



Key Decision Record Creation and Approval Module

Retaining good key decision records is critical to ensuring the success of a project or operation. Having adequately documented decisions with supporting documents and rationale can greatly reduce the amount of rework or reinvention over a project's, vehicle's, or facility's lifecycle. Stennis Space Center developed and uses a software tool that automates the Key Decision Record (KDR) process for its engineering and test projects. It provides the ability for a user to log key decisions that are made during the course of a project. By customizing Parametric Technology Corporation's (PTC) Windchill product, the team was able to log all information about a decision, and electronically route that information for approval. Customizing the Windchill product allowed the team to directly connect these decisions to the engineering data that it might affect and notify data owners of the decision. The user interface was created in JSP and Javascript, within the OOTB (Out of the Box) Windchill product, allowing users to create KDRs. Not only does this interface allow users to create and track KDRs, but it also plugs directly into the OOTB ability to associate these decision records with other relevant engineering data such as drawings, designs, models, requirements, or specifications.

This work was done by Bartt Hebert and Elizabeth A. Messer of Stennis Space Center; Colby Albasini of Computer Sciences Corp.; and Thang Le, William O'Rourke, Sr., Tim Stiglets, and Ted Strain of Sai Tech Inc. Inquiries concerning rights for the commercial use of this invention should be addressed to the Intellectual Property Manager at Stennis Space Center (228) 688-1929. SSC-00338

Enhanced Graphics for Extended Scale Range

Enhanced Graphics for Extended Scale Range is a computer program for rendering fly-through views of scene models that include visible objects differing in size by large orders of magnitude. An example would be a scene showing a person in a park at night with the moon, stars, and galaxies in the background sky. Prior graphical computer programs exhibit

arithmetic and other anomalies when rendering scenes containing objects that differ enormously in scale and distance from the viewer.

The present program dynamically repartitions distance scales of objects in a scene during rendering to eliminate almost all such anomalies in a way compatible with implementation in other software and in hardware accelerators. By assigning depth ranges corresponding to rendering precision requirements, either automatically or under program control, this program spaces out object scales to match the precision requirements of the rendering arithmetic. This action includes an intelligent partition of the depth buffer ranges to avoid known anomalies from this source. The program is written in C++, using OpenGL, GLUT, and GLUI standard libraries, and nVidia GeForce Vertex Shader extensions. The program has been shown to work on several computers running UNIX and Windows operating systems.

This program was written by Andrew J. Hanson and Philip Chi-Wing Fu of Indiana University for Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-14819-1

Debris Examination Using Ballistic and Radar Integrated Software

The Debris Examination Using Ballistic and Radar Integrated Software (DEBRIS) program was developed to provide rapid and accurate analysis of debris observed by the NASA Debris Radar (NDR). This software provides a greatly improved analysis capacity over earlier manual processes, allowing for up to four times as much data to be analyzed by one-quarter of the personnel required by earlier methods. There are two applications that comprise the DEBRIS system: the Automated Radar Debris Examination Tool (ARDENT) and the primary DEBRIS tool.

The debris radars were established to provide insight into debris events for all future space shuttle flights. Often, the debris particles are either too small or moving too quickly to be accurately characterized in any other way. Data must be rapidly and accurately analyzed in order

to assess the threat environment from ascent debris. The DEBRIS tools offer that capability, and were specifically tailored to the needs of the debris analysis mission.

The ARDENT application is intended to autonomously identify, characterize, annotate, and perform statistics on debris tracks from 150 seconds after launch to loss of signal at the far horizon. The DEBRIS application is intended primarily for analysis of the data within the first 150 seconds of flight. It allows the user to explore the available data and annotate observed debris events and tracks. It also allows ballistic analysis of an annotated event, and allows the user to display all annotated events for the mission and the associated meta information for those events.

The ARDENT debris detection algorithm uses a Multi-scale Localized Radon Transform (MSLRT) optimized for this application. The MSLRT computes a localized Radon transform of blocks of the data for multiple block sizes (or scales) to form an aggregated (across scales) debris track detection map based on identifying piece-wise linear features in the data. The DEBRIS tool consolidates and extends the capability of several discrete applications developed early in the NDR technology maturation process; specifically, data viewing, annotation of candidate debris events, and various elements of trajectory analysis. This consolidation dramatically streamlines the analysis process and the amount of overhead in both time and effort needed to fully process the debris risk portion of the shuttle ascent.

The ballistic and radar signature products of these tools allow assessment of debris material type, shape, size, and release location — information that is used to determine threat to the current mission as well as flight safety for future missions. The analysis efficiencies afforded by these tools allow detailed threat assessment of tens of gigabytes of data within three days of launch.

This work was done by Anthony Griffith, Matthew Schottel, David Lee, Robert Scully, and Joseph Hamilton of Johnson Space Center; Brian Kent, Christopher Thomas, Jonathan Benson, and Eric Branch of the U.S. Air Force; and Paul Hardman and Martin Stuble of NAVAIR (Patuxent) Department of the Navy. MSC-24827-1