Cleaver
A tetrahedral meshing tool.

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Multimaterial Volume → Cleaver → Conforming Tetrahedral Mesh
Input Representation

• Two material interfaces:
  o Isosurface: level set of a continuous scalar function in 3D

• Multi-material interfaces:
  o ??

• Indicator functions
  o One indicator function for each material
  o Scalar value indicates strength/contribution of material
  o Examples:
    • Distance Transforms
    • Partial Mixture Models
Input Format

Teem’s Nearly Rasterized Raw Data format (NRRD)
• Seg3D Compatible
• Human Readable Headers

http://teem.sourceforge.net/nrrd/index.html
Output Formats

• Tetrahedral Meshes
  o TetGen format (*.node, *.ele) - ASCII
  o Matlab format (*.mat) - Binary

• Triangle Surface Meshes
  o PLY format – Stanford Triangle Format - ASCII
Cleaver 1

> ./cleaver -i material1.nrrd material2.nrrd material3.nrrd material4.nrrd material5.nrrd

Reading File: material1.nrrd
Reading File: material2.nrrd
Reading File: material3.nrrd
Reading File: material4.nrrd
Reading File: material5.nrrd
Input Dimensions: 63 x 63 x 63
Creating Mesh with Volume Size [63, 63, 63]
Cuts Computed
Triples Computed
Quads Computed
Tets Generalized
Phase 1 Complete
Phase 2 Complete
Phase 3 Complete
Stenciling Complete
Mesh Construction Complete
Total Time: 1.8 s
Worst Angles:
min: 18.0615081787
max: 148.886779785
Writing settings file: output.info
Writing mesh node file: output.node
Writing mesh ele file: output.ele
Writing mesh ply file: output.ply
Cleaning up.
Done.
3rd Party Viewer

http://wias-berlin.de/software/tetgen/tetview.html
Generate Indicator Functions

Compute Sizing Field

Generate Mesh
Cleaver 2