

Computer-Based Instruction and Reference Documentation System for the Orbit Determination Program

Gerald R. Hintz^{1*}, Mark Ryne¹, Michael Watkins¹ Maureen Kenney²,
David Overoye², Robert Meyer¹

¹ Jet Propulsion Laboratory, California Institute of Technology

² Raytheon, Pasadena, California

The Jet Propulsion Laboratory (JPL) and Raytheon have jointly developed a Computer-Based Instruction (CBI) and reference system for JPL's Orbit Determination Program (ODP). The ODP is JPL's main software tool for trajectory determination, in use and developed at JPL over the last 40 years, to navigate and support interplanetary and earth-orbiting space missions. An automated process for running the ODP, NavShell, is also in use.

New and experienced navigators who use NavShell to run the ODP need to understand the program's flow process. New navigators traditionally acquire experience and instruction with the ODP and NavShell through a mentoring process, which has proven to be successful. However, mentoring new personnel, while a critical function, is also time-consuming. Therefore, it is important to develop tools to aid this task. Capturing the first generation of interplanetary navigators' accomplishments and experience is essential to providing a guide for future navigators.

The solution was to develop a web-enabled, computer-based instruction and reference documentation system incorporating multi-media elements. The system design captures the best methods for using the ODP software. This training tool provides instruction for novice navigators and a detailed reference system for experts. A database back-end allows us to re-organize the existing documentation and provide simplified maintenance, updating, configuration control and accessibility. This web-based interface provides parallel browse, search and indexing features.

Tutorials have been incorporated, using screen-video capture tools. This process provides a "live" demonstration of the components of the ODP and NavShell, with a voice-over explanation provided by experienced navigators. In most cases, these tutorials have been captured at scheduled seminars and linked to the ODP-NavShell CBI tool within the appropriate context. Two positive results are that the seminar tutorials are thus made available to a wider audience than was able to attend the initial series of seminars and the linking that occurs within the context of the subject matter provides a rich learning experience for the new navigators.

The system will contain descriptive "how to" methods for each model and process in the ODP. Emphasis is on the performance of specific tasks, which levy extreme flexibility requirements on the tool and the ODP caused by the constantly changing spacecraft and associated parameters. Other components of the system are: examples and exercises showing process flow, program input and output, full description of input parameters and

output messages, and a troubleshooting section to de-mystify common pitfalls, mistakes and error messages. A tool for incorporating expert knowledge in context has been developed and deployed as part of the system.

The paper will emphasize how to cope with cutting edge orbit determination and navigation-related issues. At the conference, we will demonstrate the system and answer questions about its development and usefulness.

* Gerald R. Hintz, Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109; Gerald.Hintz@jpl.nasa.gov; tel.: (818)354-4882; FAX: (818)393-6388