Scientific Visualization And Data Analysis Of The MCNP6 EEOUT File With VisIt

Casey Anderson & Roger Martz, mentor

X – Computational Physics Division, Los Alamos National Laboratory

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Abstract

A new geometry capability has been implemented in MCNP that permits the existence of an unstructured mesh geometry with its legacy Constructive Solid Geometry capability. Neutron and photon transport edit results, along with a generic mesh description, appear in an output file with an eeout extension. This work demonstrates how the VisIt program can be used to visualize the mesh geometry and the edit results.

Getting Data into VisIt

- Option 1: Create a plugin
  - Use VisIt source code, call functions, C++ language
  - Will directly read in the EEOUT file
- Option 2: Convert file in VisIt-readable format
  - Plugins already created for certain file formats, such as VTK, HDF5, SILO, and more
  - Read data from the EEOUT file and convert to existing format
- Chose Option 2
  - Parsing routine written in C++ to allow for easy transition toward the development of a plugin
 - Output file created in VTK format

Code Overview

- 2500 Lines of code written and generalized for multiple cases (i.e., multiple data sets, various mesh element types)
- Will scan in an EEOUT file called *filename*, and create an output file in VTK format called *filename.vtk*
- Source Code: VTKFile.cxx
- Executable: **vtkfile**

Creating VTK Files

- Execute the vtkfile, and it will ask for a file name
  - Enter the name of the file to Convert
  - Must be the ASCII version of the EEOUT file
- Will display the following message if correct:
  "Output File Successfully Created!!! *filename.vtk*"
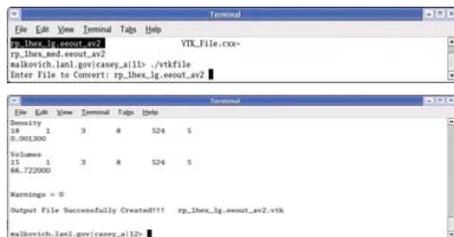
Abilities of VisIt

Opening Files
- File → Select File in main window

Plots and Operators (Add - >, Operators ->)

Pseudocolor

Mesh
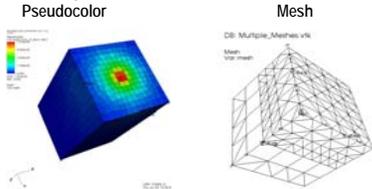
2D Slice -------->   Smoothing --- -   --> Log Scale

Materials

Three Slice   Single Slice   MCNP Plot

Clip *(Hemisphere) (Regions)*   Onion Peel *(Cells)*   Box
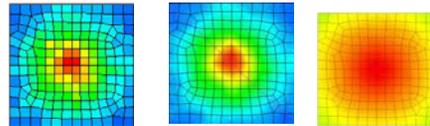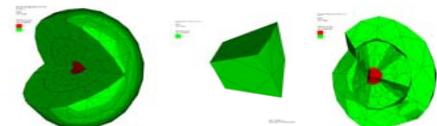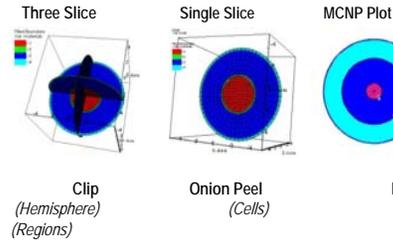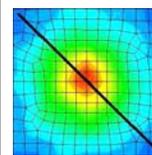
Lineout Mode   Histogram
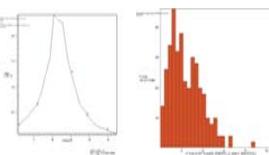
Spreadsheet *(All Cells / Points)*   Zone / Nodal Pick Data *(Select Cells / Points)*
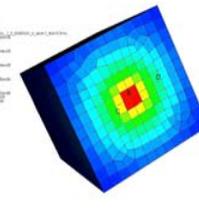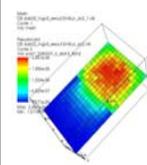
Orthogonal   Arbitrary   Project to 2D
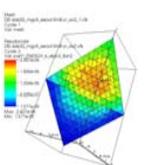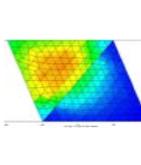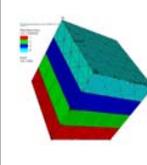
Materials Plot   Change Colors   Adjust Opacity
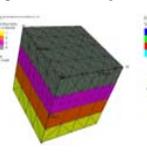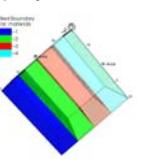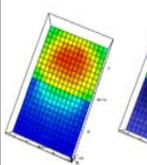
Hot (Default)   Hot-Saturated   Hot- Cold   Grey
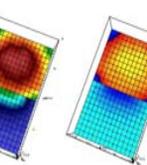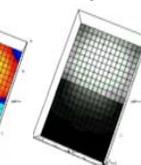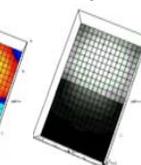
Gradient Background
No Box, Scale, Axes
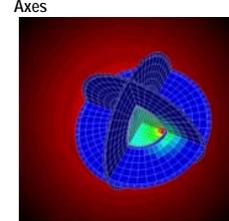
Black Background
With Box, Scale, Axes
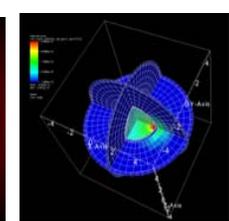
Lighting On *(Default)*   Lighting Off   Abaqus
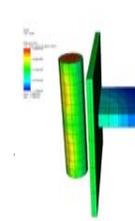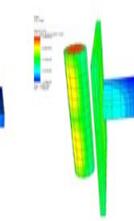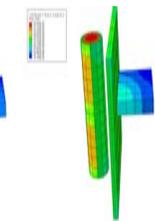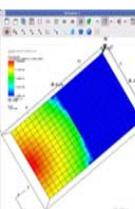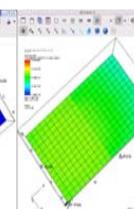
Time Bin 1   Time Bin 2   Total Time Bin
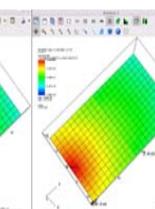
Future Work

- Develop a Plugin
  - Much of the source code already written
  - Plugin will allow for time dependencies, material naming
- Continue Testing Examples
  - Currently, successful with 25 examples