Program Predicts Time Courses of Human/Computer Interactions

CPM X is a computer program that predicts sequences of, and amounts of time taken by, routine actions performed by a skilled person performing a task. Unlike programs that simulate the interaction of the person with the task environment, CPM X predicts the time course of events as consequences of encoded constraints on human behavior. The constraints determine which cognitive and environmental processes can occur simultaneously and which have sequential dependencies. The input to CPM X comprises (1) a description of a task and strategy in a hierarchical description language and (2) a description of architectural constraints in the form of rules governing interactions of fundamental cognitive, perceptual, and motor operations. The output of CPM X is a Program Evaluation Review Technique (PERT) chart that presents a schedule of predicted cognitive, motor, and perceptual operators interacting with a task environment. The CPM X program allows direct, *a priori* prediction of skilled user performance on complex human-machine systems, providing a way to assess critical interfaces before they are deployed in mission contexts.

This program was written by Alonso Vera of **Ames Research Center** *and Andrew Howes of Cardiff University. Further information is contained in a TSP (see page 1).*

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-15028-1.

Chimera Grid Tools

Chimera Grid Tools (CGT) is a software package for performing computational fluid dynamics (CFD) analysis utilizing the Chimera-overset-grid method. For modeling flows with viscosity about geometrically complex bodies in relative motion, the Chimera-overset-grid method is among the most computationally cost-effective methods for obtaining accurate aerodynamic results. CGT contains a large collection of tools for generating overset grids, preparing inputs for computer programs that solve equations of flow on the grids, and post-processing of flow-solution data. The tools in CGT include grid editing tools, surface-grid-generation tools, volume-grid-generation tools, utility scripts, configuration scripts, and tools for post-processing (including generation of animated images of flows and calculating forces and moments exerted on affected bodies). One of the tools, denoted OVERGRID, is a graphical user interface (GUI) that serves to visualize the grids and flow solutions and provides central access to many other tools. The GUI facilitates the generation of grids for a new flow-field configuration. Scripts that follow the grid generation process can then be constructed to mostly automate grid generation for similar configurations. CGT is designed for use in conjunction with a computer-aided-design program that provides the geometry description of the bodies, and a flow-solver program.

This program was written by William M. Chan and Stuart E. Rogers of **Ames Research Center**, *Steven M. Nash of ELORET Corp., Pieter G. Buning of Langley Research Center, and Robert L. Meakin of the U.S. Army Aeroflightdynamics Directorate. Further information is contained in a TSP (see page 1).*

Inquiries concerning rights for the commercial use of this invention should be addressed to the Technology Partnerships Division, Ames Research Center, (650) 604-2954. Refer to ARC-15399-1.

Astronomer's Proposal Tool

Astronomer's Proposal Tool (APT) is a computer program that assists astronomers in preparing their Phase 1 and Phase 2 Hubble Space Telescope science programs. APT is a successor to the Remote Proposal Submission System 2 (RPS2) program, which has been rendered obsolete by more recent advances in computer software and hardware. APT exploits advances associated with widespread use of the Internet, multiplatform visual development software tools, and overall increases in the power of desktop computer hardware, all in such a way as to make the preparation and submission of proposals more intuitive and make observatory operations less cumbersome. APT provides documentation and help that are friendly, up to date, and easily accessible to users of varying levels of expertise, while defining an extensible framework that is responsive to changes in both technology and observatory operations. APT consists of two major components: (1) a set of software tools that are intuitive, visual, and responsive and (2) an integrated software environment that unifies all the tools and makes them interoperable. The APT tools include the Visual Target Tuner, Proposal Editor, Exposure Planner, Bright Object Checker, and Visit Planner.

This program was written by a team of software developers led by Tony Krueger at the Space Telescope Science Institute for **Goddard Space Flight Center**. *Further information is contained in a TSP (see page 1). GSC-14946-1*

Conservative Patch Algorithm and Mesh Sequencing for PAB3D

A mesh-sequencing algorithm and a conservative patched-grid-interface algorithm (hereafter "Patch Algorithm") have been incorporated into the PAB3D code, which is a computer program that solves the Navier-Stokes equations for the simulation of subsonic, transonic, or supersonic flows surrounding an aircraft or other complex aerodynamic shapes. These algorithms are efficient, flexible, and have added tremendously to the capabilities of PAB3D. The mesh-sequencing algorithm makes it possible to perform preliminary computations using only a fraction of the grid cells (provided the original cell count is divisible by an integer) along any grid coordinate axis, independently of the other axes. The patch algorithm addresses another critical need in multi-block grid situation where the cell faces of adjacent grid blocks may not coincide, leading to errors in calculating fluxes of conserved physical quantities across interfaces between the blocks. The patch algorithm, based on the Stokes integral formulation of the applicable conservation laws, effectively matches each of the interfacial cells on one side of the block interface to the corresponding fractional cell area pieces on the other side. This approach is comprehensive and unified such that all interface topology is automatically processed without user intervention. This algorithm is implemented in a preprocessing code that creates a cell-by-cell database that will maintain flux conservation at any level of full or reduced grid density as the user may