CSC 7700: Scientific Computing Module A: Basic Skills Lecture 5: 3D Visualization using Visit

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https://wci.IInI.gov/codes/visit/executables.html

- Linux
- Max OS X
- Windows



Data to visualize

Download (checkout/update) dataset from class repository: https://svn.cct.lsu.edu/repos/courses/sci-comp-2013public/coursework/A5/rho.rl4.h5

About the dataset:

- 3D dataset
- time-series
- density of pulsating neutron star

About the Format:

- HDF5
- Hierarchical Data Format
- data model, library, and file format for storing and managing data
- \bullet optimized for large datasets and parallel I/O
- portable
- free library (open source)

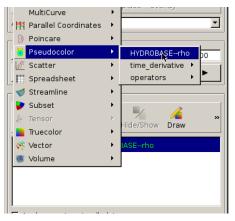


- Start Visit
- You can try enabling 3D acceleration, but at least on Intel graphics chips this tends to make Vislt fail at startup.
- open the output file of your choice

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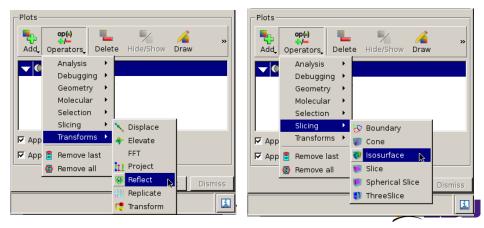


- add a pseudocolor plot from the "Plots" drop-down button
- we will display a number of isocontour lines in the star to show its oscillations
- we will use the Isosurface operator to compute the contour surfaces
- VisIt also offers a Contour plot which however is limited in the transparency options compared to the Isosurface, PseudoColor combination we use





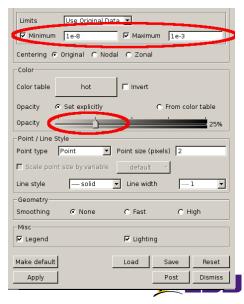
- add Isosurface operator from Operators/Slicing/Isosurface
- add Reflect operator from Operators/Transforms/Reflect, to populate the "missing" octants



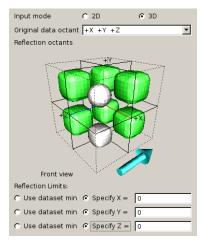
• double-click on the

Pseudocolor entry in the list of plots to display its options page. Your might have to expand the list using the triangle shaped button on the left first

- add transparency by reducing the opacity to about 25% and set limits of $[10^{-8}, 10^{-3}]$ for the plot range. We will use the same range when creating isocontours in the next step
- you have to click on Apply then on Dismiss to apply the new settings



• double click on the Reflect operator, change to 3D and activate all octants except the original (+X + Y + Z) one and the +X - Y + Z one, change the reflection point to the origin.



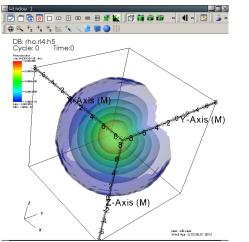


• double click on the Isosurface operator and select the range used for the Pseudocolor plot, use 6 levels and leave the scaling at linear

• Isosurface	e operator	attributes		
Select by	N levels			
Minimum	1e-8	🗸 Maximum	1e-3	
Variable		default	•	
Scale 📀 Line	ar 🔿 Log			
Make default]	Load	Save	Reset
Apply]		Post	Dismiss



- click on Draw to see how your plot looks like
- rotate to an orientation that looks nice, by grabbing the plot with the mouse





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- next we will change VisIt's rendering options to add shadows and change the background to something more attractive
- unfortunately this means we will eventually loose the transparancy. Though fiddling with the Screen capture option in File/Save Window Options.... Experiment!
- first though open the Annotation control page

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- in the X-Axis subtab of the 3D tab, disable the axis title
- repeat for the other two axes
- in the Colors tab, change the background to black and the foreground to white
- add a gradient to the background, with a dark gray as the second colour

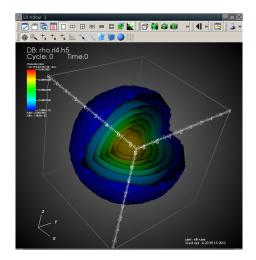
	Background color
	Foreground color
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	Gradient style Rac
General 2D 3D Array Colors Objects	Gradient color 1
☑ Show axes ☑ Show triad ☑ Show bounding box	Gradient color 2
General 3D X-Axis Y-Axis Z-Axis	
	Background image More colors
Custom title X-Axis	Repetitions in X 1

General 2D 3D Array Colors Objects

- open VisIt's rendering options from the Options/Rendering... menu
- on the Advanced tab, enable scalable rendering, Shadows and Depth Cueing

•	Rendering options
	Basic Advanced Information
	Use scalable rendering
	C Auto 🕜 Always C Never
	When polygon count exceeds 2000 KPolys 🛨
	Compress images (geometry too) from engine
	C Auto C Always C Never
	Compact domains on engine
	C Auto C Always 🕫 Never
	When domains per process exceeds 256 🚊
	🔽 Shadows (scalable rendering only)
	Strength 50%
ľ	Depth Cueing (scalable rendering only)
	V 🔽 Cue automatically along camera depth
	Manual start point -10 0 0
	Manual end point 10 0 0
	Apply color using textures
	Apply Post Dismiss

• click on Draw to see how your plot looks like

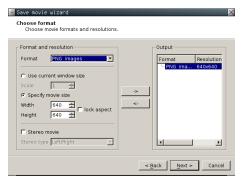




- in this last step we will let VisIt rendering frames of a small movie showing the oscillations
- to start the movie wizard, select Save movie... from the File menu

• VisIt 2.4.2					
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Close file				•	
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🛱 Save movie	•	<u> </u>			
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Export databa	se				»
Compute <u>e</u> ngir	nes		Ctrl+E		
Exit			Ctrl+X		
😵 Re	flect	^	×		

- Finally, inside the wizard, change the frame size to approximately 640 × 640 pixels (multiples of 16 are best)
- choose png output
- add the movie format to the list on the right using the -> button
- click on next and accept the defaults for all other steps, maybe choosing a different output directory for the frames





- once VisIt is done, which will take some minutes, we can render the frames into an actual movie
- for this, cd into the folder containing the frames and use, e.g., ffmpeg: ffmpeg -loop_input -vframes 200 -qscale 1 -b 1000
 - -i movie%04d.png movie.avi
 - -loop_input makes ffmpeg wrap around when looking for frames
 - -vframes 200 is the number of frames to include in the movie, we set this to twice as many as we have actual frames, ie. the movie will loop twice
 - -qscale 1 sets the quality scale for the encoder. 1 is best quality.
 - -b 1000 asks for a bitrate of 1000 kilobits per second
 - -i movie%04d.png tells ffmpeg the names of the input files, it accepts printf format specifiers to construct a file name based on the frame number. ffmpeg stops encoding once it generates a name for which no or no valid file is found.
- play the movie, e.g., using ffplay



Follow the previous steps to generate a sequence of images.

- don't write-up these steps again in your report
- be sure to add all problems/obstacles you encountered
- select two images of the sequence one close to (but not of) the first timestep, and one close (but not of) the end.
- Add these images to the report (include them in the pdf file, don't add the file separately)
- commit the single-file report to your repository (coursework/A5)
- Emphasis not on reproducing images identically, but on effort to gain experience

Due: Fri, Sep 20th 2013

