further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-15728-1

Distributed Observer Network

The Distributed Observer network (DON) is a NASA-collaborative environment that leverages game technology to bring three-dimensional simulations to conventional desktop and laptop computers in order to allow teams of engineers working on design and operations, either individually or in groups, to view and collaborate on 3D representations of data generated by authoritative tools such as Delmia Envision, Pro/Engineer, or Maya. The DON takes models and telemetry from these sources and, using commercial game engine technology, displays the simulation results in a 3D visual environment.

DON has been designed to enhance accessibility and user ability to observe and analyze visual simulations in real time. A variety of NASA mission segment simulations [Synergistic Engineering Environment (SEE) data, NASA Enterprise Visualization Analysis (NEVA) ground processing simulations, the DSS simulation for lunar operations, and the Johnson Space Center (JSC) TRICK tool for guidance, navigation, and control analysis] were experimented with. Desired functionalities, [i.e. Tivo-like functions, the capability to communicate textually or via Voice-over-Internet Protocol (VoIP) among team members, and the ability to write and save notes to be accessed later] were targeted. The resulting DON application was slated for early 2008 release to support simulation use for the Constellation Program and its teams.

Those using the DON connect through a client that runs on their PC or Mac. This enables them to observe and analyze the simulation data as their schedule allows, and to review it as frequently as desired. DON team members can move freely within the virtual world. Preset camera points can be established, enabling team members to jump to specific views. This improves opportunities for shared analysis of options, design reviews, tests, operations, training, and evaluations, and improves prospects for verification of requirements, issues, and approaches among dispersed teams.

This work was done by Michael Conroy, Rebecca Mazzone, William Little, and Priscilla Elfrey of Kennedy Space Center; David Mann of ASRC Aerospace; and Kevin Mabie, Thomas Cuddy, Mario Loundermon, Stephen Spiker, Don Whiteside, Frank McArthur, Tate Srey, and Dennis Bonilla of Valador Inc. For further information, contact the Kennedy Innovative Partnerships Program Office at (321) 861-7158. KSC-13081

Computer-Automated Evolution of Spacecraft X-Band Antennas

A document discusses the use of computer-aided evolution in arriving at a design for X-band communication antennas for NASA's three Space Technology 5 (ST5) satellites, which were launched on March 22, 2006. Two evolutionary algorithms, incorporating different representations of the antenna design and different fitness functions, were used to automatically design and optimize an X-band antenna design. A set of antenna designs satisfying initial ST5 mission requirements was evolved by use these algorithms.

The two best antennas — one from each evolutionary algorithm — were built. During flight-qualification testing of these antennas, the mission requirements were changed. After minimal changes in the evolutionary algorithms — mostly in the fitness functions — new antenna designs satisfying the changed mission requirements were evolved and within one month of this change, two new antennas were designed and prototypes of the antennas were built and tested. One of these newly evolved antennas was approved for deployment on the ST5 mission, and flight-qualified versions of this design were built and installed on the spacecraft. At the time of writing the document, these antennas were the first computer-evolved hardware in outer space.

This work was done by Jason D. Lohn of Ames Research Center and Gregory S. Hornby of the University of California Santa Cruz and Derek S. Linden of JEM Engineering. Further information is contained in a TSP (see page 1). ARC-15568-1