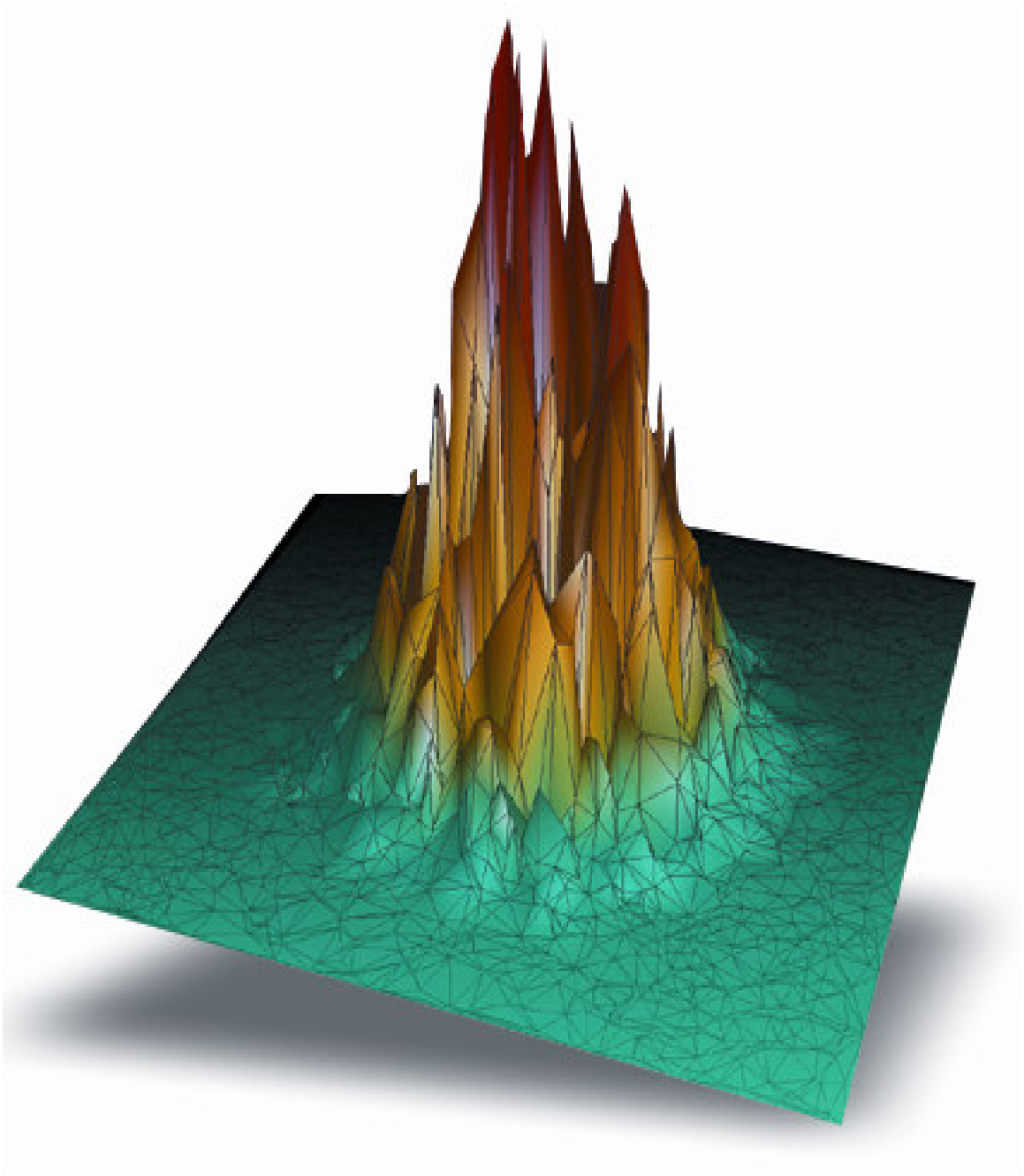
iTools Tutorial Three



A 3D Multiplanar Viewer

Creating a 3D Multiplaner Viewer

This tutorial assumes the user has a basic understanding of iTools. If you are a beginning iTools user, it is recommended that you first review the tutorial 1: ***Using iTools.***

Part 1: Setup

The ability to collect and analyze 3 dimensional data is becoming increasing popular in many areas of science, engineering and medicine. Atmospheric Science, Oceanography, Non-destructive testing and Medical Researcher all have a need to view 3 dimensional data. A useful tool in analyzing 3D volumes is the ability to display and manipulate orthogonal cutting planes of the 3D data. This tutorial will take you through the steps needed to create a simple 3D multiplaner viewer. It utilizes the iVolume and iImage applications.

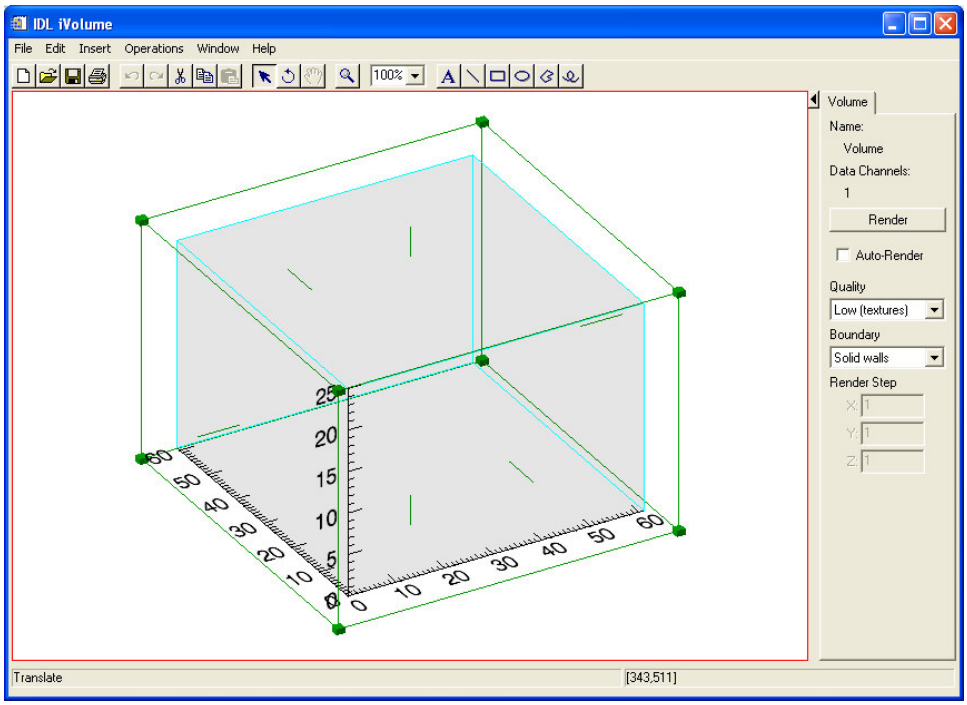
Begin at the IDL command line by restoring the sample data used in the tutorial. The data is part of the standard IDL installation.

1) RESTORE, demo_filepath('storm25.sav', SUBDIR=['examples','demo','demodata'])

Next, type the command “IVOLUME”, and pass in the variable “T”.

2) IVOLUME, T

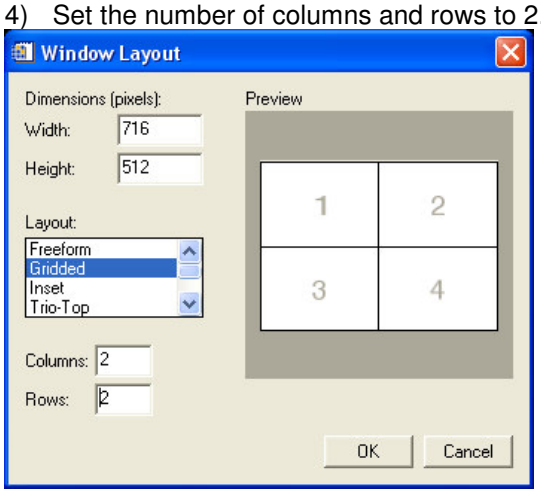
When you hit return, an iVolume window will appear. The data will not be visible until you select the “Render” button.



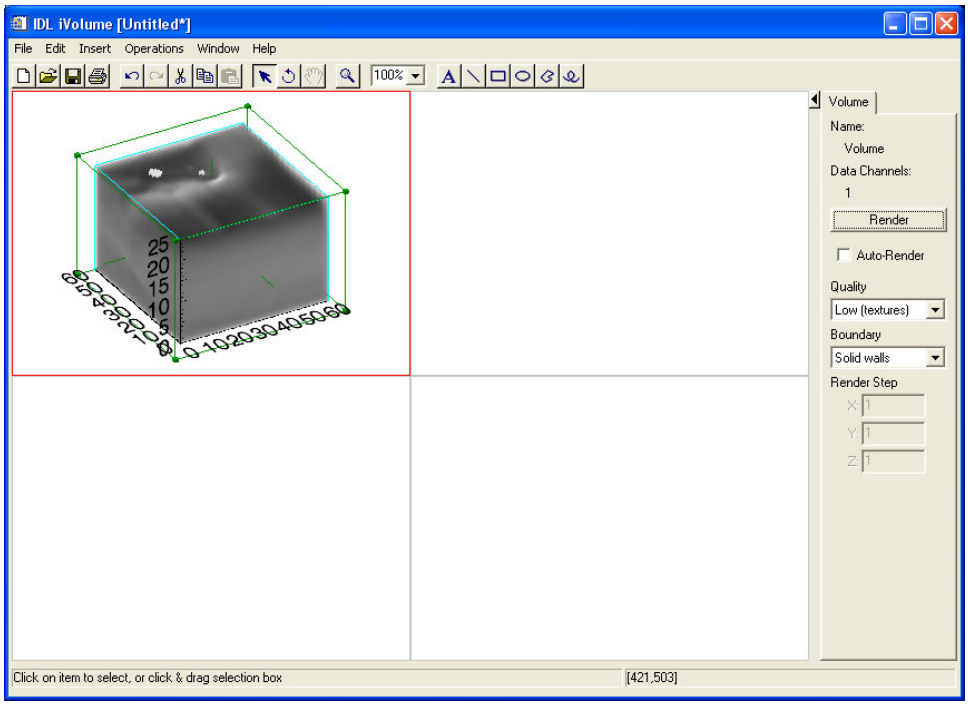
The desired layout is one view for the 3D visualization and one view each for the 3 image planes. A 2 x 2 layout is ideal for this. From the main menu,

3) Select Window -> Layout…

4) Set the number of columns and rows to 2. Then hit OK.



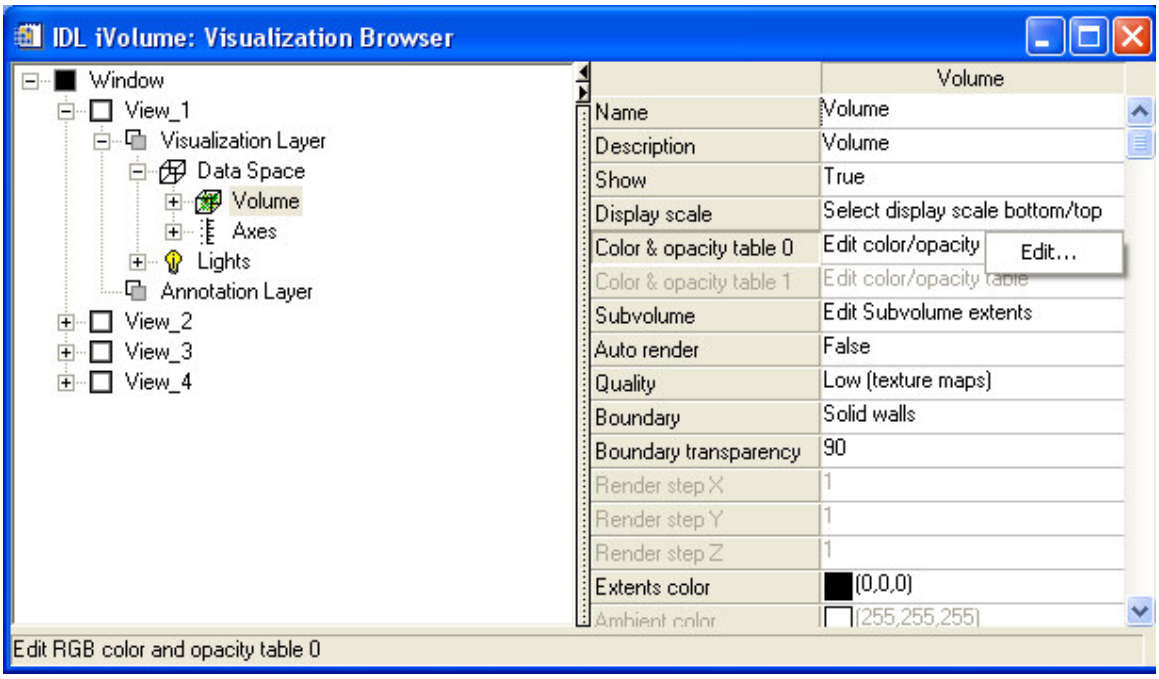
5) Once control returns to the main iVolume window select “Render” The resulting window appears below.



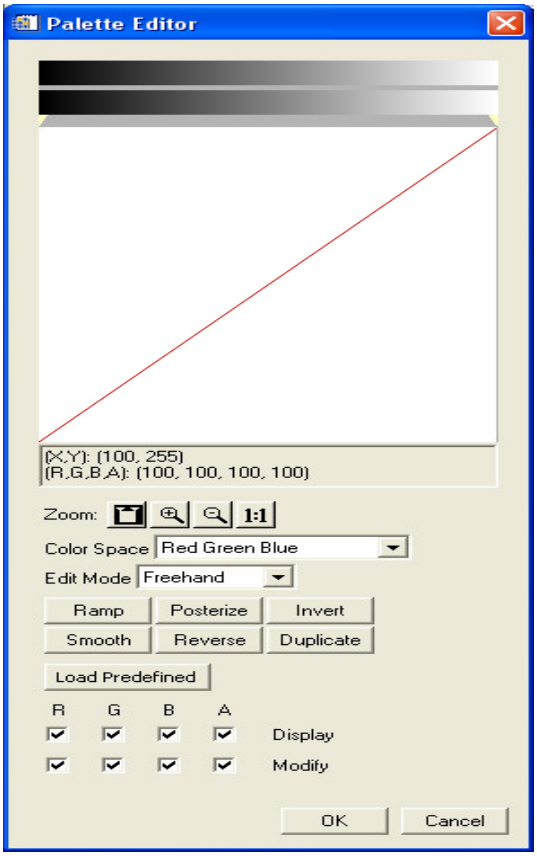
Adding color will make it easier to see features in the data.

6) Begin by selecting the volume. A cyan colored bounding box indicates when this occurs.

7) Next click the menu selection Window > Visualization Browser. This brings up the iVolume Visualization Browser.



8) Select “Color & Opacity table 0” and press its 'Edit' button to change the color table entry.



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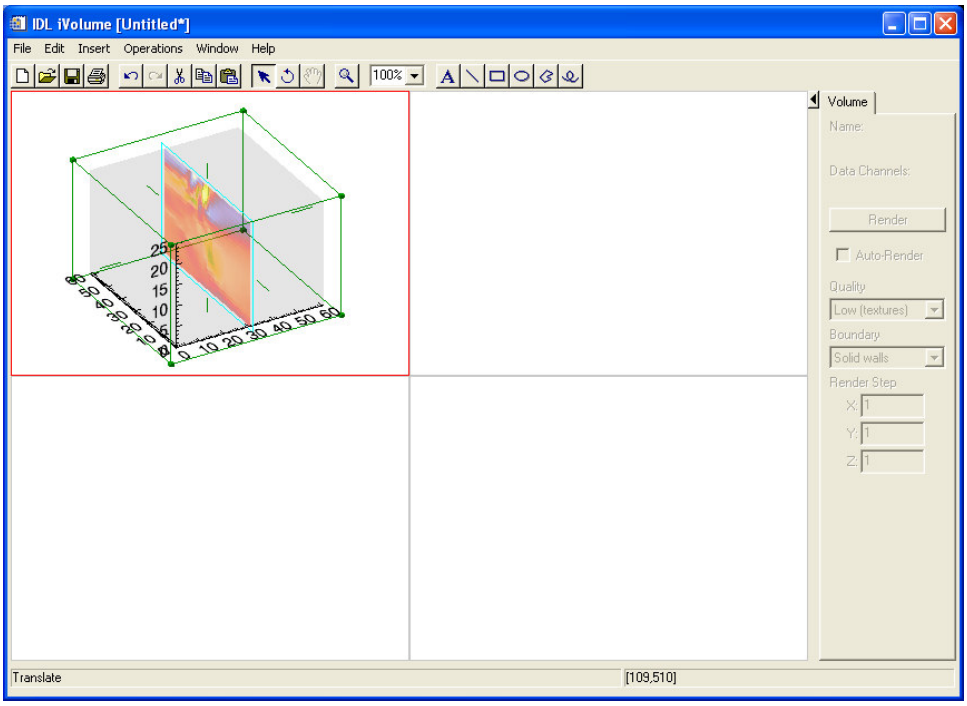
9) Now select “Load Predefined” to display a list of color tables. After making a selection hit OK.

The next step is to begin selecting the 3 orthogonal image planes. From the main menu

10) Select Operations -> Volume -> Image Plane.

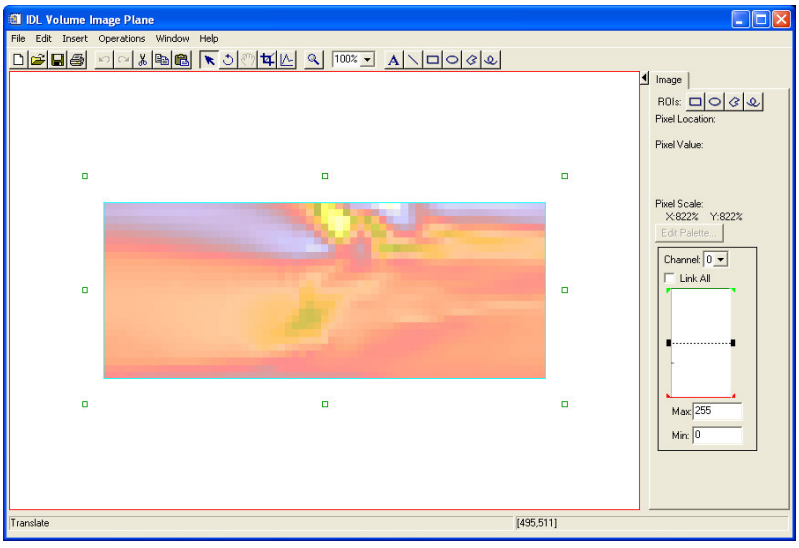
This will display the default X image plane as shown below.



Our goal is to display an image of each of the 3 orthogonal planes in the remaining views of the iVolume display. In order to do this, each image plane must be exported to an iImage tool. From the main menu,

11) Select Operations -> Image Plane -> Launch iImage.

An iImage window similar to the following should now be displayed.

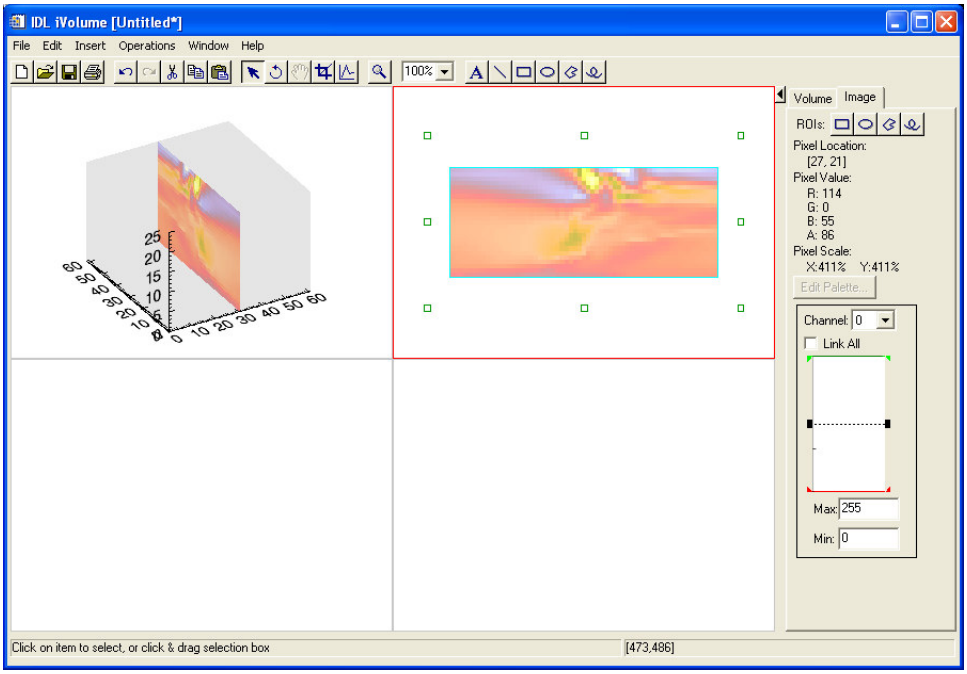


The image now displayed in the iVolume Image Plane window needs to be copied back to one of the 3 remaining views in iVolume.

12) Position the cursor over the image, press the right mouse button to display the context menu. Select “Copy”.

13) Use of the image plane window is now complete. From this window’s menu select File -> Exit to close this window.

14) To paste this image into the main iVolume window position and click the mouse in the upper right view and then from the main iVolume window menu select Edit -> Paste Special. The display should now look like the following.



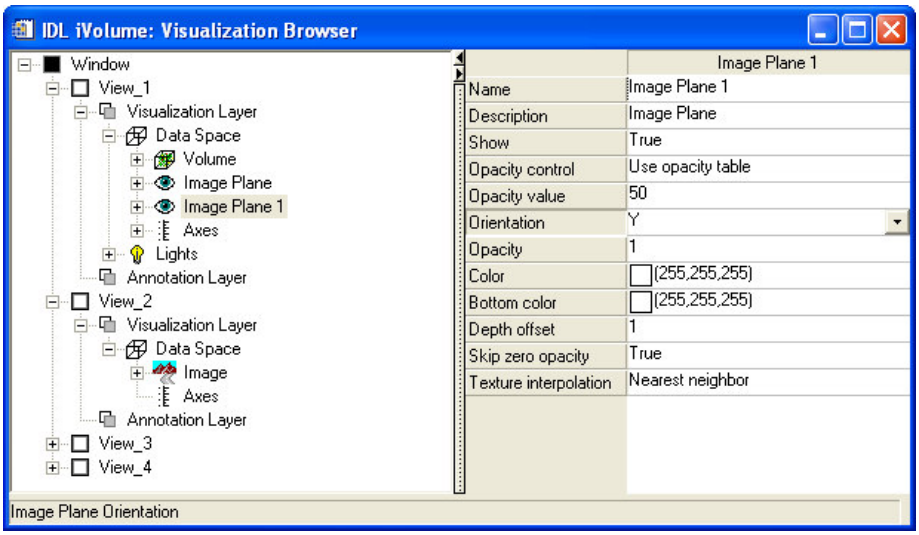
To continue adding image planes steps 10-14 must be repeated for each of the Y and Z planes.

15) Select Operations -> Volume -> Image Plane.

This will display the default X image plane as shown earlier.

16) Next select Window -> Visualization Browser.

17) The new image plane that was just added is designated “Image Plane 1”. From this window select “Image Plane 1” from the Window -> View_1 -> Visualization Layer -> Data Space hierarchy.

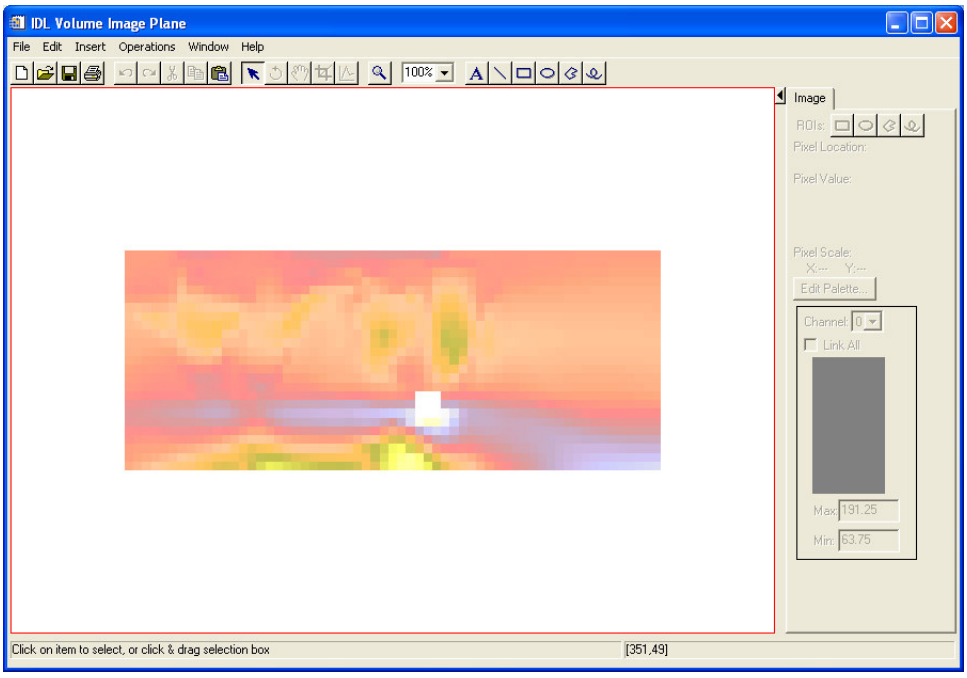


18) Change the “Orientation” property of Image Plane 1 to “Y” as shown below.

Continue with the copy/paste for the “Y” image plane.

19) Select Operations -> Image Plane -> Launch iImage.

An iImage window similar to the following should now be displayed.

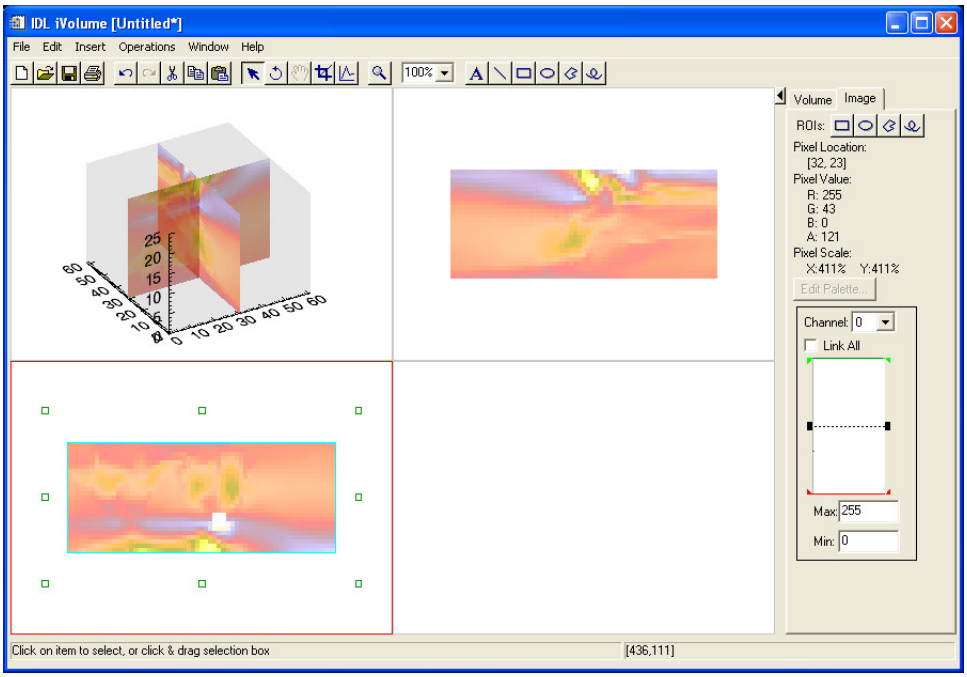


The image now displayed in the iVolume Image Plane window needs to be copied back to one of the 2 remaining views in iVolume.

20) Position the cursor over the image, press the right mouse button to display the context menu. Select “Copy”.

21) Use of the image plane window is now complete. From this window's menu select File -> Exit to close this window.

22) To paste this image into the main iVolume window position and click the mouse in the lower left view and then from the main iVolume window menu select Edit -> Paste Special. The display should now look like the following.

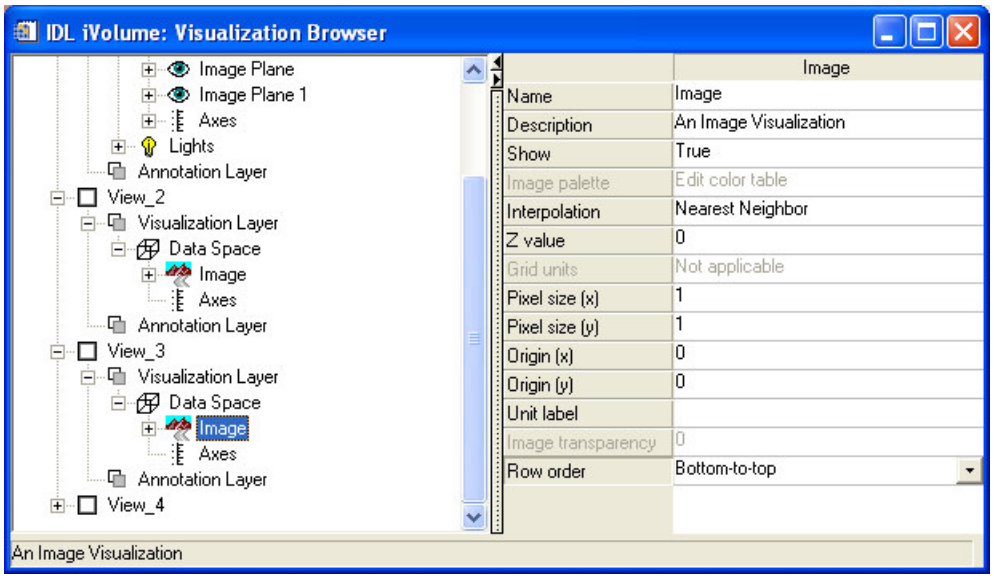


******** Special Note ********

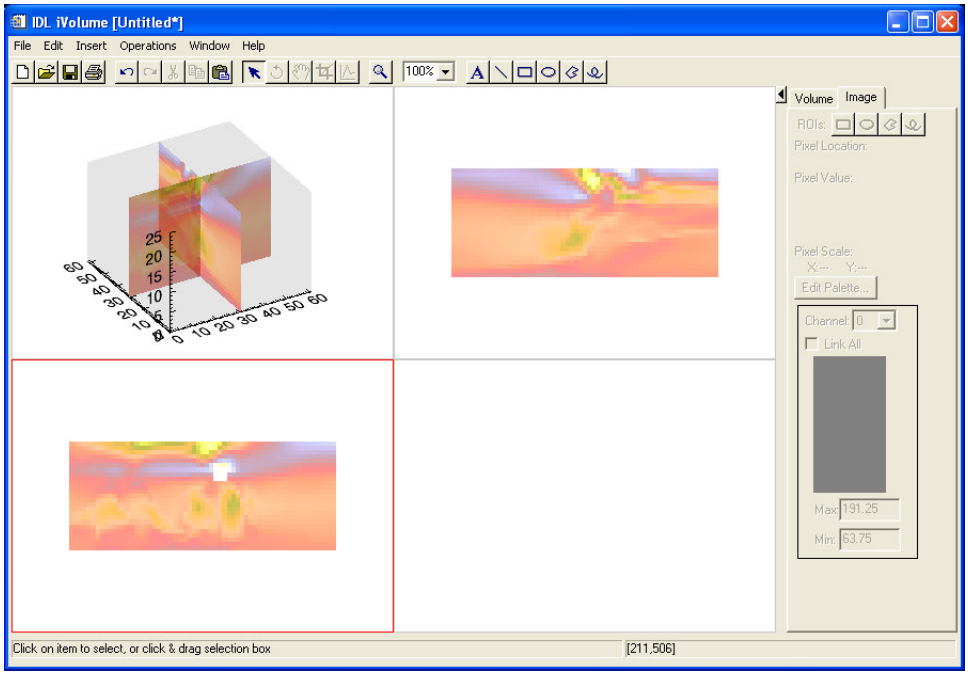
There is a problem with the Y image plane when displayed. The image is flipped from the original orientation in the data cube. The following steps will correct this problem.

23) Select Window -> Visualization Browser.

24) From the Browser, select Image under the Window -> View_3 -> Visualization Layer -> Data Space hierarchy.



24) Select the “Row order” property and change to “Top-to-bottom”. The display will now appear as below.



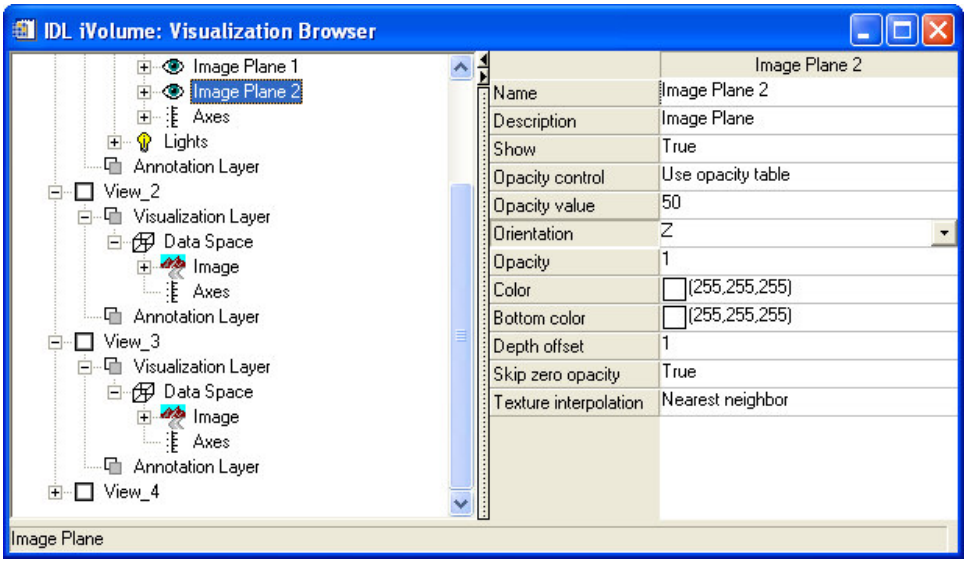
We will now proceed with the final image plane. Again from the main menu,

25) Select Operations -> Volume -> Image Plane.

This will display the default X image plane as shown earlier.

26) Next select Window -> Visualization Browser.

27) The new image plane that was just added is designated “Image Plane 2”. From this window select “Image Plane 2” from the Window -> View_1 -> Visualization Layer -> Data Space hierarchy.

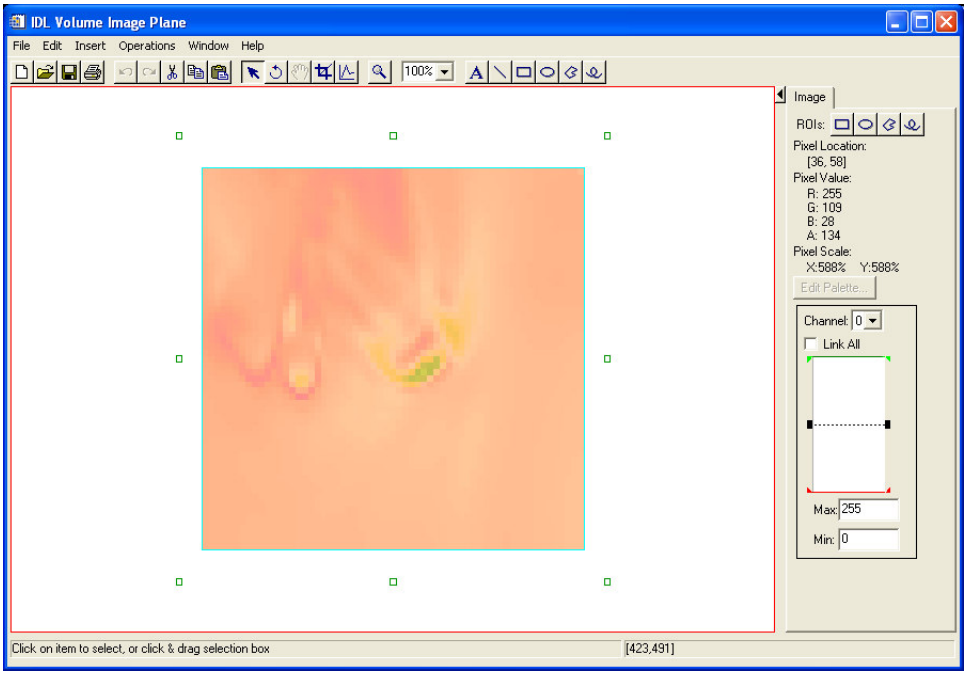


28) Change the “Orientation” property of Image Plane 2 to “Z” as shown above.

Continue with the copy/paste for the “Z” image plane.

29) Select Operations -> Image Plane -> Launch iImage.

An iImage window similar to the following should now be displayed.

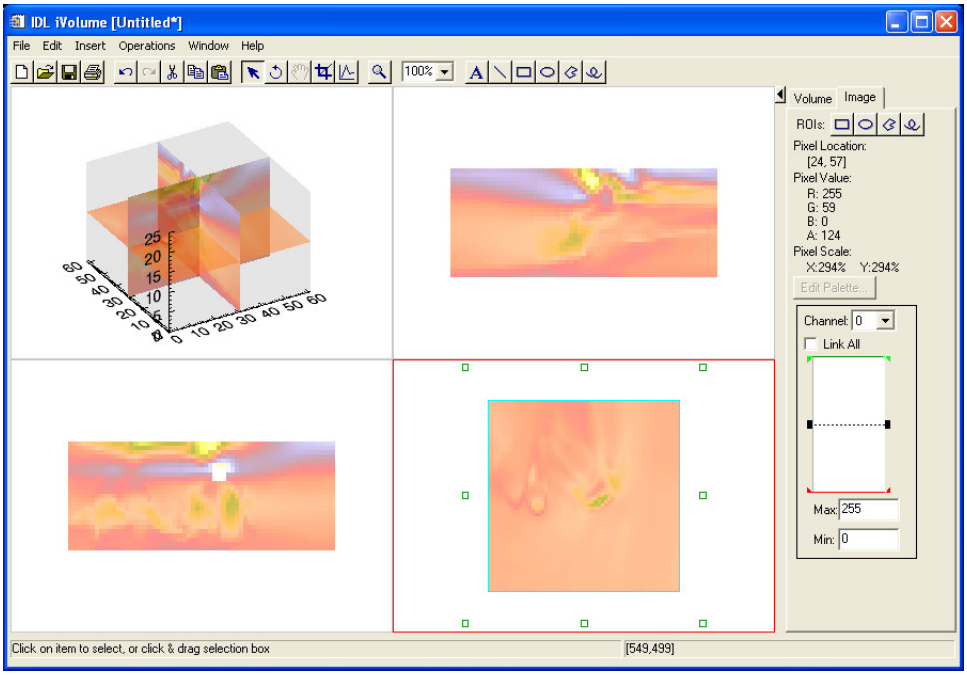


The image now displayed in the iVolume Image Plane window needs to be copied back to the remaining view in iVolume.

30) Position the cursor over the image, press the right mouse button to display the context menu. Select “Copy”.

31) Use of the image plane window is now complete. From this window's menu select File -> Exit to close this window.

32) To paste this image into the main iVolume window position and click the mouse in the lower right view. Then, from the main iVolume window menu select Edit -> Paste Special. The display should now look like the following.



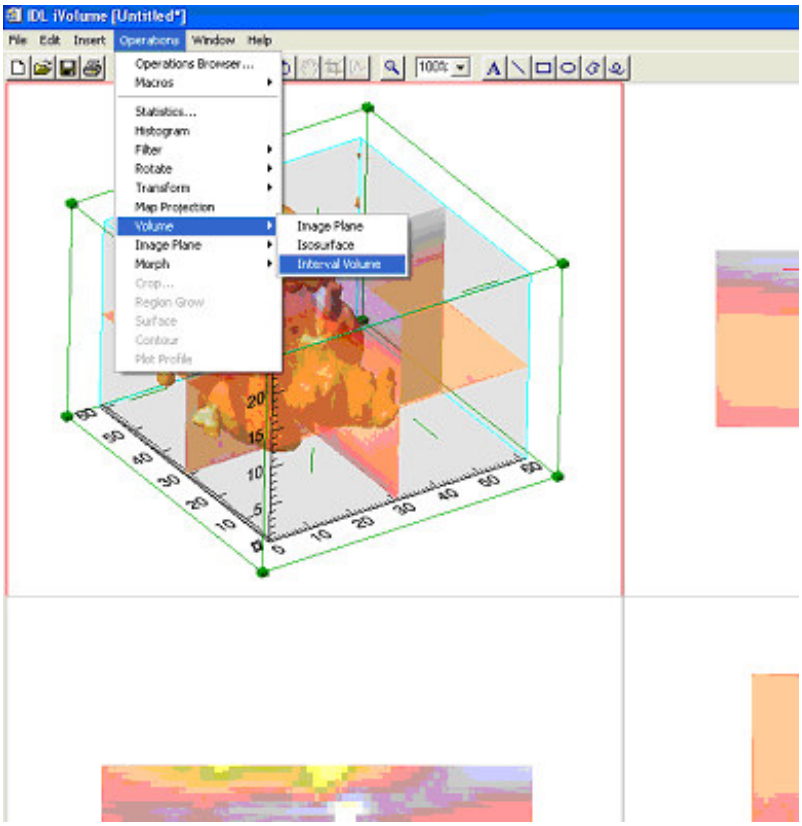
This completes the construction of the multiplanar reconstruction viewer.

Part 2: Features

This hybrid tool gives you all the functionality of the individual tools. For example, select the “Volume” tab on the right side of the display. Now select the upper-left view (the volume). The controls on the Volume tab will now be active. At this time the volume can be manipulated with all the same tools that are in a standard iVolume application. Review the operations available from the main menu.

33) Select Operations -> ……

Operations such as “Statistics”, “Histogram”, “Filter” are all available as well as iVolume specific operations as “Volume -> Image Plane”, “Volume -> Isosurface” and “Volume -> Interval Volume”.



The same applies for any of the 3 image planes that are displayed as part of the Multiplanar ("MPR") tool.

34) Select one of the 3 views that contain an image. Next select the Image tab on the right of the display. Review the operations that are available. Again from the main menu,

35) Select Operations ->…..

Operations such as “Statistics”, “Histogram”, “Filter” are all available as well as “Surface”, “Contour” and “Morph”.

Some things to try with the new tool are volume image plane manipulation and image line plot profiles. For the image plane manipulation do the following.

36) Select one of the 3 image planes in the volume. Drag the cursor to move the plane within the stack. Notice how the corresponding image in the other window updates.

37) To create a line plot profile of an image plane, select a plane in one of the three image windows. From the toolbar select the “Line Profile” icon (to the left of the magnifying glass). Draw the profile on the image.

38) In the new iPlot window, select the line profile that was just created on the image in the MPR tool display. Drag this line and see how the profile plot updates.

39) Continue experimenting with all the features available in the tool.

END