

Exercise 13 : Volume Render Advanced Rendering Controls

Adding the ability to control specific objects in the rendering process provides incredible power and versatility in the creation of unique visualizations. In Analyze, this is possible with the use of object maps. Object maps are special image files that are used in Analyze to partition and identify structures as belonging to a particular segmented object. Voxels in the volume image correspond directly, on a one-to-one basis, with a voxel in the object map, whose value assigns the voxel to a particular segmented object. Each of the objects within the object map can be controlled and manipulated independently. This exercise will begin to explore the power of object control in creating 3-D visualizations, but will only “scratch the surface” of the endless possibilities for exploration of this 3-D visualization space.

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



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

Defining Objects in an Object Map

3. Choose **File > Create Object Map**. The **Objects** window will automatically be returned; dismiss the window for now by clicking **Done**.
4. Open the **Threshold Tool** (**Tools > Manipulate > Threshold**) (figure 1).
 - Set the **Minimum Threshold** to **85** [A].
 - Set **Change to Object Map** [B].
 - Set **Defined Object** to *****New***** [C].
 - Click **Threshold Volume** to define a new object. Note all voxels from 85 to 255 will be defined as a new object, 'Object_2'.
 - Click **Done** to close the Threshold Tool.



5. Open the **Preview** window (**Generate > Preview**) to interactively review your changes.

6. Open the **Objects** window (**View > Objects**). Select **Object_2** (if it is not already selected) from the **Object** drop-down menu. Change the following attributes for **Object_2**:



7. Click **Render** to display the rendering in the main Volume Render window (figure 2).



8. In the main Volume Render window, open the **Thresholds** window (**Generate > Thresholds**). Set the **Threshold Minimum** to **145** and click **Render**.

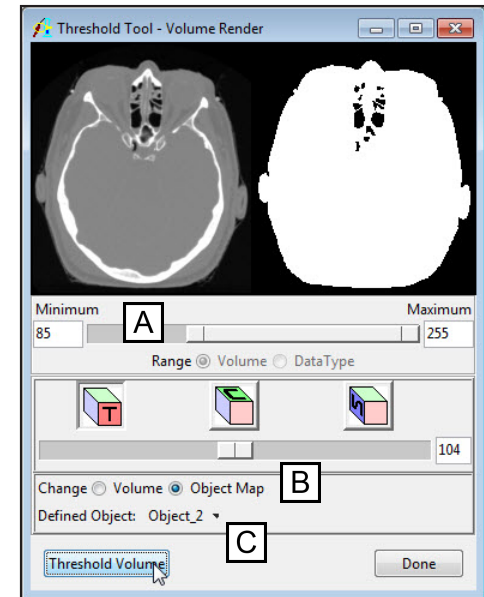


Figure 1

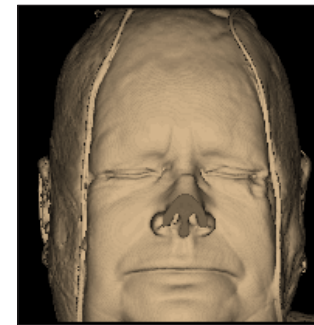
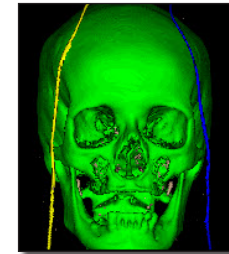


Figure 2

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9. Open the **Connect Tool (Tools > Manipulate > Connect)**.
 - Change the **Connect Method** to **Connected Components**.
 - Set to **Keep the '3' Largest Objects**.
 - Click **Label Components**. The three largest objects will automatically be identified and labeled as new objects (figure 3).
 - Click **Done** to close the Connect Tool.



tip | Up to 255 different objects can be defined in an object map.

Figure 3

Manipulating Objects

10. In the **Objects** window (**View > Objects**) (figure 4), click **Reassign Object(s)** [A].
11. In the window returned (figure 5), select: **BlueObject** from the **Reassign from** list. From the drop down menu to the right select: **YellowObject**. Click **Apply** and then **OK** to dismiss the window. Note the update in the Preview window.
12. Click **Remove Unused** [B] in the Objects window to remove 'BlueObject'. Click **OK** in the dialog box returned.
13. Select the **GreenObject** from the **Object** drop-down menu. Then change the following attributes:
 - **Name: Bone**
 - **Color: white**
 - **Shades: 32**
14. Select the **YellowObject** from the **Object** drop-down menu. Then change the following attributes:
 - **Name: Rope**
 - **Color: red**
 - **Shades: 8**
15. Click **Render**.
16. In the **Thresholds** window (**Generate > Thresholds**), set the **Threshold Minimum** to 5.
17. Return to the **Objects** window and set **Control by** to **Attribute** [C].

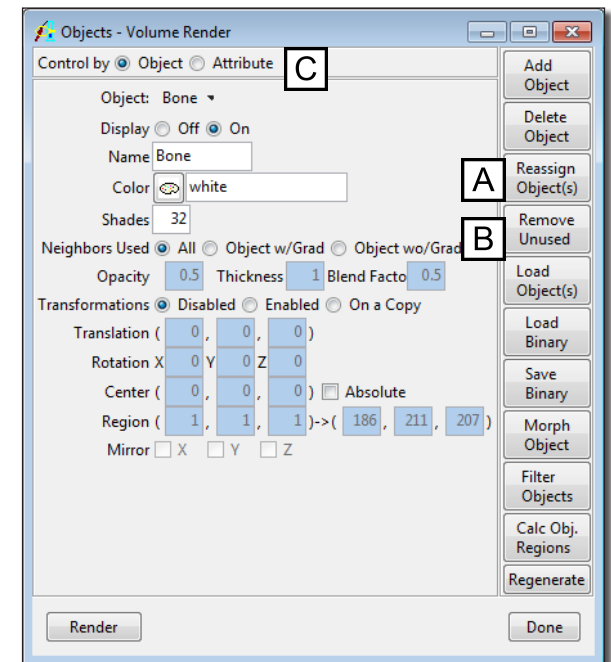


Figure 4

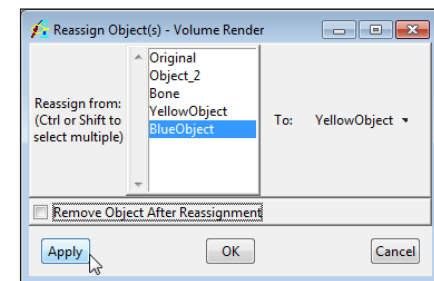


Figure 5



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18. Set the **Display** attribute to **Off** for the **Original** object. Then, click **Render**.
19. Open the **Render Types** window (**Generate > Render Type**). Select the Object Compositing option, then open the Object Mapping window, (**Generate > Type Specific > Object Mapping**).
20. Select the **Transparency** render type (figure 6) and click **Render** to view the effects.
21. A variety of object attributes can be controlled in the **Objects** window. Set **Attribute** to **Opacity** by selecting it from the drop-down menu. Change the **Bone** object to **1** (opaque). Click **Render** (figure 7).

Saving an Object Map

22. Object maps can be saved for review or use at a later time, or to load into another Analyze module; choose **File > Save Object Map** to save the object map.
23. Name the file **Cubic_CT_Head_xxx.obj** (where 'xxx' are your initials) and specify a location to save the file, then click **Save** (object maps are saved as .obj files).
24. Close the Volume Render module before proceeding to the next exercise.

note | The Object Mapping is only available if the Object Compositing option is selected. The Transparency render type is only available when an object map has been loaded or created.

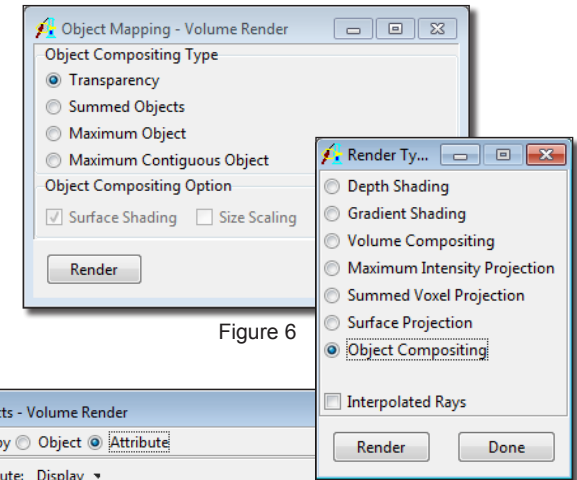


Figure 6

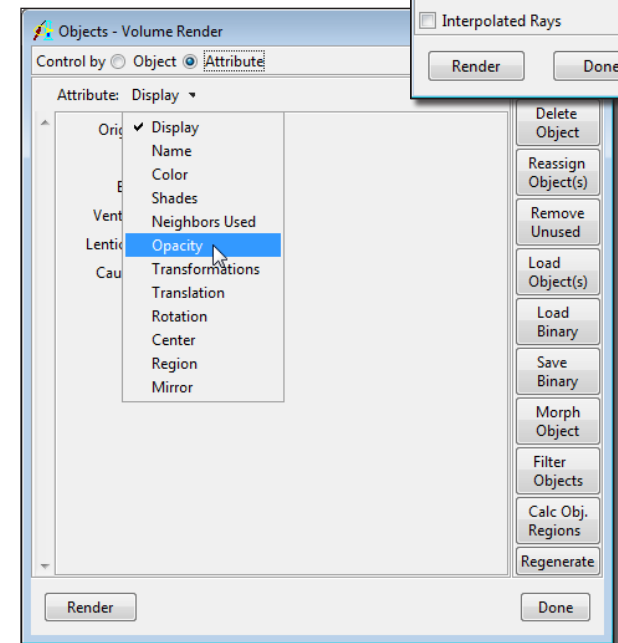


Figure 7