



Tutorial for Visualization

ElmerTeam

CSC – IT Center for Science Ltd.

PATC Elmer Course CSC, August 2012 сsс



Visualization with ElmerPost

How to write files for ElmerPost

- Default suffix is .ep
- May be requested in Simulation section Post File = case.ep
- Or using ResultOutputSolver with
 Output format = ElmerPost



Loading data

- Assume data in case.ep
- File -> Open ->
 case.ep
- Here the timesteps are chosen
- If element edges or sides are not defined for BCs they may have to be created here

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76	Read Model File	J
	Status: Header Read	I
	Options:	
	🔽 Generate Surface Element Sides	
	🔲 Generate Volume Element Sides	
	🔲 Generate Volume Element Edges	
	File Information:	
	Nodes: 11949 Elements: 69792 Timestps: 2 DOFS: 5 Vector: Velocity Scalar: Pressure Scalar: Temperature	
	Select timesteps:	
	First: 1 Last: 1 Increment 1 All	
	Select file:	
Mo	del file: C:/elmerwrk/Viz/case.ep Browse	
	Read header Read file OK Close	



Moving object in ElmerPost



- Rotate
 - Mouse: Right bottom
 - Click:
 - Command line, e.g.: rotate 30 45 60
- Scale
 - Mouse: Both bottoms
 - Click: 🕁 🚓
 - Command line: scale 1 10 1
- Translate
 - Mouse: Left bottom
 - Click: 🖛 🗰 🛊
 - Command line: translate 1 2 3

Setting background color



- Click:
 - Edit -> Background
 - Set 100.0 100.0 100.0 for white
- Command line
 - background 100 100 100



Color mesh with surface + edges

ELMER POST GRAPHICS	76 Color Mesh Edit
	Mesh Style: Line Surface ® Both Line Style: Image: All Free Line Quality: Image: Image

Plotting isosurfaces



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Using clip planes

ELMER POST GRAPHICS	

% clip_edit	_ D X
Low X Plane: -1.250	-1.250
High X Plane: 0.950	0.950
Low Y Plane: -1.250	-1.250
High Y Plane: 1.250	1.250
Low Z Plane: -1.250	-1.250
High Z Plane: 0.950	0.950
Apply 0	K Close

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Isosurface + surface plot + clip planes



Vector plots

ELMER POST GRAPHICS	7% vector	
	Vector Length Scale: 1.00 Line Style: C Line Solid Line Quality: 1 Width Scale: 1 Threshold Variable: none Min: 0.0 Max: 1.0 Color Variable: Velocity_abs Length Variable: Velocity_abs Arrow Variable: Velocity_abs Apply Close	

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Vector plot + solid surface



Surface plot + Isosurfaces + Opaque - 0 X 74 Material ELMER POST GRAPHICS Apply-To Shininess 25.0 0.0 32.0 64.0 96.0 128.0 Opacity (%) 30.0 90.0 74 isosurface 13.4734079143 90.0 16.9468158286 20.4202237428 Number Of Isosurfaces: 6 23.8936316572 90.0 27.3670395714 30.8404474857 0.0 25.0 50.0 75.0 100.0 Min: 10.0 Max: 34.3138554 🔲 Keep Surface Style: O Line 💿 Surface O Both Line Style: 💿 Line 🔿 Solid Line Quality: 1 alice blue AliceBlue Width Scale: 1 antique white Contour Variable: Temperature AntiqueWhite AntiqueWhite1 Color Variable: Temperature AntiqueWhite2 Max: 34.314 Min: 10 AntiqueWhite3 Keep AntiqueWhite4 Surface Normal Variable: none aguamarine 🗕 aquamarine1 Apply Close Apply ΟK

Cancel

Change of colormap

% ci_editColormap File Edit Apply-To			ER POST GRAPHICS	
	0 50 0	75.0	100.0	
Apply Alice blue AliceBlue antique white AntiqueWhite1 AntiqueWhite2 AntiqueWhite3 AntiqueWhite4 aquamarine aquamarine1	о осо ОК	Canc	el	

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Selecting active geometric entities



Saving figures



File -> Save Image -> jpg

7% Save Screen	
	Save as:
C	Postscript
	Fit PS to page
C	PPM Image
()	JPG Image
S	elect file:
File Name:	Browse
	Save Close

Deformation in geometry



Assume displacement field in variable "Displacement"

Set in command windows: math n0=nodes math nodes=n0+Displacement

Replot



Visualization with Paraview

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Exporting 2D/3D data: ResultOutputSolve

An example shows how to save data in unstructured XML VTK (.vtu) files to directory "results" in single precision binary format.

```
Solver n
Exec Solver = after timestep
Equation = "result output"
Procedure = "ResultOutputSolve" "ResultOutputSolver"
Output File Name = "case"
Output Format = String "vtu"
Binary Output = True
Single Precision = True
Save Geometry Ids = True
End
```

Filename conventions



- Suffix of unstructured XML based VTU file is .vtu
- Timesteps numbered #step
- Partitions numbered with #partpar#step
- Holder for vtu files in parallel is .pvtu

Loading data

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	File name: casevtu0001.vtu OK	0	
	Files of type: Supported Files (*.xyz *.okc *.h5 *.vsh5 *.vld *.rst *.POS* *.CHG* Cancel		

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Note: Paraview may have several datasets at the same time!

Solid color



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Moving object in Paraview



- Rotate
 - Mouse: Left bottom
- Scale
 - Mouse: Right bottom
- Translate
 - Mouse: Center bottom

Setting background color



Color mesh with surface + edges



AMR Contour

AMR Dual Clip

- Annotate Time Filter

Append Attributes

Append Datasets

Append Geometry

- Block Scalars
- Calculator Cell Centers Cell Data to Point Data Clean
- Clean Cells to Grid
- Clean to Grid Clip

Clip Closed Surface

- **Clip Generic Dataset**
- **Compute Derivatives**
- Connectivity
- **Contingency Statistics** Contour Generic Dataset

Contour

Curvature D3 Decimate Delaunay 2D Delaunay 3D

Descriptive Statistics

Elevation

Extract AMR Blocks

Extract Block

Extract CTH Parts

Extract Cells By Region

- Extract Edges
- Extract Generic Dataset Surface
- Extract Level
- R Extract Selection
- Extract Subset Extract Surface
- FFT Of Selection Over Time
- FOF/SOD Halo Finder
- Feature Edges Gaussian Resampling
- Generate Ids
- Generate Quadrature Points

Generate Quadrature Scheme Dictionary

- Generate Surface Normals
- ۲ Glyph **Glyph With Custom Source**

Gradient Gradient Of Unstructured DataSet Grid Connectivity Group Datasets Histogram Image Data to Point Set Integrate Variables Interpolate to Quadrature Points Intersect Fragments Iso Volume K Means Level Scalars

- Linear Extrusion
- Loop Subdivision
- Mask Points
- Material Interface Filter
- Median
- Merge Blocks Mesh Quality
- Multicorrelative Statistics
- Normal Glyphs Octree Depth Limit Octree Depth Scalars
- Outline
- **Outline Corners** Outline Curvilinear DataSet
- Particle Pathlines
- ParticleTracer
- Plot Data Plot Global Variables Over Time
- Plot On Intersection Curves Plot On Sorted Lines
- Plot Over Line
- Plot Selection Over Time A Point Data to Cell Data Principal Component Analysis
 - Probe Location
- Process Id Scalars
- Programmable Filter Python Calculator
- Quadric Clustering Random Vectors
- Rectilinear Data to Point Set Rectilinear Grid Connectivity Reflect
- Ribbon
- **Resample With Dataset**
- Rotational Extrusion

- Scatter Plot Shrink
- Slice
 - Slice Generic Dataset Smooth
- <u></u> Stream Tracer Stream Tracer For Generic Datasets Stream Tracer With Custom Source Subdivide Surface Flow Surface Vectors
- Table To Points Table To Structured Grid Temporal Cache Temporal Interpolator Temporal Shift Scale
- Temporal Snap-to-Time-Step Temporal Statistics Tessellate Tetrahedralize Texture Map to Cylinder Texture Map to Plane
- Texture Map to Sphere
- 20 Threshold Transform **Triangle Strips** Triangulate

Tube

- Warp By Scalar
- Warp By Vector 1 Youngs Material Interface

builtin: case0001.pvtu Ð Connectivity1 ۲ Slice1 Glvph1



- Paraview uses extensively filters to create new datasets
- Filters and datasets may be set active or passive by clicking the eye
- Several datasets may be visualized at the same time

Plotting a slice



Plotting a clip



Vector plot

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Vector plot + opaque solid surface

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Vector plot + solid surface with Id treshold

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Change of colormap

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Automatically Rescale to Fit Data Range	
Minimum: 10 Maximum: 34.3139	
Rescale Range Rescale to Data Range Rescale to Temporal Range	
✓ Use Discrete Colors	
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Properties	
Display	
View	
Visible Apply Make Default Close	
Select	
Color	
✓ Interpolate Scalars	
✓ Map Scalars	
Apply Texture None	
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Deformation – WarpByVector filter



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Plot line – PlotOverLine filter



Streamlines – Filter StreamTracer



Partitioning – Connectivity filter



Saving figures

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Saving animations with Paraview



- The only packing method that comes with Paraview by default is motion AVI
- It is advicable to save the animation as separate files
- You may use ElmerClips to make mpg animations of the separate png figures