Visualizing Material Model Data Using PRISM

4th Workshop on Ramp Compression

19 January 2011

V. Gregory Weirs
Optimization and Uncertainty Quantification
## Sandia National Laboratories

What is PRISM?

- PRISM is a plugin to ParaView

- The SESAME reader displays material model surfaces, generally equations-of-state and scalar properties

- The PRISM filter displays experimental or simulation data on the material model surface

- Intended for analysts and code developers

Display surfaces, contours, phase changes

Example:

• Pressure surface vs. Density and Temperature

• Contours of Energy

• Solid Melt, Liquid Melt, and Vaporization Curves
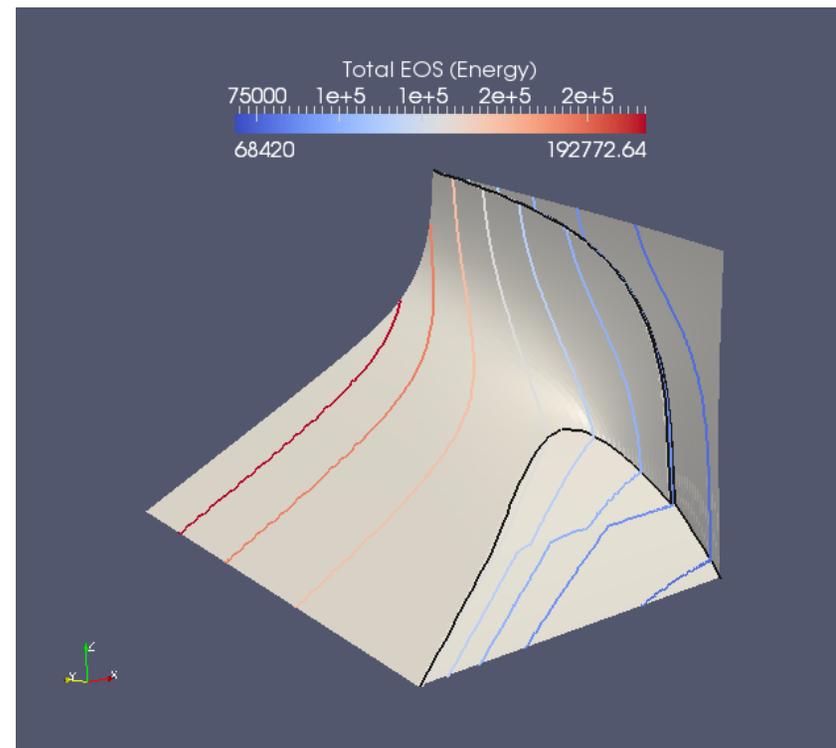
Flexible Unit Conversion

- Default conversions file includes cgs and SI. Users can add their own conversions to the file.

Display Simulation Data on Material Surfaces

- Element data

- Tracers in csv format (hscth format)
  - Should work for CTH and ALEGRA users
  - Others may need to reformat their data

- Linked selection: still buggy but fixes are in progress

Sandia
National
Laboratories

Material Models Accepted

PRISM reads the complete SESAME specification (as described in LA-UR-92-3407)

- All table numbers (next slide)
- SESAME units
- ASCII format only, one material per file
  - LANL SESAME "ship" format
  - SNL "Kerley" format
- Additional variables beyond those defined by the format

PRISM works with SESAME *files*, not libraries

SESAME format is just a convenient file format; PRISM is not restricted to material models in the SESAME library

Sandia National Laboratories

Types of SESAME Data Records

- Table 101 Comments
- Table 102 Comments
- Table 201 Atomic Number, Atomic Mass, Normal Density
- Table 301 Total EOS (304 + 305 + 306)
- Table 303 Ion EOS Plus Cold Curve (305 + 306)
- Table 304 Electron EOS
- Table 305 Ion EOS (Including Zero Point)
- Table 306 Cold Curve (No Zero Point)
- Table 401 Vaporization Table
- Table 411 Solid Melt Table
- Table 412 Liquid Melt Table
- Table 431 Shear Modulus Table
- Table 501 Opacity Grid Boundary: Calculated vs. Interpolated

- Table 502 Rosseland Mean Opacity
- Table 503 Electron Conductive Opacity1
- Table 504 Mean Ion Charge1
- Table 505 Planck Mean Opacity
- Table 601 Mean Ion Charge2
- Table 602 Electrical Conductivity
- Table 603 Thermal Conductivity
- Table 604 Thermoelectric Coefficient
- Table 605 Electron Conductive Opacity2

Sandia National Laboratories

Future Work

- Bug fixes. As you find them, please report them – no one will try to fix a bug they don't know about.

- Solid mechanics models

- Visualizing material model uncertainties

Sandia National Laboratories

Live Demonstration

Two plates in a symmetric impact

- ALEGRA Eulerian simulation, essentially 1-D

- No strength

- Fake material "proxium"

- Conditions chosen to be interesting in EOS space

Sandia
National
Laboratories