Information Technology

Space Operations Learning Center

Goddard Space Flight Center, Greenbelt, Maryland

The Space Operations Learning Center (SOLC) is a tool that provides an online learning environment where students can learn science, technology, engineering, and mathematics (STEM) through a series of training modules. SOLC is also an effective media for NASA to showcase its contributions to the general public. SOLC is a Web-based environment with a learning platform for students to understand STEM through interactive modules in various engineering topics.

SOLC is unique in its approach to develop learning materials to teach school-aged students the basic concepts of space operations. SOLC utilizes the latest Web and software technologies to present this educational content in a fun and engaging way for all grade levels. SOLC uses animations, streaming video, cartoon characters, audio narration, interactive games and more to deliver educational concepts. The Web portal organizes all of these training modules in an easily accessible way for visitors worldwide.

SOLC provides multiple training modules on various topics. At the time of this reporting, seven modules have been developed: Space Communication, Flight Dynamics, Information Processing, Mission Operations, Kids Zone 1, Kids Zone 2, and Save The Forest. For the first four modules, each contains three components: Flight Training, Flight License, and Fly It! Kids Zone 1 and 2 include a number of educational videos and games designed specifically for grades K-6. Save The Forest is a space operations mission with four simulations and activities to complete, optimized for new touch screen technology. The Kids Zone 1 module has recently been ported to Facebook to attract wider audience.

This work was done by Ben Lui, Barbara Milner, Dan Binebrink, and Heng Kuok of Goddard Space Flight Center. For more information, visit http://solc.gsfc.nasa.gov. GSC-16063-1

OVERSMART Reporting Tool for Flow Computations Over Large Grid Systems

Ames Research Center, Moffett Field, California

Structured grid solvers such as NASA's OVERFLOW compressible Navier-Stokes flow solver can generate large data files that contain convergence histories for flow equation residuals, turbulence model equation residuals, component forces and moments, and component relative motion dynamics variables. Most of today's large-scale problems can extend to hundreds of grids, and over 100 million grid points. However, due to the lack of efficient tools, only a small fraction of information contained in these files is analyzed.

OVERSMART (OVERFLOW Solution Monitoring And Reporting Tool) provides a comprehensive report of solution convergence of flow computations over large, complex grid systems. It produces a one-page executive summary of the behavior of flow equation residuals, turbulence model equation residuals, and component forces and moments. Under the automatic option, a matrix of commonly viewed plots such as residual histograms, composite residuals, sub-iteration bar graphs, and component forces and moments is automatically generated. Specific plots required by the user can also be prescribed via a command file or a graphical user interface. Output is directed to the user's computer screen and/or to an html file for archival purposes.

The current implementation has been targeted for the OVERFLOW flow solver, which is used to obtain a flow solution on structured overset grids. The OVERSMART framework allows easy extension to other flow solvers.

This work was done by David L. Kao and William M. Chan of Ames Research Center. OVERSMART is part of the Chimera Grid Tools software package (ARC-16025-1), which is available for U.S. general release. Please contact Martha Del Alto, Software Release Authority, at Martha.E.DelAlto@nasa.gov for further inquiries. Further information is contained in a TSP (see page 1). ARC-16025-1A

Large Eddy Simulation (LES) of Particle-Laden Temporal Mixing Layers

NASA's Jet Propulsion Laboratory, Pasadena, California

High-fidelity models of plume-regolith interaction are difficult to develop because of the widely disparate flow conditions that exist in this process. The gas in the core of a rocket plume can often be modeled as a time-dependent, high-temperature, turbulent, reacting continuum flow. However, due to the vacuum conditions on the lunar surface, the mean molecular path in the outer parts of the plume is too long for the continuum assumption