perform optical calibration of video-camera-based optoelectronic sensor systems that will be used to guide automated rendezvous maneuvers of spacecraft. The function of the robot is to move a target and hold it at specified positions. With the help of limit switches, the software first centers or finds the target. Then the target is moved to a starting position. Thereafter, with the help of an intuitive graphical user interface, an operator types in coordinates of specified positions, and the software responds by commanding the robot to move the target to the positions. The software has capabilities for correcting errors and for recording data from the guidance-sensor system being calibrated. The software can also command that the target be moved in a predetermined sequence of motions between specified positions and can be run in an advanced control mode in which, among other things, the target can be moved beyond the limits set by the limit switches.

This program was written by Albert (Nick) Johnston of Marshall Space Flight Center. For further information, contact Sammy Nabors, MSFC Commercialization Assistance Lead, at sammy.a.nabors@nasa.gov. MFS-31925-1

SQL-RAMS

SQL-RAMS (where "SQL" signifies Structured Query Language and "RAMS" signifies Rocketdyne Automated Management System) is a succes-

sor to the legacy version of RAMS — a computer program used to manage all work, nonconformance, corrective action, and configuration management on rocket engines and ground support equipment at Stennis Space Center. The legacy version resided in the FileMaker Pro software system and was constructed in modules that could act as standalone programs. There was little or no integration among modules. Because of limitations on file-management capabilities in FileMaker Pro, and because of difficulty of integration of FileMaker Pro with other software systems for exchange of data using such industry standards as SQL, the legacy version of RAMS proved to be limited, and working to circumvent its limitations too time-consuming. In contrast, SQL-RAMS is an integrated SQL-server-based program that supports all data-exchange software industry standards. Whereas in the legacy version, it was necessary to access individual modules to gain insight into a particular work-status document, SQL-RAMS provides access through a single-screen presentation of core modules. In addition, SQL-RAMS enables rapid and efficient filtering of displayed statuses by predefined categories and test numbers. SQL-RAMS is rich in functionality and encompasses significant improvements over the legacy system. It provides users the ability to perform many tasks, which in the past required administrator intervention. Additionally, many of the design limitations have been corrected, allowing for a robust application that is user centric.

This program was written by Victor O. Alfaro and Nancy J. Casey of The Boeing Co. 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-00207.

Distributing Data From Desktop to Hand-Held Computers

A system of server and client software formats and redistributes data from commercially available desktop to commercially available hand-held computers via both wired and wireless networks. This software is an inexpensive means of enabling engineers and technicians to gain access to current sensor data while working in locations in which such data would otherwise be inaccessible. The sensor data are first gathered by a data-acquisition server computer, then transmitted via a wired network to a data-distribution computer that executes the server portion of the present software. Data in all sensor channels — both raw sensor outputs in millivolt units and results of conversion to engineering units — are made available for distribution. Selected subsets of the data are transmitted to each hand-held computer via the wired and then a wireless network. The selection of the subsets and the choice of the sequences and formats for displaying the data is made by means of a user interface generated by the client portion of the software. The data displayed on the screens of hand-held units can be updated at rates from 1 to somewhat more than 10 times per second.

This program was written by Jason L. Elmore of Marshall Space Flight Center. For further information, contact Sammy Nabors, MSFC Commercialization Assistance Lead, at sammy.a.nabors@nasa.gov. MFS-32017-1

Best-Fit Conic Approximation of Spacecraft Trajectory

A computer program calculates a best conic fit of a given spacecraft trajectory. Spacecraft trajectories are often propagated as conics onboard. The conic-section parameters as a result of the best-conic-fit are uplinked to computers aboard the spacecraft for use in updating predictions of the spacecraft trajectory for operational purposes. In the initial application for which this program was written, there is a requirement to fit a single conic section (necessitated by onboard memory constraints) accurate within 200 microradians to a sequence of positions measured over a 4.7-hour interval. The present program supplants a prior one that could not cover the interval with fewer than four successive conic sections. The present program is based on formulating the best-fit conic problem as a parameter-optimization problem and solving the problem numerically, on the ground, by use of a modified steepest-descent algorithm. For the purpose of this algorithm, optimization is defined as minimization of the maximum directional propagation error across the fit interval. In the specific initial application, the program generates a single 4.7-hour conic, the directional propagation of which is accurate to within 34 microradians easily exceeding the mission constraints by a wide margin.

This program was written by Gurkopal Singh 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-40622.