Report for HW04

1. The TCL version of the code, head_6.tcl has been rewritten to the python code head.py, when executing the python code, I got the isosurfaces representing the bone and skin successfully visualized:

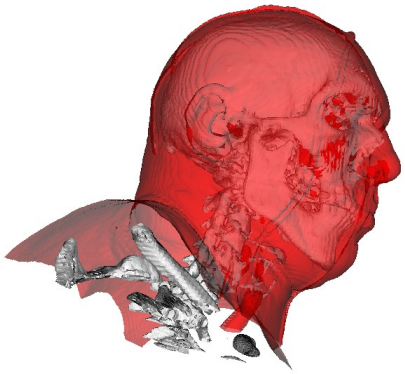

Figure 1: the visualization of the skin(read color, semitransparent) and bone(white color) of human head

2. The iso-value of the out most layer of contour has been changed from 25 to 75:

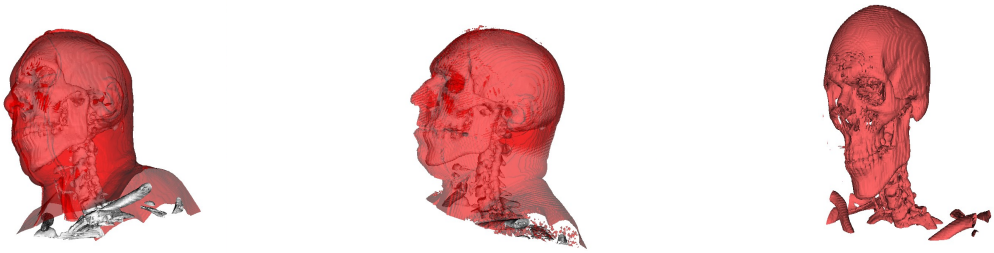

Figure 2: the visualization of head with the out most layer of contour changed form 25(left) to 60(middle) and then to 75(right).

We can see that by changing the iso-value of the contour to a larger value, the surface its represent will move inward gradually, from skin, to the mussel and then to the bone.
To better visualize the face of the head, we can set the opacity of the out most layer of contour to be 1 :

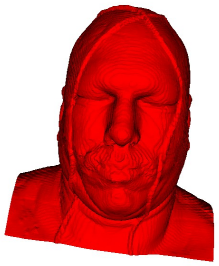

Figure 3: The visualization of face.

3. The picture are shown in Figure 1, 2 and 3.

4.
Hue represents the name of the color such as red, green or blue, by adjusting the range of hue, we can change the components of the color.

The saturation can adjust the intensity of color, reducing the value of saturation will add more gray into the color

The luminance is the brightneess or darkness of the color, higher value of luminance will makes the color lighter.

Compared with the RGB settings, the Hue, Saturation and luminance contains more informations about the nature of colors instead of just mixing the read, green and blue components. Thus it is more convenient to be used to generate the real looking color.

5.
Lookup table:
Lookup table used in this case is an essential part for color mapping visualization, it can map the scalar values to user specified colors. User can choose the range of hue, saturation, value and alpha, and the function vtkLookupTable will generate the color by linear interpolation and stored into the initialized lookup table. The lookup table can speed up the computation since the linear interpolation only needs to be done once.

Contour Filter:
The contour filter is a filter that find out the position of isosurface(or isoline). It can take a 2D or 3D dataset as input and get the isosurfaces\isolines which have the user-specified input(by calling .SetValue()) . In this project, we used this filter to generate the isosurface for skin and bone. Because the density of this two kind of tissues are different than the other materials surrounding them, we can find out a value which can represent the density of bone or skin, and then use the contour filter identify the corresponding isosurface.

Probe Filter:
Probe filter is a filter that computes point attributes(color of point in this case) at specified point positions. It takes a geometric shape and also a source data as the input, and it will compute the attriputes of the points on geometric shape by interpolating into the source data and find the value which corresponding to the point coordinates. In this project, its function is to find out the color of the isosurfaces which has been identified by the contour filter, by interpolate and checking the value on the color map. The isosurface representing the bone and skin have different colors because they have different color at the position of color map.