VISUAL WORKSHOP AS THE SINGLE MODEL EDITOR FOR THE ANSWERS SHIELDING AND CRITICALITY CODES

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This paper describes the design philosophy behind Visual Workshop an 'Integrated Development Environment' for preparing, modifying, checking, running and analyzing results from the ANSWERS shielding, criticality and reactor physics codes. Visual Workshop is being developed as part of the NCD Collaboration between BNFL Group and Serco, and is marketed via Serco's ANSWERS Software Service.

I. INTRODUCTION

Visual Workshop is designed as the 'Integrated Development Environment' (IDE) for use by criticality and radiation shielding analysts employing the ANSWERS suite of codes.

The Visual Workshop specification supports models for version 9A of the ANSWERS criticality code MONK[1] and for versions 10A and 15A of the ANSWERS shielding codes MCBEND[2] and RANKERN[3,] respectively.

Visual Workshop is being developed as part of Nuclear Codes Development (NCD) collaboration between BNFL Group and Serco Limited.

Visual Workshop is the production version of an earlier iteration of this IDE design, the Visual Model Editor[4] (VME)

II. DESIGN PHILOSOPHY

Visual Workshop is designed to act as a single interface for the checking of models, the submission of jobs, and the examination of job output. As such it builds upon the experiences gained using the suite of ANSWERS tools.

Visual Workshop will take these experiences and will expand the existing capabilities to allow for the selective display of parameterized models; allow for more effective error checking; and provide additional post-processing and results-display capabilities.

II.A. Wireframe

Visual Workshop has a wireframe display that allows the rapid traversal of a model. This is restricted to the model components described using Fractal Geometry[5] (FG), a Constructive Solid Geometry (CSG) representation. The wireframe view allows the display of dose points, source bodies and splitting meshes.

II.B. Ray-trace

Visual Workshop will display 2D and 3D images of a model as defined by its zones, regions or materials. These displays also allow the representation of the model components that use Hole Geometry[6] (HG) as well as the FG components. HG components use a tracking algorithm that does not rely on element boundaries.

The ray-trace images also allow dose points, source bodies and splitting meshes to be visualized and the geometry, in the form of multiple definitions, to be checked.

II.C. Model Checking

Visual Workshop includes an optional tree view that provides an exploded view of the model. This view provides one means of accessing the model editor dialog. This dialog allows the model to be updated with the changes immediately reflected in the Visual Workshop displays.

Visual Workshop also allows models to be executed and the resulting output analyzed for errors. The reported errors provide another means of linking to the model editor dialog, so allowing corrections to be rapidly implemented.

A model for an ANSWERS code may be parameterized to allow the generation of a suite of input cases from a single master case. Visual Workshop allows the selection of which parameterized case is to be viewed so allowing the analyst to inspect, and so understand the implications of, the parameterization on the model.

Visual workshop will also allow the checking of some models for version 9 of the reactor physics code WIMS[7]. This is an example of how this tool can be expanded to support all of the ANSWERS analysis codes.

III. METHODS

Visual Workshop uses Java for its Graphical User Interface (GUI) to facilitate multi-platform support, with the Swing GUI library providing a common look-and-feel on all platforms. It employs the Java Native Interface (JNI) to integrate the GUI with the existing FORTRAN calculation engines to provide 2D and 3D real-time interactive ray-trace visualisation.

For the wireframe display, Visual Workshop also employs JOGL[8], the Java binding to OpenGL, so allowing hardware graphics support.

Visual Workshop also makes use of open-source freely-licensed applications to provide functionality and speed-up development. An example of such use is JFreeChart[9], a Java class library for generating charts and other graphics display, for the display of results from a run.

IV. FUTURE DEVELOPMENTS

It is planned that Visual Workshop will develop in future years in response to user demands.

One initial planned development is to enhance the wireframe functionality by use of Visualization Toolkit [10] (VTK). This is an open-source freely-available software system dedicated to 3D computer graphics, image processing and visualisation.

Another enhancement is to complete support for the CAD Hole geometry type so allowing models produced from imported CAD files to be analyzed.

V. CONCLUSIONS

Visual Workshop provides capabilities and tools for the criticality and radiation shielding analysts to refine and verify their models in a way that enhances their productivity. It will allow what was once a primarily a textual exercise to become a graphical one, which is vital to a process where a visual understanding of the problem is key. Visual Workshop will also allow the 'build-check-edit' cycle employed by the analyst to be handled via a single interface instead of as before via a series of discrete tools, and will allow new tools to be readily integrated into this process.

For the future it has been identified that visual workshop must support enhanced results processing in a user-friendly visual manner, and provide new tools for combining and comparing results.

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