Software for Managing Parametric Studies

The Information Power Grid Virtual Laboratory (II Lab) is a Practical Extraction and Reporting Language (PERL) graphical-user-interface computer program that generates shell scripts to facilitate parametric studies performed on the Grid. (“The Grid” denotes a worldwide network of supercomputers used for scientific and engineering computations involving data sets too large to fit on desktop computers.) Heretofore, parametric studies on the Grid have been impeded by the need to create control language scripts and edit input data files — painstaking tasks that are necessary for managing multiple jobs on multiple computers. II Lab reflects an object-oriented approach to automation of these tasks: All data and operations are organized into packages in order to accelerate development and debugging. A “container” or “document” object in II Lab, called an “experiment,” contains all the information (data and file paths) necessary to define a complex series of repeated, sequenced, and/or branching processes. For convenience and to enable reuse, this object is serialized to and from disk storage. At run time, the current II Lab experiment is used to generate required input files and shell scripts, create directories, copy data files, and then both initiate and monitor the execution of all computational processes.

This program was written by Maurice Yarrow, Karen M. McCann, and Adrian DeVivo of Ames Research Center. For further information, access http://www.nas.nasa.gov/ILab/.

Inquiries concerning rights for the commercial use of this invention should be addressed to the Patent Counsel, Ames Research Center, (650) 604-5104. Refer to ARC-14800.

Software for Testing Electroactive Structural Components

A computer program generates a graphical user interface that, in combination with its other features, facilitates the acquisition and preprocessing of experimental data on the strain response, hysteresis, and power consumption of a multilayer composite-material structural component containing one or more built-in sensor(s) and/or actuator(s) based on piezoelectric materials. This program runs in conjunction with LabVIEW software in a computer-controlled instrumentation system. For a test, a specimen is instrumented with applied-voltage and current sensors and with strain gauges. Once the computational connection to the test setup has been made via the LabVIEW software, this program causes the test instrumentation to step through specified configurations. If the user is satisfied with the test results as displayed by the software, the user activates an icon on a front-panel display, causing the raw current, voltage, and strain data to be digitized and saved. The data are also put into a spreadsheet and can be plotted on a graph. Graphical displays are saved in an image file for future reference. The program also computes and displays the power and the phase angle between voltage and current.

This program was written by Robert W. Moses, Robert L. Fox, Archie D. Dimery, Robert G. Bryant, and Qamar Shams of Langley Research Center, and William C. White of Wyle Laboratories. Further information is contained in a TSP (see page 1). LAR-16546

Advanced Software for Analysis of High-Speed Rolling-Element Bearings

COBRA-AHS is a package of advanced software for analysis of rigid or flexible shaft systems supported by rolling-element bearings operating at high speeds under complex mechanical and thermal loads. These loads can include centrifugal and thermal loads generated by motions of bearing components. COBRA-AHS offers several improvements over prior commercial bearing-analysis programs: It includes innovative probabilistic fatigue-life-estimating software that provides for computation of three-dimensional stress fields and incorporates stress-based (in contradistinction to prior load-based) mathematical models of fatigue life. It interacts automatically with the ANSYS finite-element code to generate finite-element models for estimating distributions of temperature and temperature-induced changes in dimensions in iterative thermal/dimensional analyses: thus, for example, it can be used to predict changes in clearances and thermal lockup. COBRA-AHS provides an improved graphical user interface that facilitates the iterative cycle of analysis and design by providing analysis results quickly in graphical form, enabling the user to control interactive runs without leaving the program envi-