Visualisation Summative Assignment

hzwr87

This report concerns variant b of the assignment, using the 16 bit variants of the data from the Stanford data archive, as this allowed us to utilise the dataset showing the Stanford terra-cotta bunny, which only had 16-bit data files assotiated with it, without having to alter our implementation for the other datasets.

A sketch of our software architecture is shown in the flowchart in Figure 1. We split this down into three main stages, setup, isosurface model creation and output. The setup phase involved parsing the command line parameters, reading the requested dataset in the appropriate format and setting up the renderer, renderer windown and user interactor. We then proceed to create our isosurface model using the VTK implementation of the marching cubes algorithm. We specify the isosurface value (threshold) which will be expressed as a percentage of the maximum voxel value found in the data set. The values we use are shown in Table 1. In some of the datasets, it is then necessary to filter this isosurface to keep the largest region, to remove elements that are present in the dataset that are not meaningful for this visualisation. We then use the output of this to create a geometry from the data of the remaining isosurface using VYK's polygon data mapper. This geometry is then assigned to an actor, and given an assotiated number of cloud points, colour value and opacity. We can do this multiple times, for example to show both the skin and skull views of the head dataset as shown in Figure 5. When this was done, we needed to select colours that showed a clear contrast. We use black for the background and white for the foreground in most cases, as this shows a clear contrast. When we use two thresholds, the second is displayed in green, as it constrasts well with black and white and works well with opacity. The final step was then to add the actor(s) that we had created to the renderer and display them.

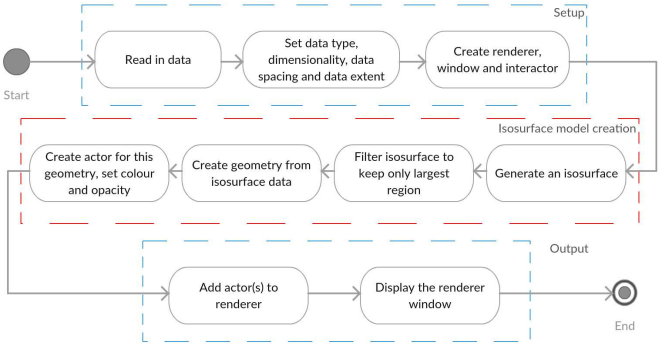
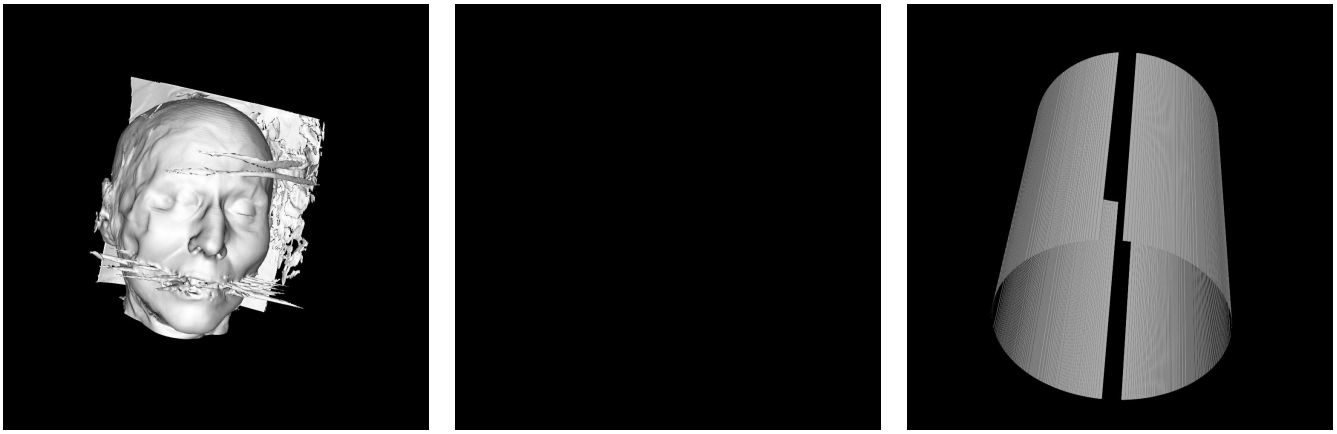


Figure 1: Flowchart of our VTK rendering pipeline

Each dataset was initially examined with the isosurface value at 10% of maximum voxel value. This did not give much useful information for the brain and bunny datasets. On the head dataset, it showed useful information but was too cluttered. Other values were therefore experimented with. These values and the information they show are presented in Table 1.

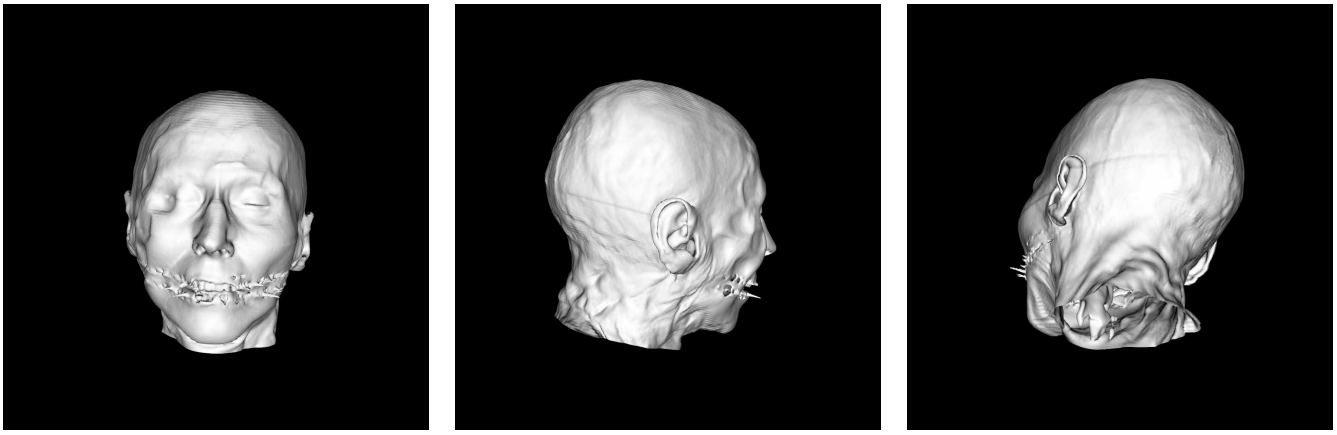
Dataset	Isosurface Value (% of max value)	Information Being Shown	Figure Number
Head	10	Effect of setting isosurface value to 10%	2a
Brain	10	Nothing	2b
Bunny	10	Surrounding tube, but no bunny	2c
Head	25	Threshold required to show skin	3
	35	Threshold required to show skull	4
	25 and 35	Two thresholds, showing skin and skull	5
Brain	30	Full information of dataset	6
	45 and 48	Two thresholds, showing the separation of brain and skull	7
Bunny	3	Full information of bunny dataset	8
	3	Effect of filtering the isosurface to keep the largest region.	9
	3	Effect of changing the aspect ratio from 1:1:2 to 1:1:1	10

Table 1: What each isosurface value shows



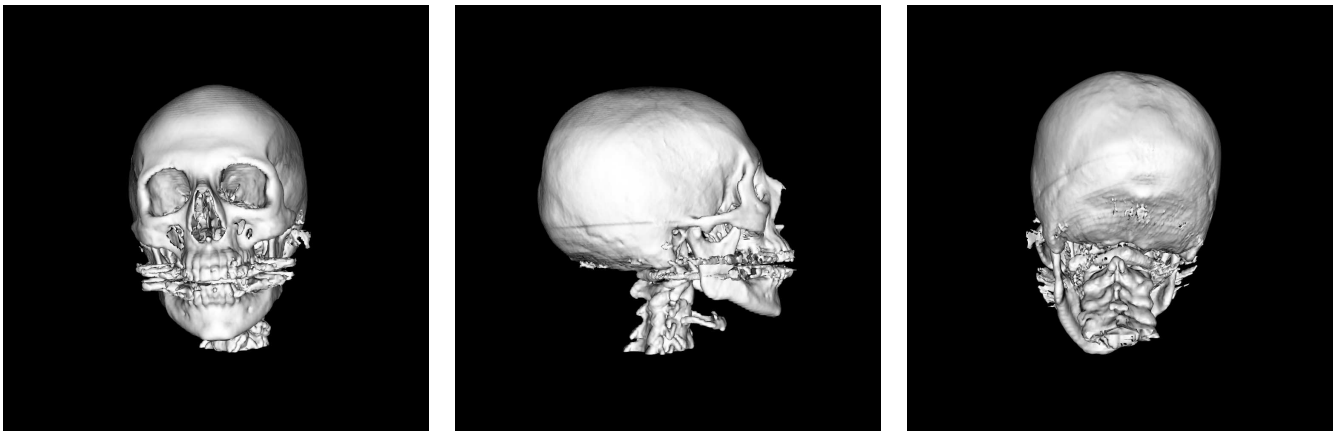
(a) Head Dataset (b) Brain Dataset (c) Bunny Dataset

Figure 2: 10% Thresholds



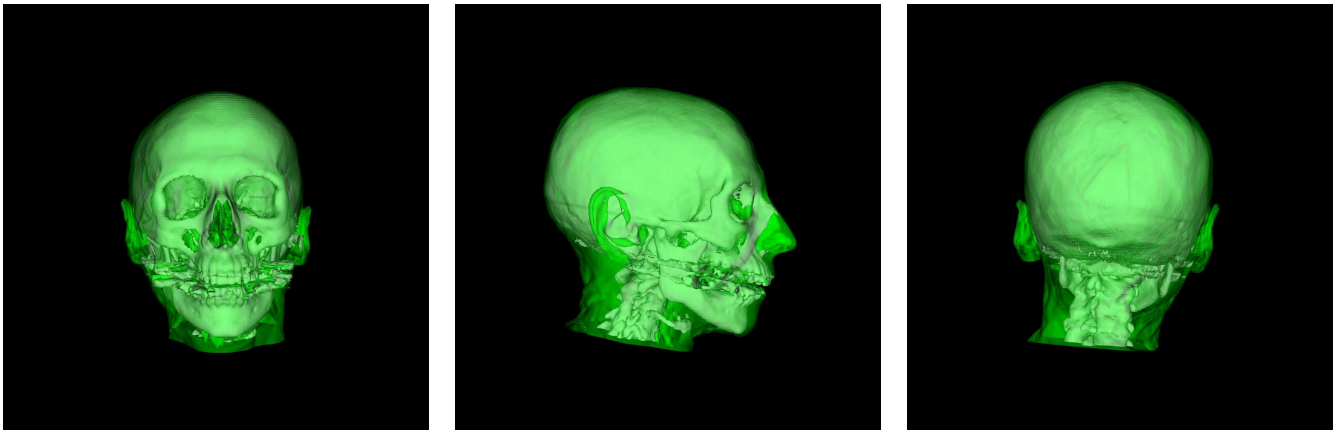
(a) (b) (c)

Figure 3: Head Skin



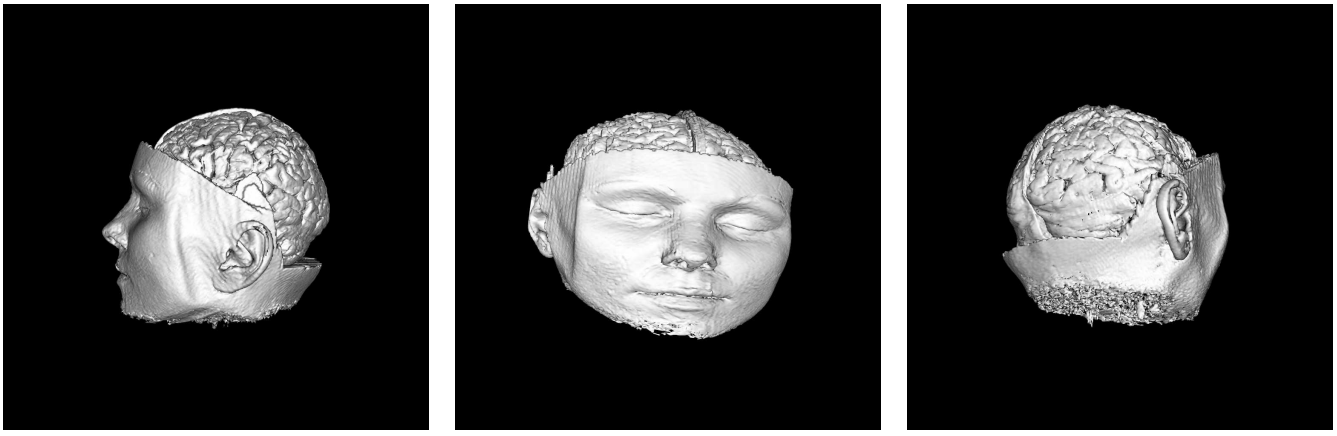
(a) (b) (c)

Figure 4: Head Skull



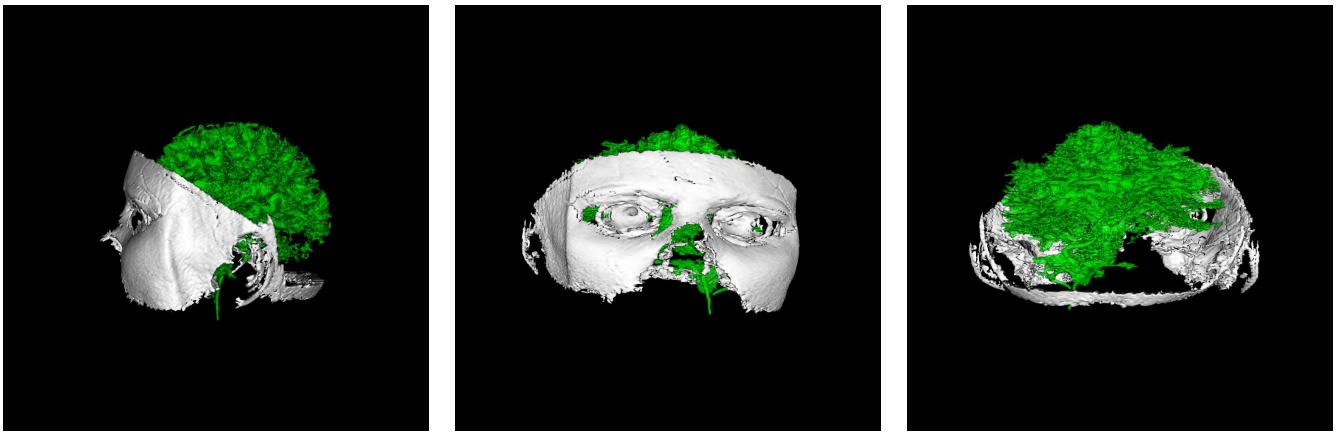
(a) (b) (c)

Figure 5: Head Skull and Skin Combination



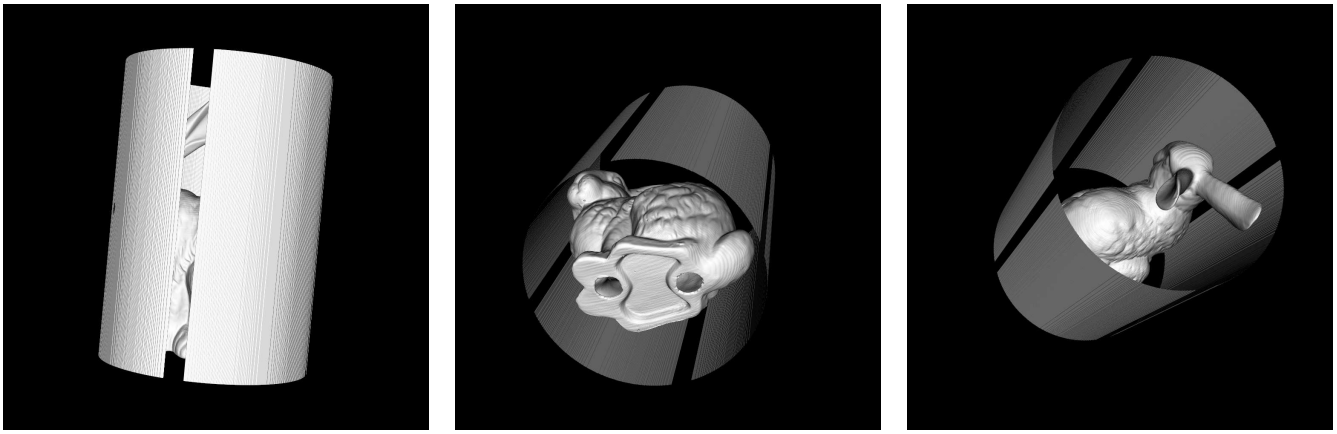
(a) (b) (c)

Figure 6: Brain Dataset



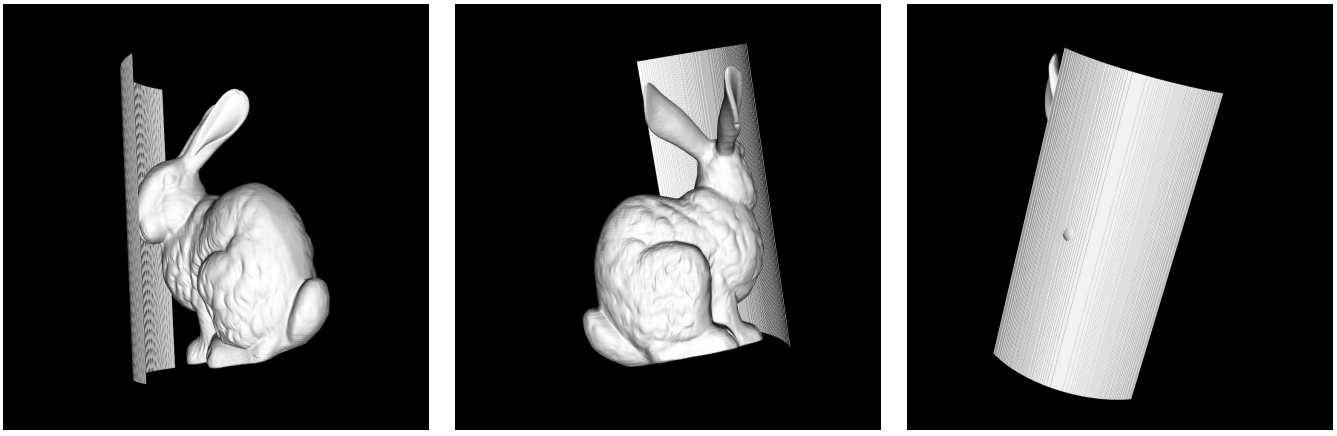
(a) (b) (c)

Figure 7: Brain Dataset Combination of Thresholds



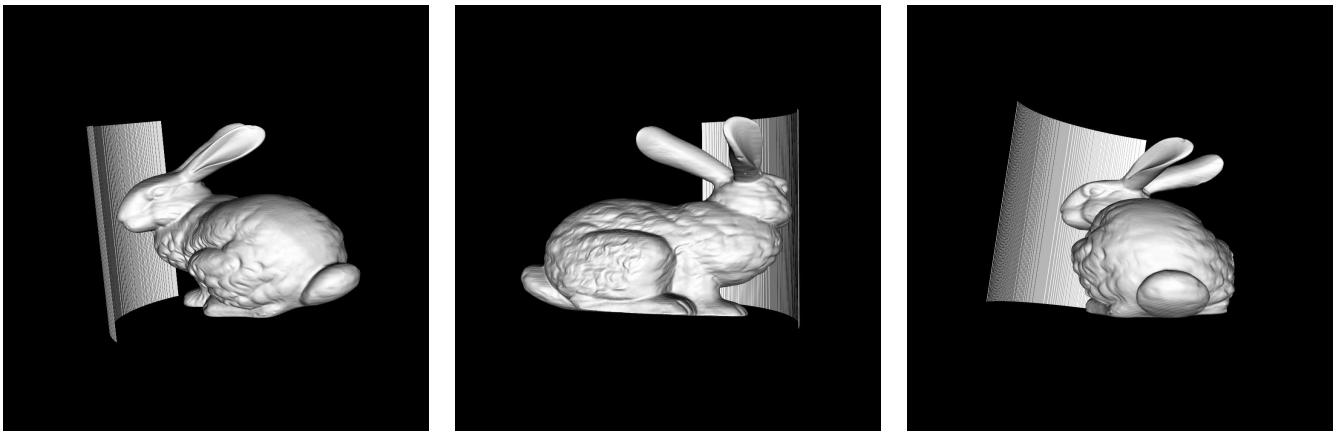
(a) (b) (c)

Figure 8: Bunny Dataset



(a) (b) (c)

Figure 9: Bunny Dataset Largest Component



(a) (b) (c)

Figure 10: Bunny Dataset Correct Aspect Ratio