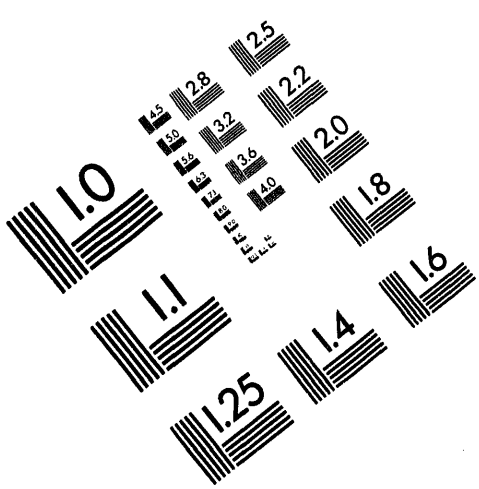

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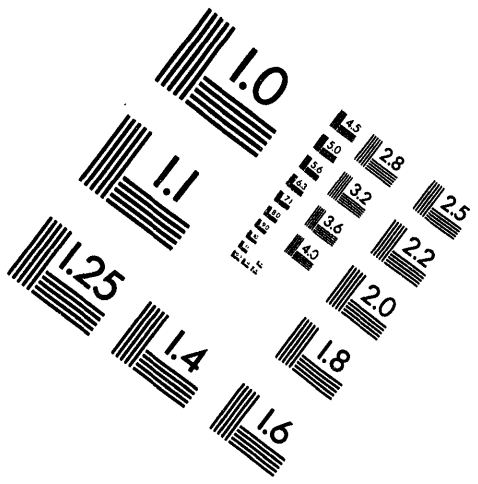

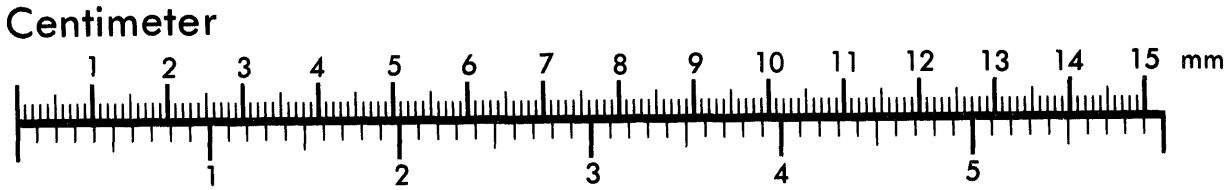

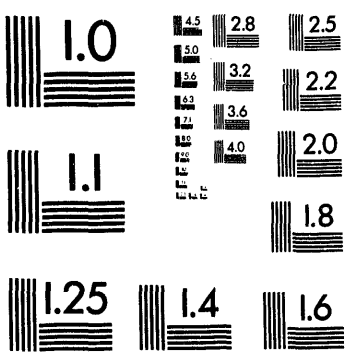

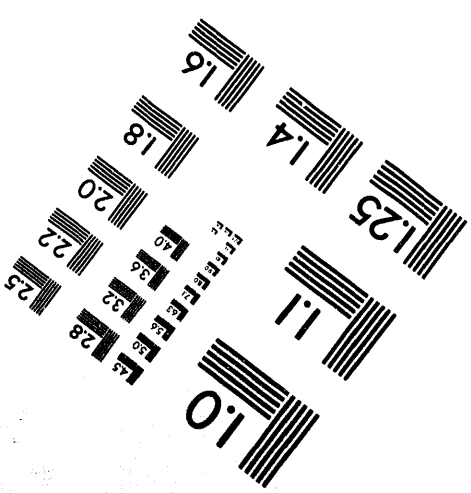

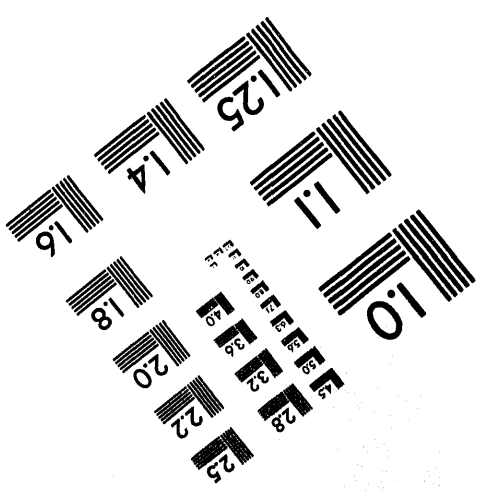

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AUTHOR(S): S. R. Lee, J. Anderson, D. G. Collins, J. D. Fowler, N. A. Hammar, H. G. Hughes, N. D. Keen, K. R. Koch, P. D. Soran, J. A. Takamine, and K. A. Van Riper

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Unified GUI for the Los Alamos Radiation Transport Code System

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Introduction

Justine is a Unified Graphical User Interface (UGUI) which is used to define geometries using constructive solid geometric (CSG) operations on three-dimensional objects. These user defined geometries, along with other code specific parameters also controlled by Justine, are used by the Los Alamos Radiation Transport Code System (LARTCS), which includes the Radiation Transport Group's (X-6) Monte Carlo and deterministic transport codes. Justine enhances user productivity, aids in code debugging, and enhances the reliability of the LARTCS.

A Brief Tour of Justine

Justine is shown in the figure, with a simple sample geometry displayed. The geometry is displayed in wire frame, although Justine can also display the geometry as shaded solids. As shown in the figure, the two two-dimensional slices represent both the XY and XZ slices through this geometry. The user can flip the two slices to get

to the YZ slice as well. It is important to note that although the figure is a black and white screen dump, Justine exploits full color capabilities throughout to enhance visualization. Users can rotate and magnify their geometries in the three-dimensional window interactively using the mouse. A user can also magnify and scale the two-dimensional slices as well.

The user builds geometries by constructing primitive objects, like elliptical surfaces, cones, spheres, and so on, and performing CSG operations on these objects. The user can generate the objects by typing in exact quantities in a property sheet for that object, or by dragging the object desired with the mouse in one of the two-dimensional slices. As one might expect, the object property sheets are accessed by clicking the mouse on the appropriate icon for the object at the top of the Justine window. The user can then combine these objects two by two using binary CSG operations, or make MCNP cells directly by selecting the surfaces and intersection desired and allowing Justine to build the cell and do all of the appropriate CSG operations automatically.

The menu bar at the top of the Justine window gives the user full access to all of Justine's features, including visualization options and control over other code options, such as MCNP tallies, materials, meshing capabilities, and so on. Justine also has a restart capability, allowing a user to save his or her work for future modification.

Justine has been written in C with object-oriented paradigms. It is a highly portable code, able to compile and execute on a variety of Unix based platforms, including Cray, HP, IBM, SGI, and SUN. Justine is a Motif/X based application, requiring no special graphics hardware to allow a user to interactively manipulate his or her geometries. It is currently being used to set up geometries for the MCNP and DANT codes within X-6.

As it exists today, Justine has the ability to create complicated geometries and produce an input file for MCNP. Many of MCNP's various run time parameters are also produced by Justine. Additional capabilities include defining and assigning materials to computational cells, source definition, tallies, as well as assigning other MCNP specific computational attributes to the problem cells. Justine also has the ability to generate a regular rectangular mesh and commands for execution with the DANT codes.

Future Capabilities

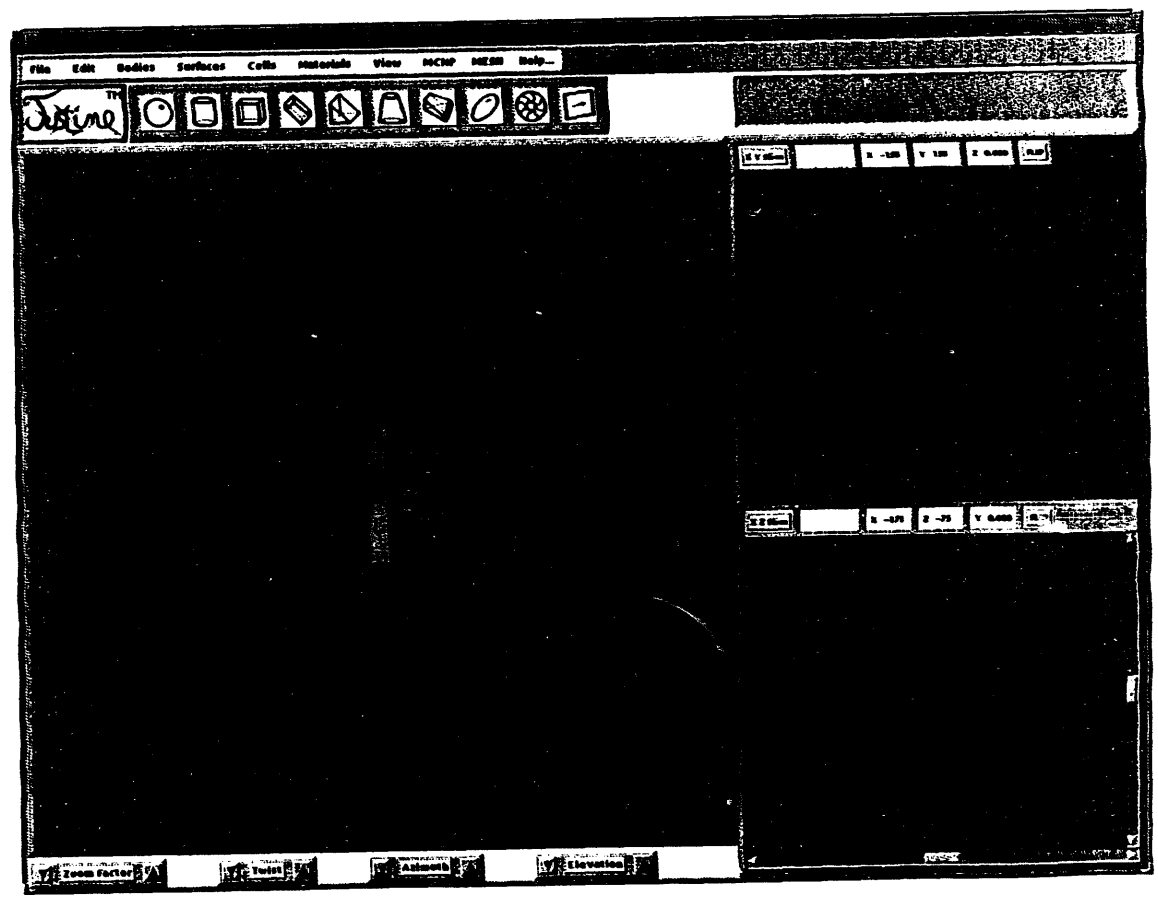
Justine will eventually be used to set up, visualize, execute, and analyze output from the codes that comprise the LARTCS. Users will be able to define geometries in an intuitive way, and simply select the desired tool for the transport calculation. In this manner, Justine unifies the codes in LARTCS.

There are many future plans for Justine, including

- Reading existing MCNP input files
- Producing and reading IGES files for CAD/CAM interface

- Mesh generation control for DANT
- Seamless integration to either MCNP or DANT
- Run-time code control
- Visualization of code output

The UGUI represents a major customer-focused effort in X-6, and has already fostered a number of interactions with industry -- a role which will continue in to the future. In general, the UGUI enhances user productivity, aids in code debugging, and enhances reliability of LARTCS.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