Exercise 12 : Volume Render Basic Rendering Controls

The Volume Render module provides a variety of display representations for three-dimensional image data sets. Also provided in the module are tools for volume image editing and measurement. This exercise will demonstrate the different control parameters involved in the process of volume rendering. This includes demonstrating various rendering algorithms that are part of the suite of techniques used to render volume images with Analyze.

1. Load the **Cubic_CT_Head.avw** data set from the **$:\BIR\images\TutorialData** directory.

2. Open the **Volume Render** module (**Display > Volume Render**).

3. Press the **Render** PowerBar button or choose **Generate > Render**.

4. Open the **Preview** window (**Generate > Preview**).

Thresholding Data

5. Open the **Thresholds** window (**Generate > Thresholds**).
6. Set the **Threshold Minimum** to **85** (figure 1) - all voxels with a value less than 85 are now removed from view.
7. The resulting image can be seen in the Preview window (figure 2). Click **Render** to display the rendering in the main Volume Render window.
8. Now, set the **Threshold Minimum** to **145**—all voxels with a value less than 145 are now removed from view. Click **Render**.

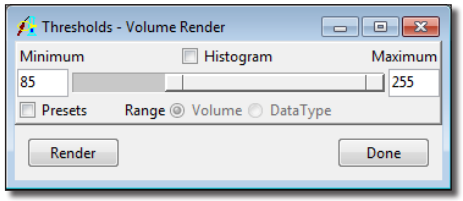

Figure 1

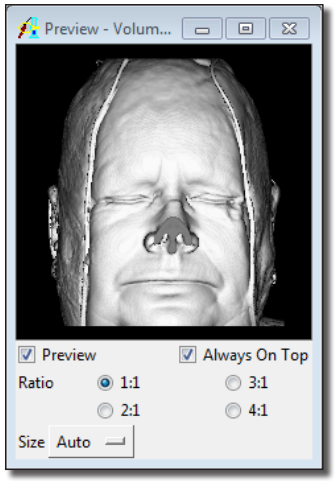

Figure 2

Controlling the Rotation Parameters

9. Open the **Rotation** window (**Generate > Rotation**).
10. The **Volume Absolute** option is selected by default (figure 3); use the **X**, **Y**, and **Z** slider bars to change the rendering view. Click **Render** as desired.
11. Select the **Screen Relative** and **Volume Relative** options and compare the different rotation methods available. The 'Screen Relative' option specifies that the rotation of the volume be performed relative to the current screen axis, while the 'Volume

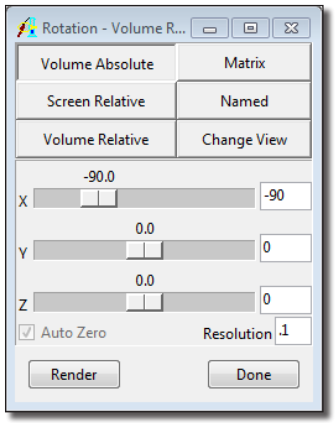

Figure 3

Relative' option specifies that the rotation be performed relative to the current position of the volume axis.

12. Look at the **Matrix** option, but adjustment is not recommended.
13. Experiment with the **Named** option views.
14. Select the **Change View** option and use the arrows to manipulate the rendering view (figure 4). Alternatively, you can click and drag the rendering to a new angle in the image display.

> *note* | As the rendering is moved, only the originally viewable voxels are interactively re-rendered, providing visual cues to the movement and orientation of the image. Upon release of the mouse button, the full image is rendered at the new orientation.

15. When you are familiar with all of the rotation options, select the **Front** view from the **Named** option and click **Render**.
16. Click **Done** to dismiss the Rotation window.

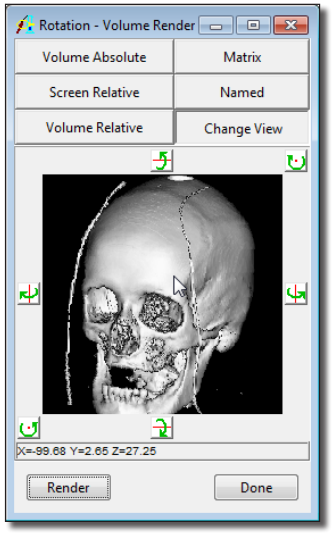

Figure 4

Rendering Algorithms

17. Open the **Render Types** window (**Generate > Render Type**) (figure 5).
18. Experiment with the rendering algorithms. (See Note below).
19. Select the **Depth Shading** option. View the rendering in the Preview window. Click **Render** to display the rendering in the main Volume Render window (figure 6).
20. Select the **Volume Compositing** option. View the rendering in the Preview window. Click **Render** to display the rendering in the main Volume Render window (figure 7). For more information on the Volume Compositing Tissue Map Type Specific option, please review exercise 13, Volume Render – Tissue Map Tool.

> *note* | Additional parameters for each render type are available from the Type Specific sub-menu (Generate > Type Specific), explanation of all of these additional options is beyond the scope of this exercise, but more information can be found in the User's Guide (Help > User's Guide).

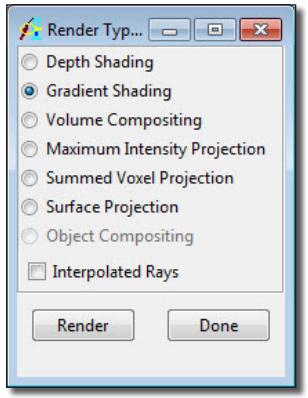

Figure 5


Figure 6

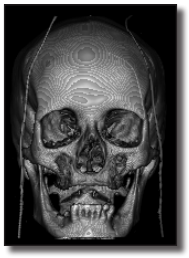
Figure 7

21. Select the **Maximum Intensity Projection** option. Click **Render** to display the rendering in the main Volume Render window.

    - This render type is normally used with vascular data where the signal is enhanced (usually using contrast), but the dense bone in this data set also shows up well. Try the MIP Weighting option available from with the Type Specific sub-menu (**Generate > Type Specific > MIP Weighting**). The 'Before' weighting option works very well with this input data (figure 8).

22. Select the **Summed Voxel Projection** option and click Render.

    - If the threshold minimum is still set to 145, the Summed Voxel Projection algorithm is actually only adding and averaging the voxels corresponding to bone, ignoring all soft tissue. In most cases, whenever you use the Summed Voxel or Maximum Intensity Projections render types, you may want to set the threshold range to the complete range of the input data.

    - In the **Thresholds** window (**Generate > Thresholds**) change the Threshold **Minimum** to **0** and click **Render**. Notice that now the Summed Voxel Projection rendering looks like a re-projection X-ray (a Digitally Reconstructed Radiograph – DRR) (figure 9).

23. Select the **Surface Projection** option. Set the **Threshold Minimum** back to **145** in the Thresholds window, then click **Render**. This render type is more effective with different input data, but the effect can be seen using the current surface (figure 10).

24. Select **Gradient Shading** and click **Done** to dismiss the Render Types window.

Figure 8

Figure 9

Figure 10

note When working with anisotropic data, the 'Interpolated Rays' option may help to improve the quality of the rendering.

The Clip Tool

25. Open the **Clip tool** (**Generate > Clip**).

26. The Clip tool (figure 11) allows a subregion of the volume to be rendered. Experiment with the **Clip Plane** and **Clip Volume** parameters.

27. Click **Done** to close the Clip tool.

28. Close all windows related to the Volume Render module before moving onto the next exercise.

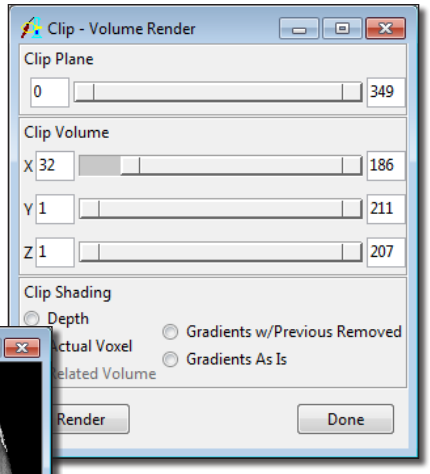

Figure 11

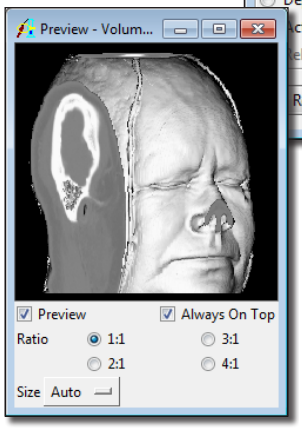

Figure 12