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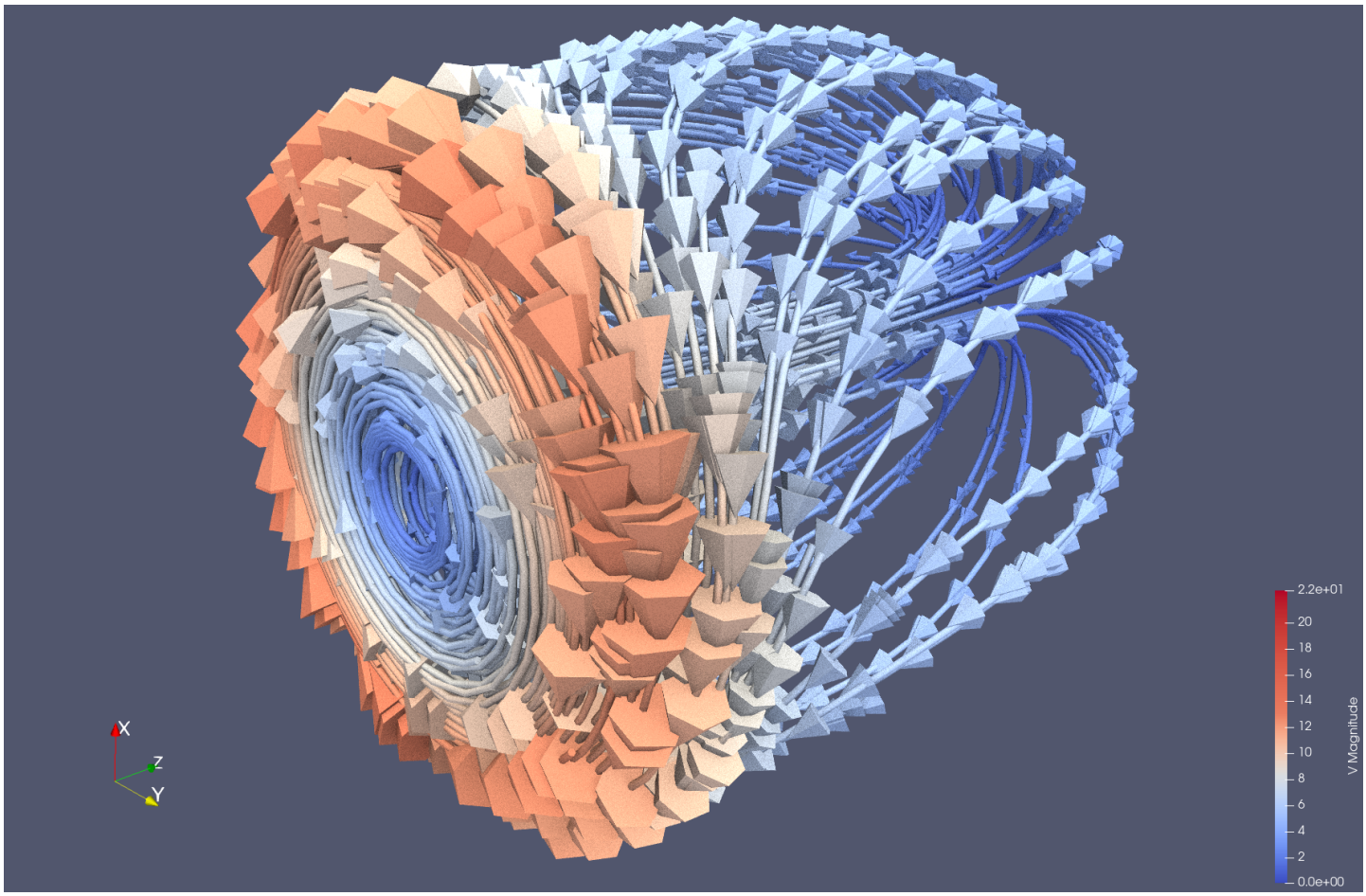
Before using these sets of documents, make sure you have everything installed correctly. Installation instructions are here: https://github.com/gicentre/litvis/blob/main/documents/tutorials/introduction/installingLitvis.md.

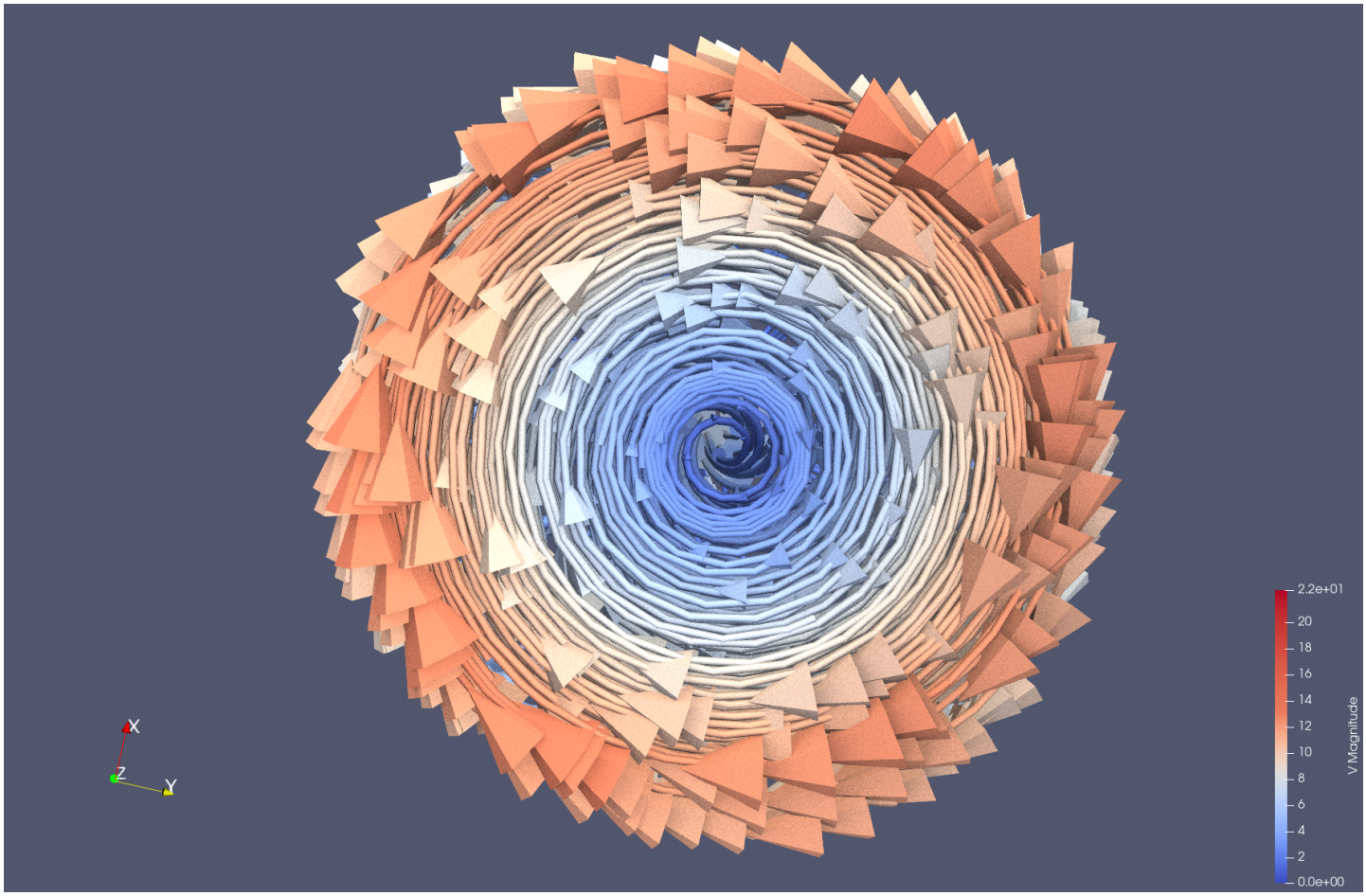
**What can we learn from the visualization?**

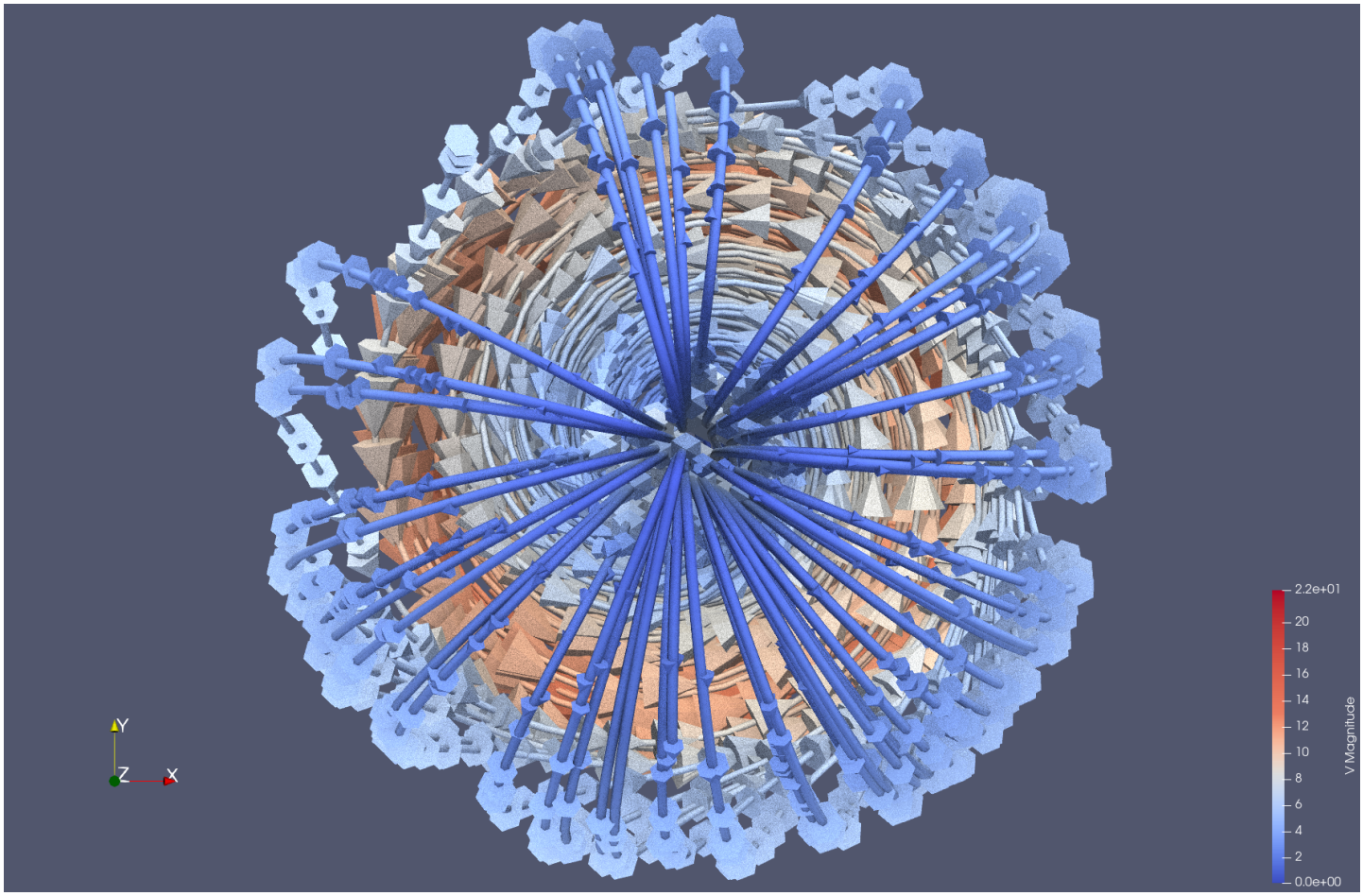
This visualisation is from the Paraview Examples folder filename `"disk_out_ref.ex2"` . This dataset is a simulation of the flow of air around a heated and spinning disk.
The attribute from this dataset I have used is the Velocity, V. From these values I have traced the velocities of the air flowing around the spinning disk.
From the visualisation we can see that the air velocity is fast at the edges but as it travels inwards to the center of the cylinder it slows. Then as it passes through the center out to the other end of the cylinder. Once the air exits the end of the cylinder it travels to the other end where the air speeds up again, completing the cycle.

**What is the name for the type of visualization(s) used?**

Flowvis, Tube and Glyph representation of air speed.






**What are all visual mappings used?**

- Colour - The mapping of light blue (low velocity) to red (high velocity) on a linear scale. This is the default colour mapping in Paraview.
- Tube - To aid the visibility of the streams. The tubes have a radius of 0.034.
- Glyph - To show the velocity and direction of the air flow. The glyphs have a scale factor of 0.053.
- This has been rendered with raytracing.

**Was there any special data preparation done?**

- I have only selected to visualise the velocity so have only checked that set of variables in the Properties tab of Paraview.
- I have also selected a surface representation for the data, both the glyphs and the tube streams use this representation.
- Stream Tracer - To trace the lines of the airflow. This filter has been left default.

**What are the limitations of your design?**

Possibly a animated view of the air would show the user a more immediately obvious air flow demonstration.
Including a representation of the disk itself could improve the story of the data. To show the user what the air is flowing from. However, I do not feel that these limitations take away from what my visualisation achieves.

Put your 1st data1 design concept here

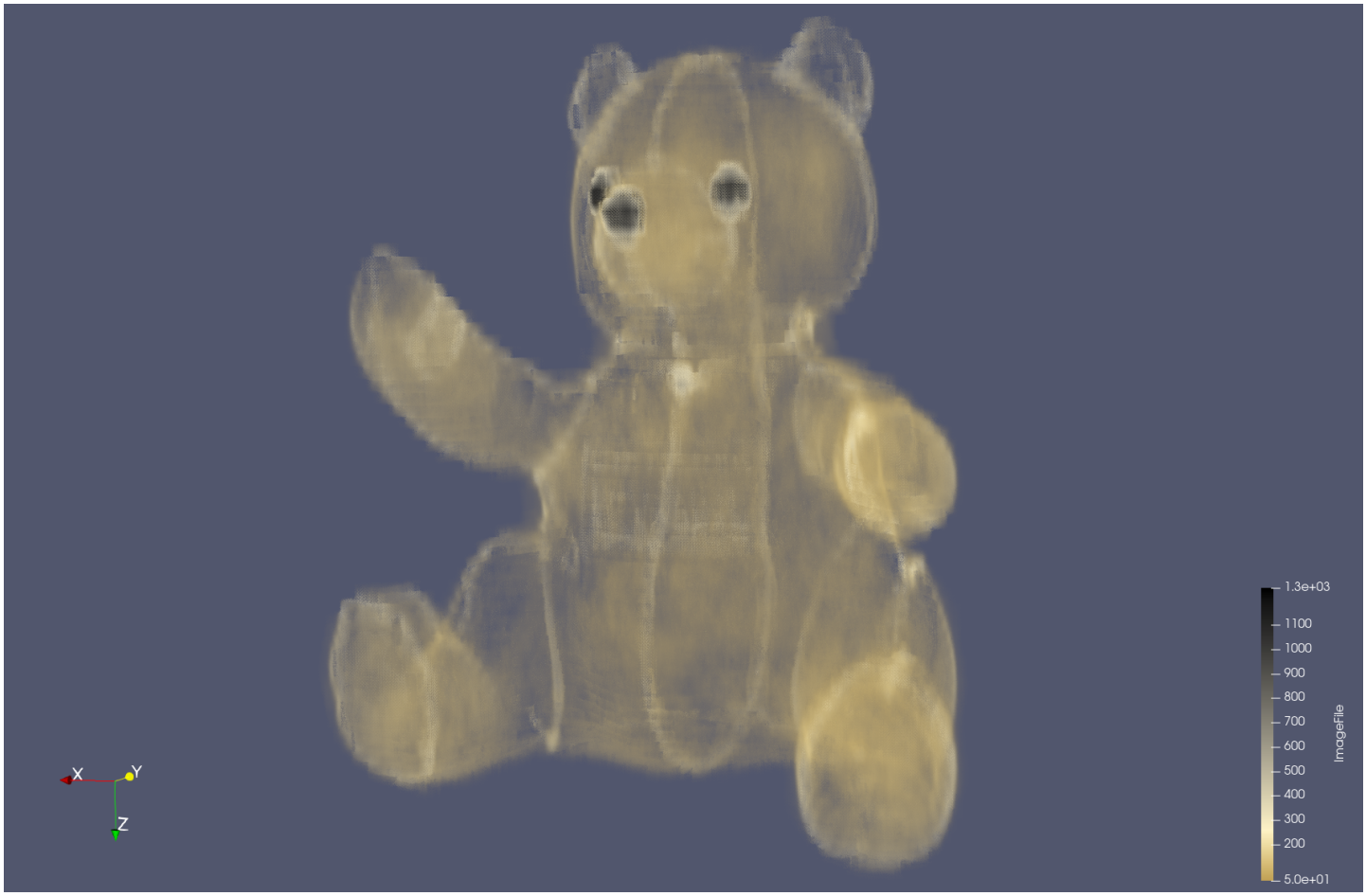
**What can we learn from the visualization?**

This visualisation is mainly to make sense of the dataset. We are given a quite sparse looking dataset that on the face of it seems to only really have a oval outline throughout the slices.
The dataset if of a traditional teddy bear with button eyes and nose.

The aim with this visualisation was to achieve a smoother texture akin to that of the traditional teddy bear. This visualisation shows the user how the components are assembled on a teddy bear. The stitching is visible on the limbs and through the middle of the bear. We also see the eyes and nose being shown more clearly as they, as well as the stitching are more prominent on the scans in the dataset.

**What is the name for the type of visualization(s) used?**

Volume Visualisation




**What are all visual mappings used?**

- Colour - I have used a linear mapping of the values from ImageFile
  using the brown for the values that corresponded to fur, from the start of the colour scale

  white to represent the stitching, at data value: 243.97589111328125

  black to represent the eyes and nose, at data value: 478.9156494140625

- A volume representation is used to show these materials to the user. Making the parts that are less dense in the dataset transparent.
- This has been rendered with raytracing and shadows.

**Was there any special data preparation done?**

- Data Properties - Data Extent (0-511, 0-511, 0-62)
- Threshold - To remove the box around the bear. Minimum = 50, Maximum = 1492. Remove anything under 50.
- Calculator - I have scaled up the values in the Z-axis so that the bear is of proper scale. The formula = `coordsX*iHat+coordsY*jHat+(8.24193548387)*coordsZ*kHat`
- Clip - I have used 2 clip filters to remove the mass behind the bear, this is a Plane clipping. In a formation of (/ \). They have both been inverted.

  Clip 1 - Origin: 257, 435.801, 255,5. Normal: 0.37, 0.9378, 0

  Clip 2 - Origin: 219.679, 426, 255.633. Normal: -0.195, 0.9808, 0

**What are the limitations of your design?**

The parts such as stitching could be more prominent in the vis as they too have some transparency which I would have prefered to have slightly less of.
This could be sharper in detail with more close up views.

Put your 2nd data1 design concept here

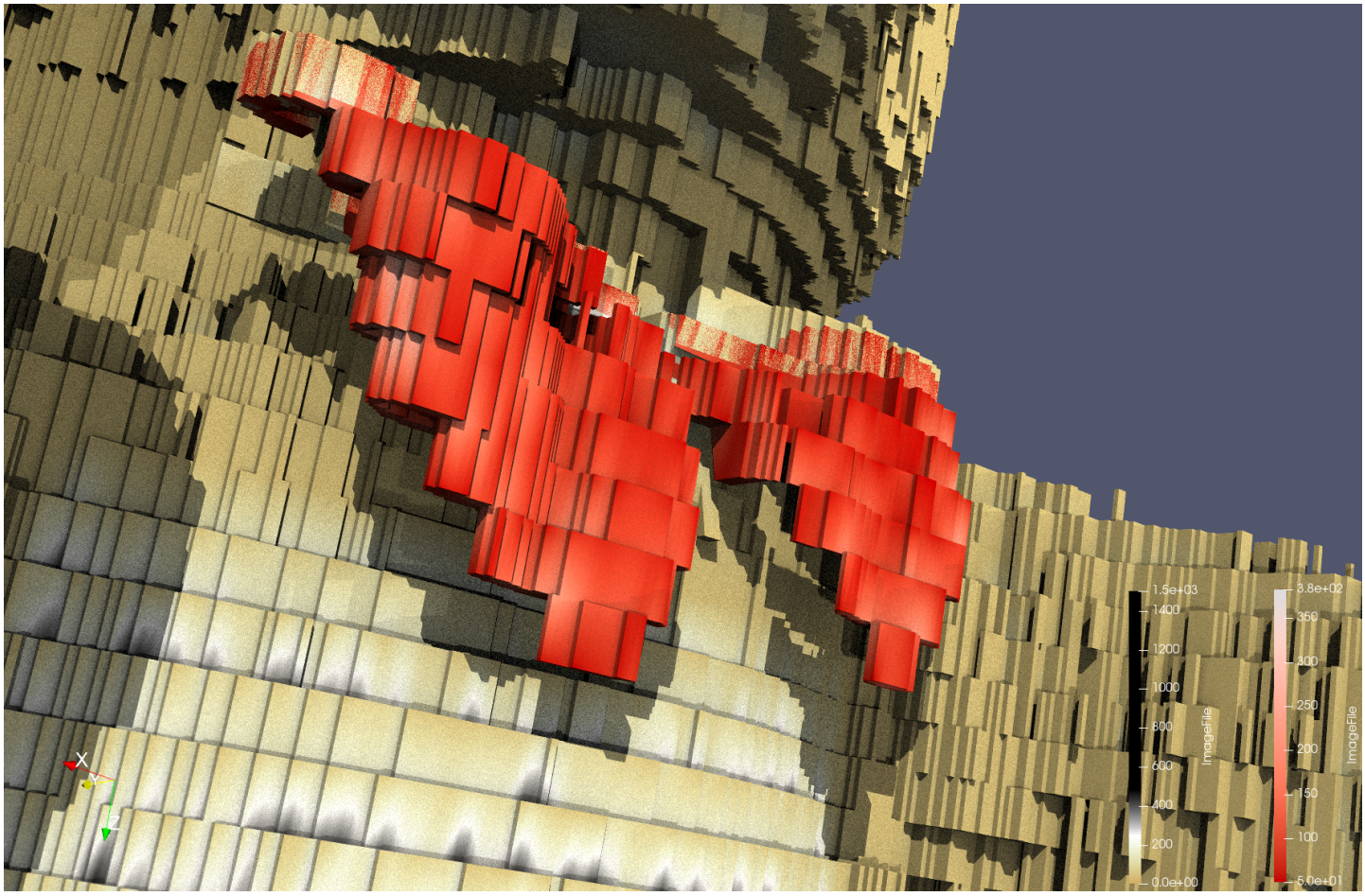
**What can we learn from the visualization?**

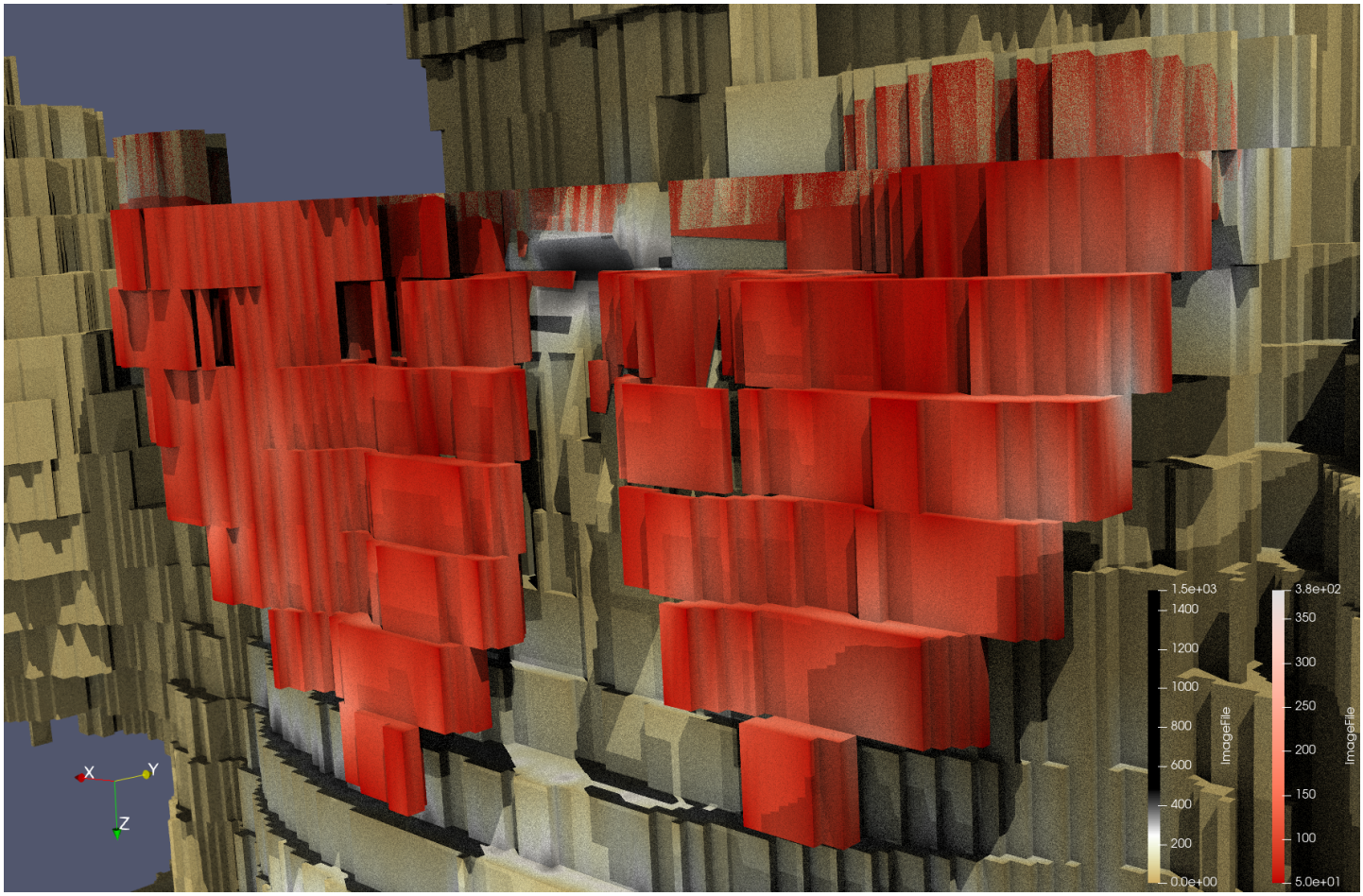
This visualisation looks to show the bear in a more common 3d object of a teddy bear. When looking at the surface I noticed that there was a bow on the bear, something that I had not realised after creating the data1_1 visualisation. When applying the surface representation of this data I saw this feature and wanted to bring the users attention to it.

The bow has been separated out from the rest of the bear and coloured in red as is the norm for a bear like this. Using ray tracing and shadows really allows us to see how the bow is protruding from the bear as it leaves a shadow behind.

**What is the name for the type of visualization(s) used?**

Surface Visualisation




**What are all visual mappings used?**

- Colour (Bear) - I have used a linear mapping of the values from ImageFile

using the brown for the values that correspond to fur, from the start of the colour scale

white to represent the stitching, at data value: 243.97589111328125

black to represent the eyes and nose, at data value: 478.9156494140625

- Colour (Bow) - To create a region that can be coloured independently I used an ExtractByCells filter on the box clip of the bow (Clip 3). Then gave it a linear mapping with red starting at datavalue = 50.
- This has been rendered with raytracing and shadows.
- This visualisation uses a Surface mapping for all visible components.

**Was there any special data preparation done?**

- Data Properties - Data Extent (0-511, 0-511, 0-62)
- Threshold - To remove the box around the bear. Minimum = 50, Maximum = 1492. Remove anything under 50.
- Calculator - I have scaled up the values in the Z-axis so that the bear is of proper scale. The formula = `coordsX*iHat+coordsY*jHat+(8.24193548387)*coordsZ*kHat`
- Clip - I have used 2 clip filters to remove the mass behind the bear, this is a Plane clipping. In a formation of (/ \). They have both been inverted.

Clip 1 - Origin: 257, 435.801, 255,5. Normal: 0.37, 0.9378, 0

Clip 2 - Origin: 219.679, 426, 255.633. Normal: -0.195, 0.9808, 0

^ These are the same as the previous visualisation.

- Additional Clipping - I have used a clipping filter to clip the bow of the total dataset and then done this for the separate bow to colour it independently, these are Box clippings.

Clip 3 - Clip Type: Box, Position: 150, 215, 200. Rotation: 20, -1.3797, -1. Length: 150, 50 , 70. Inverted.

Clip 4 - Clip Type: Box, Position: 150, 215, 208.69. Rotation: 20, -1.3797, -1. Length: 150, 50 , 70. **NOT Inverted.** To take away from the bear.

**What are the limitations of your design?**

I would have liked to smooth the surface out, however when I tried to add a contour -> smooth filter (the way I found from an online resource) my program became unusable, it was really slow and would crash with a simple zoom or rotation of the camera view.

Put your 1st data2 design concept here

**What can we learn from the visualization?**

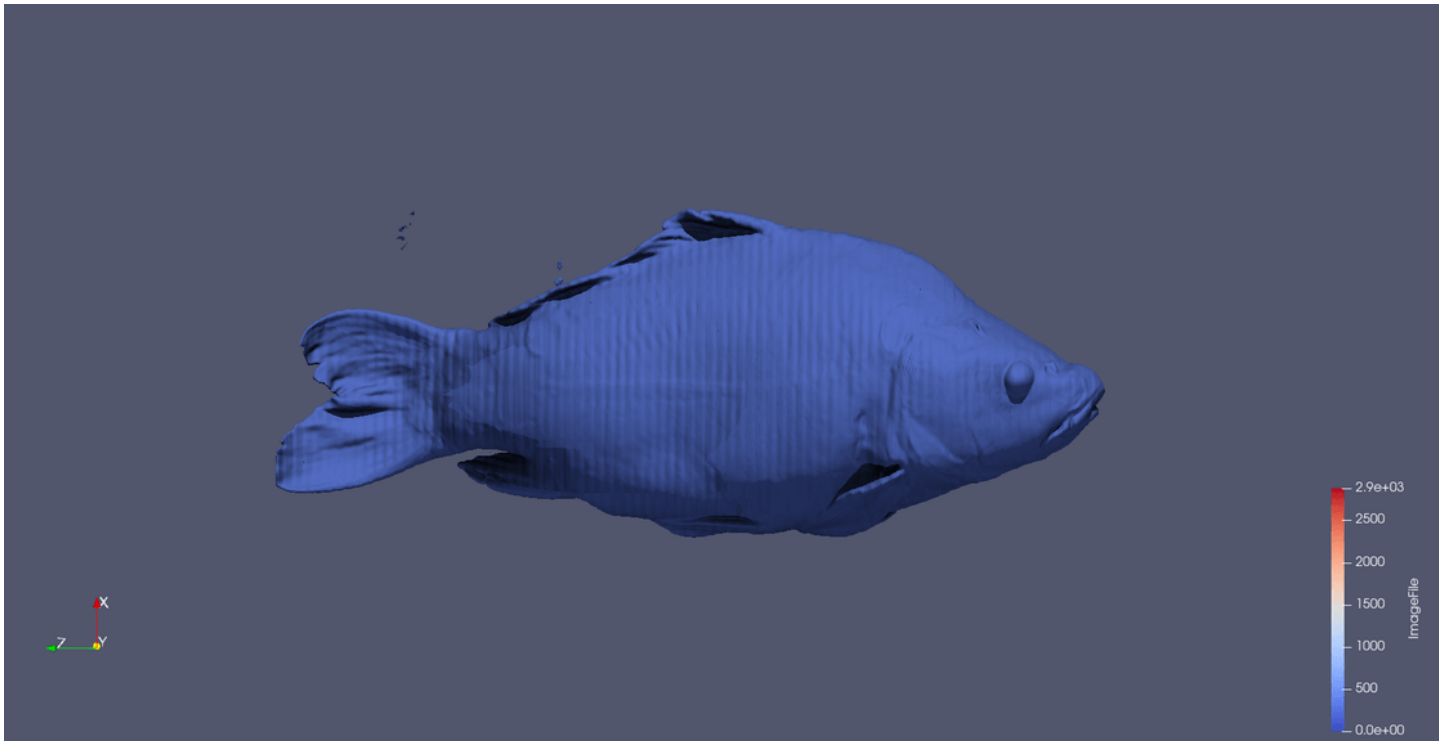
This dataset was a mystery upon looking at the slices of the `.raw` datafile. I had seen some CT scans of a skull before and it struck me quite quickly this was a bone structure of some type. After applying a contour filter it became obvious that it was a fish.

This visualisation intends to show the user the bone structure of a fish in comparison to the skin structure of the fish and how they are separate in density. By adding a gif representation the user can see the entire 360 degree view of the fish with skin and bone.

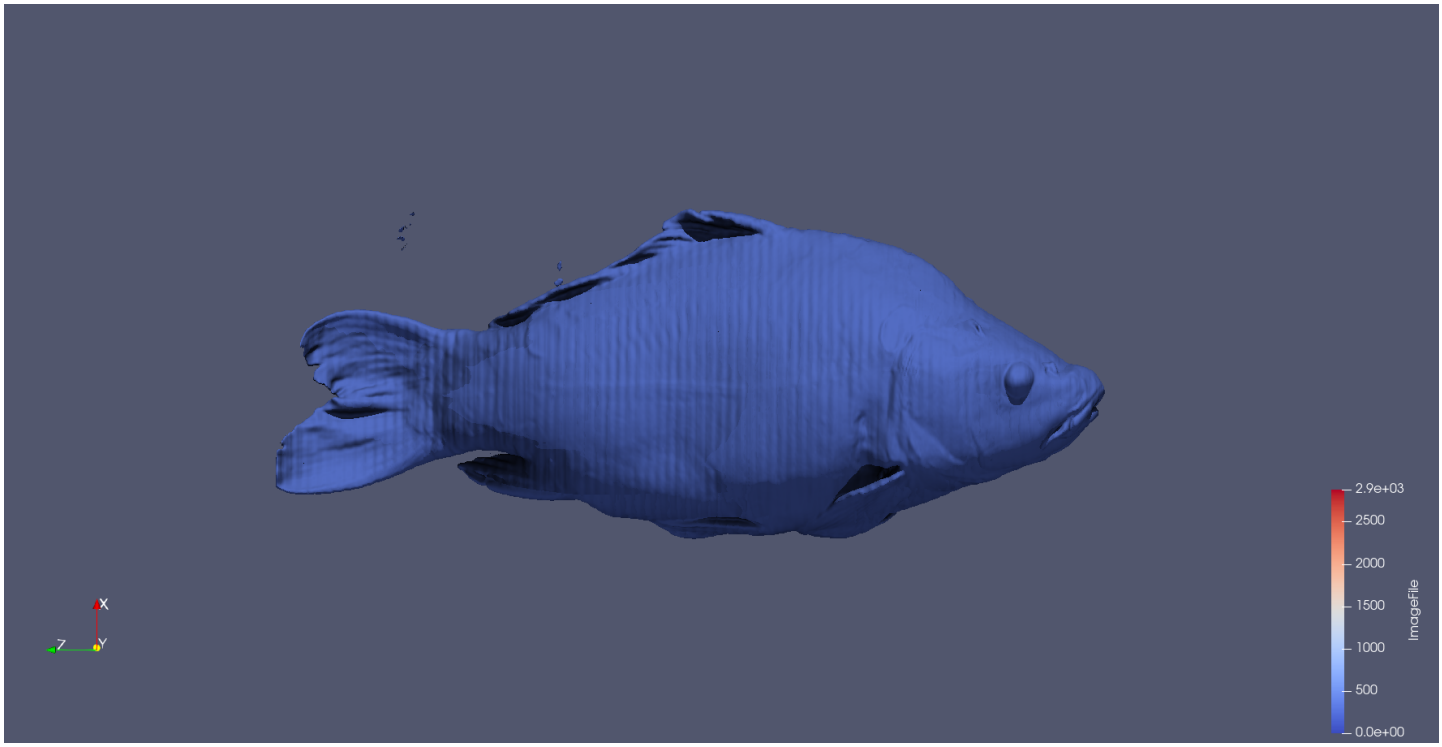
We are really able to see how fish have a very small brain indicated by the small region of space amongst the dense head area. Also from my visualisation this fish does not seem to have prominent teeth.

**What is the name for the type of visualization(s) used?**

Isosurface reveals bone behind skin.




This is a gif ^


X
Z
Y
2.9e+03
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2000
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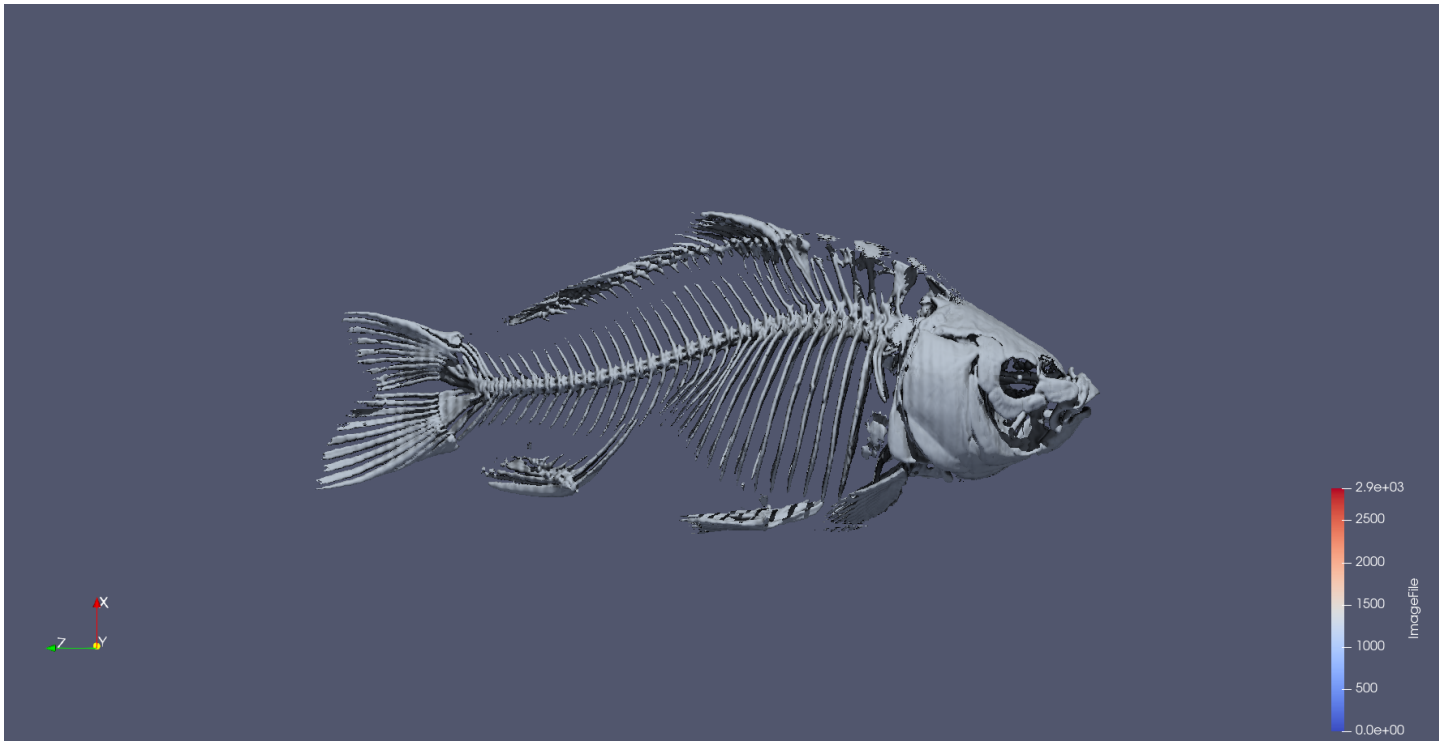
1000
500
0.0e+00
ImageFile


X
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Y
2.9e+03
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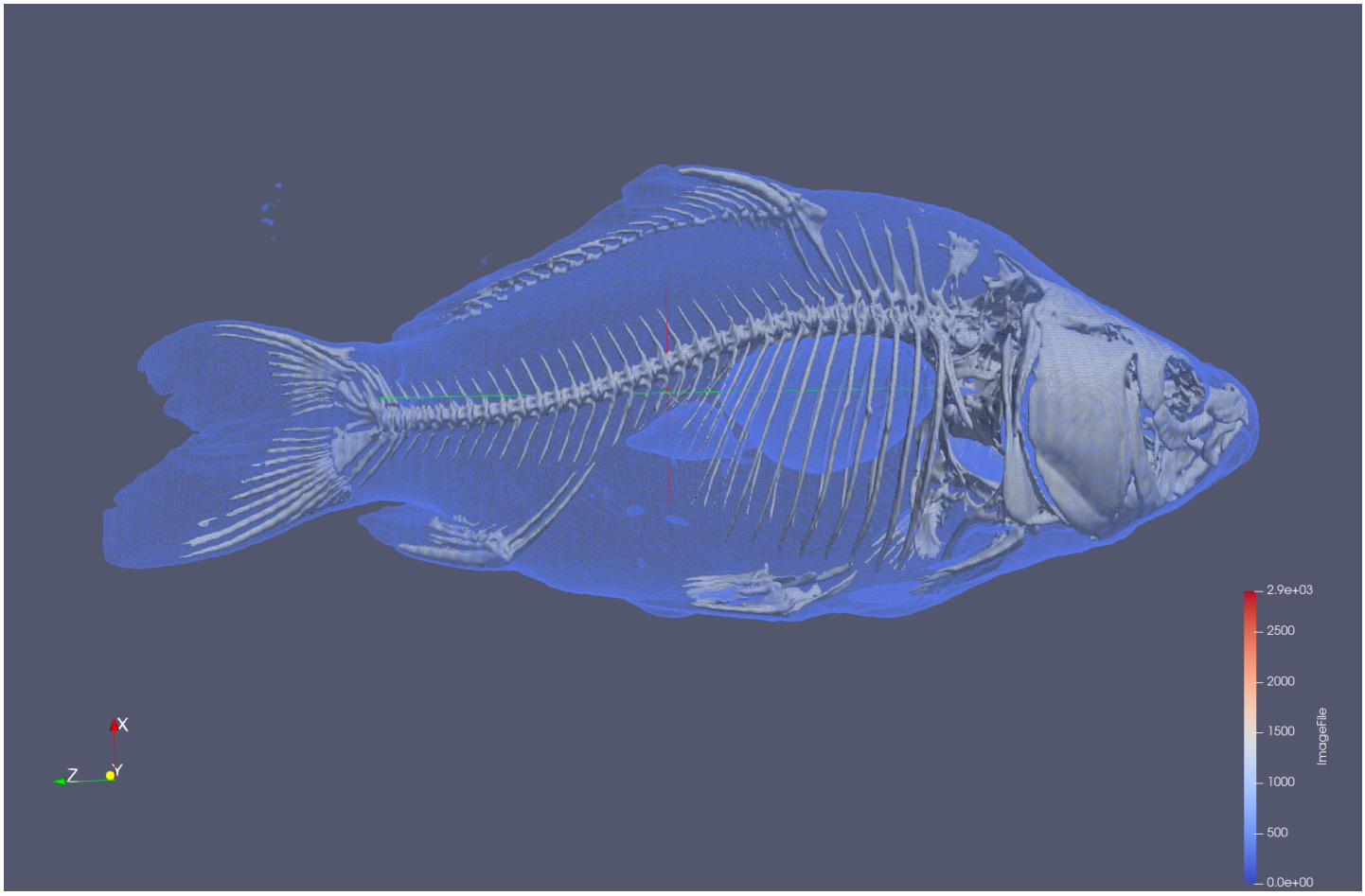
500
0.0e+00
ImageFile




**What are all visual mappings used?**

- Colour - The Colour Map I have used is the default Paraview colour map. (Cool to Warm). I found that this represented the fish quite well. Even when just fitted to the data with no additional editing. 0 being the start and 2900 being the end.
- Camera - This visualisation uses an animation of the camera orbiting around the fish. I have created a Camera orbit animation with time length 2.
- Wireframe - To show both the skin and bone in one image I have used a wireframe representation on the skin at isosurface value 300. The bone is using a surface representation at isosurface value 1300. This particular image does not use ray tracing to enhance visual clarity.
- This has been rendered with raytracing and shadows.

**Was there any special data preparation done?**

- Data Properties - Data Extent (0-255, 0-255, 0-511)
- Contour

  For the skin I have used a contour filter with an isosurface value of 300.

  For the bones I have used a contour filter with an isosurface value of 1300.

  Choosing these values means we are only looking at the skin an bone rather than any organs or other things in the dataset.

- Animated Contour - I have used an animated contour that will scroll through the isosurfaces to reveal the more dense bone under the skin. Using one of the contour layers that have been used to represent the skin and bone separately.

At time 0.5 I set the value of the isosurface to be 300.

At time 1.5 I set the value of the isosurface to be 1300.

This allows the user to see both the bone and skin for longer so it does not just change before the user can make sense of the visualisation. This twinned with the orbit vismapping makes the visualisation.

**What are the limitations of your design?**

I would prefer this to be interactive rather than just a sweeping gif but I'm not really sure how to do this.
Having more zoomed in views of the gif moving slower focussing on different parts of the fish could be useful to the observer.

Put your 2nd data2 design concept here

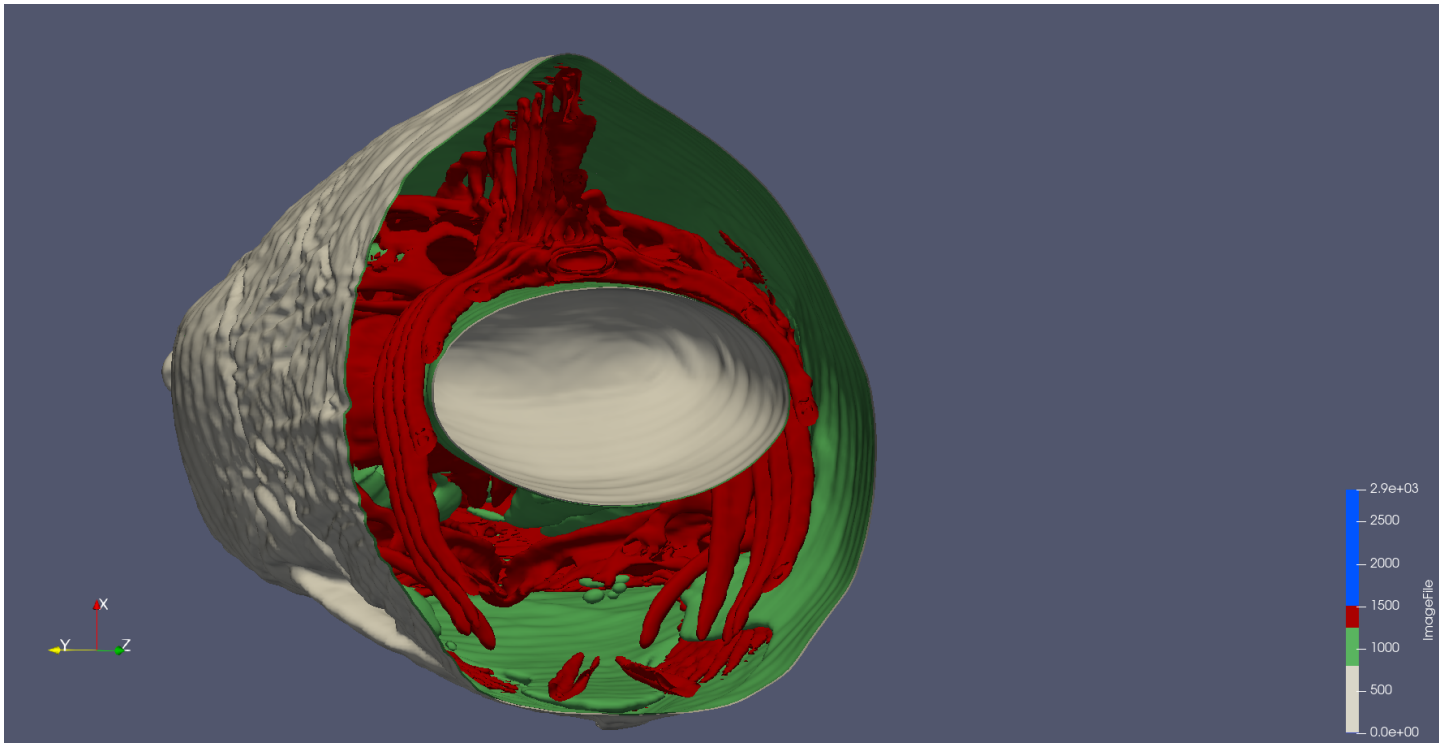
**What can we learn from the visualization?**

This visualisation looks at the cross-section of the fish. Using a slicing filter through the z-axis we are able to see the different isosurface values separated by colour.
This visualisation is looking at the skeleton and the organs of the fish, skeleton red organs are green and white. We are able to see the fish 'hollow' areas such as the air bladder/swim bladder and stomach are placed around the skeleton similar to how this is in humans with lungs and stomach.

**What is the name for the type of visualization(s) used?**

Cross-sectional slicing animation. Surface representation. Isosurface separation.


This is a gif ^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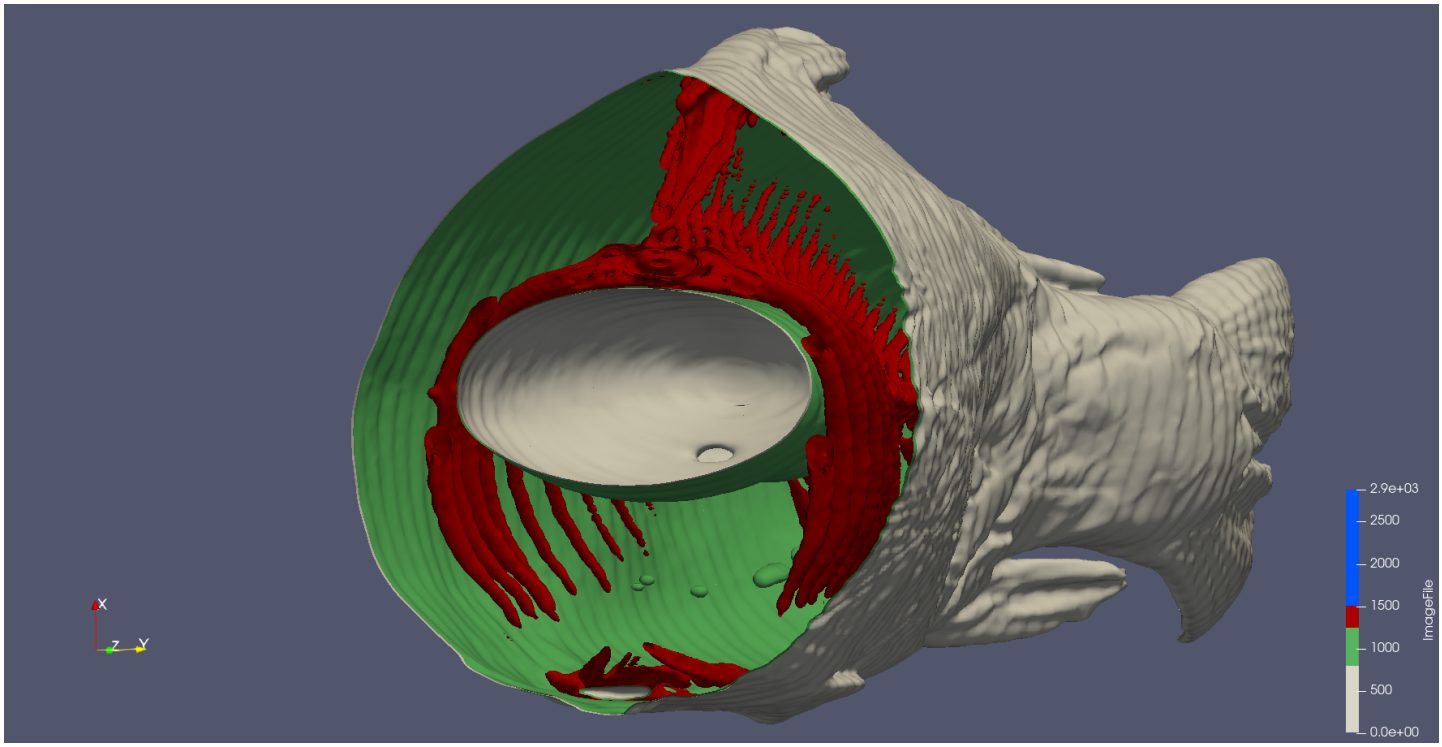
0.0e+00
ImageFile

This is a gif ^




**What are all visual mappings used?**

- Colour - I have use a colour mapping to value for this data. Checking the Interpret Values as Categories.

  Isosurface value 600 - White

  Isosurface value 800 - Green

  Isosurface value 1250 - Red

  Isosurface value 1500 - Blue

- This visualisation uses the Surface representation for all visible layers.
- This has been rendered with raytracing, **no** shadows.
- I have used an animated clip that I describe in the dataprep section.

**Was there any special data preparation done?**

- Data Properties - Data Extent (0-255, 0-255, 0-511)
- Contour - I have used a contour filter with 4 different values, 600 for skin, 800 for the inside of the fish, 1250 for bones, 1500 anything more than bone. (largely not present)
- Clipping - I have used a clipping filter to display the cross section of the fish. I have animated the z-axis (Clip 1 - Origin (2)) this by setting the start value at 511 at time 0 and then setting the value to 0 at time 2.

**What are the limitations of your design?**

Having the air bladder and stomach as different colours would draw more attention to that feature. Potentially having more colours and isosurfaces represented could show more of the data of the fish.