

Expert System Based Telemetry Analysis for Real-Time Monitoring and Control of Complex Spacecraft

Talarian Corporation
Bryant C. Cruse



ABSTRACT

A project to provide expert system based support for control and monitoring of the Hubble Space Telescope (HST) had been underway at Goddard Space Flight Center since 1987. The work is being done for NASA Goddard by Lockheed Missiles and Space Company under the Hubble Space Telescope Mission Operational Contract. The HST will downlink over 6000 individual parameters in any of 17 separate formats. Data rates vary from 500 bps to 32 kbps. The project's goal is to provide an expert system based module at each of the seven operator workstations in the Mission operations Room. The modules will serve as intelligent assistants to the human operators, providing real-time interpretation of the incoming telemetry to verify execution of the mission schedule, detect anomalies, and assist in normal or contingency real-time commanding of the spacecraft.

The project is made possible through the use of L*Star. L*Star is a distributed knowledge based architecture optimized for real-time monitoring, analysis, and control. L*Star was originally developed by Lockheed and is currently being enhanced and maintained by Talarian Corporation. The architecture provides three separate processes which can run on a single or networked CPUs; a high speed inference engine which supports a substantial temporal reasoning capability, a flexible data management process, and a state of the art color graphics based man-machine interface.

The magnitude and complexity of the project has necessitated the employment of a number of innovative methodologies for the design, development, test, and integration of large knowledge bases. These techniques, which have general applicability to expert system based telemetry analysis of complex spacecraft, are described together with the HST project and the L*Star tool.