Facilitating Navigation Through Large Archives

Automated Visual Access (AVA) is a computer program that effectively makes a large collection of information visible in a manner that enables a user to quickly and efficiently locate information resources, with minimal need for conventional keyword searches and perusal of complex hierarchical directory systems. AVA includes three key components: (1) a taxonomy that comprises a collection of words and phrases, clustered according to meaning, that are used to classify information resources; (2) a statistical indexing and scoring engine; and (3) a component that generates a graphical user interface that uses the scoring data to generate a visual map of resources and topics. The top level of an AVA display is a pictorial representation of an information archive. The user enters the depicted archive by either clicking on a depiction of subject area cluster, selecting a topic from a list, or entering a query into a text box. The resulting display enables the user to view candidate information entities at various levels of detail. Resources are grouped spatially by topic with greatest generality at the top layer and increasing detail with depth. The user can zoom in or out of specific sites or into greater or lesser content detail.

This program was written by Robert O. Shelton of Johnson Space Center, Stephanie L. Smith of LinCom, and Dat Truong and Terry R. Hodgson of Science Applications International Corp.

The code is copyrighted and is available for licensing. For further information, contact the Johnson Technology Transfer Office at (281) 483-3809. MSC-23542

Program for Weibull Analysis of Fatigue Data

A Fortran computer program has been written for performing statistical analyses of fatigue-test data that are assumed to be adequately represented by a two-parameter Weibull distribution. This program calculates the following:

- Data for the profile likelihood of any percentile of the distribution; and
- Likelihood-based confidence intervals for parameters and/or percentiles of the distribution.

The program can account for tests that are suspended without failure (the statistical term for such suspension of tests is “censoring”). The analytical approach followed in this program for the software is valid for type-I censoring, which is the removal of unfailed units at pre-specified times. Confidence regions and intervals are calculated by use of the likelihood-ratio method.

This program was written by Timothy L. Krantz of the Vehicle Technology Center of the U.S. Army Research Laboratory for Glenn Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Commercial Technology Office, Attn: Steve Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-17401-1.

Comprehensive Micromechanics-Analysis Code — Version 4.0

Version 4.0 of the Micromechanics Analysis Code With Generalized Method of Cells (MAC/GMC) has been developed as an improved means of computational simulation of advanced composite materials. The previous version of MAC/GMC was described in “Comprehensive Micromechanics-Analysis Code” (LEW-16870), NASA Tech Briefs, Vol. 24, No. 6 (June 2000), page 38. To recapitulate: MAC/GMC is a computer program that predicts the elastic and inelastic thermomechanical responses of continuous and discontinuous composite materials with arbitrary internal microstructures and reinforcement shapes. The predictive capability of MAC/GMC rests on a model known as the generalized method of cells (GMC) — a continuum-based model of micromechanics that provides closed-form expressions for the macroscopic response of a composite material in terms of the properties, sizes, shapes, and responses of the individual constituents or phases that make up the material. Enhancements in version 4.0 include a capability for modeling thermomechanically and electromagnetically coupled (“smart”) materials; a more-accurate (high-fidelity) version of the GMC; a capability to simulate discontinuous plies within a laminate; additional constitutive models of materials; expanded yield-surface-analysis capabilities; and expanded failure-analysis and life-prediction capabilities on both the microscopic and macroscopic scales.

This program was written by S. M. Arnold of Glenn Research Center and B. A. Bednarcyk of Ohio Aerospace Institute. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Commercial Technology Office, Attn: Steve Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-17495-1.
uses COTS (commercial off-the-shelf) software where possible.

This program was written by Francisco Delgado of Johnson Space Center. For further information, contact the Johnson Technology Transfer Office at (281) 483-3809. MSC-23490

Spacecraft Engineering Simulation II (SES II) is a C-language computer program for simulating diverse aspects of operation of a spacecraft characterized by either three or six degrees of freedom. A functional model in SES can include a trajectory flight plan; a submodel of a flight computer running navigational and flight-control software; and submodels of the environment, the dynamics of the spacecraft, and sensor inputs and outputs. SES II features a modular, object-oriented programming style. SES II supports event-based simulations, which, in turn, create an easily adaptable simulation environment in which many different types of trajectories can be simulated by use of the same software. The simulation output consists largely of flight data. SES II can be used to perform optimization and Monte Carlo dispersion simulations. It can also be used to perform simulations for multiple spacecraft. In addition to its generic simulation capabilities, SES offers special capabilities for space-shuttle simulations: for this purpose, it incorporates submodels of the space-shuttle dynamics and a C-language version of the guidance, navigation, and control components of the space-shuttle flight software.

This program was written by Kirk Shireman and Gene McSwain of Johnson Space Center, and Bernell McCormick and Panayiotis Fardelos of the Boeing Co. For further information, contact the Johnson Technology Transfer Office at (281) 483-3809. MSC-23377

The System Power Analysis for Capability Evaluation (SPACE) software analyzes and predicts the minute-by-minute state of the International Space Station (ISS) electrical power system (EPS) for upcoming missions as well as EPS power generation capacity as a function of ISS configuration and orbital conditions. In order to complete the Certification of Flight Readiness (CoFR) process — in which the mission is certified for flight — each ISS System must thoroughly assess every proposed mission to verify that the system will support the planned mission operations; SPACE is the sole tool used to conduct these assessments for the power system capability. SPACE is an integrated power system model that incorporates a variety of modules tied together with integration routines and graphical output. The modules include orbit mechanics, solar array pointing/shadowing/thermal and electrical, battery performance, and power management and distribution performance. These modules are tightly integrated within a flexible architecture featuring data-file-driven configurations, source- or load-driven operation, and event scripting. SPACE also predicts the amount of power available for a given system configuration, spacecraft orientation, solar-array pointing conditions, orbit, and the like. In the source-driven mode, the model must assure that energy balance is achieved, meaning that energy removed from the batteries must be restored (or balanced) each and every orbit. This entails an optimization scheme to ensure that energy balance is maintained without violating any other constraints. In the load-driven mode, SPACE determines whether a given distributed, time-varying electrical load profile can be supported by the power system and will determine whether the system stays in energy balance. Load-driven