Region of Interest: Defining Regions

The Region of Interest module allows users to define and measure 3-D regions. This exercise will demonstrate how to use the tools in the module to define regions of interest within a volume image.

1. Load the **MRI_3D_Head.avw** data set from the **$:\BIR\images\ TutorialData** directory.

2. Open **Region of Interest** (**Measure > Region of Interest**).

ROI Interface

3. When the module is opened, an object map is automatically created to store defined regions. To define a new region, make sure that the Object to Define: is set to ***New*** at the bottom of the window (figure 1).

4. The buttons along the left side of the window control the definition of regions on the images (figure 2). The buttons below the image display allow you to modify the defined regions (figure 3).

5. The first slice of the volume is automatically displayed when the ROI module is opened. You can move to a different slice by using the Slice slider bar or + and - on your keyboard. The currently displayed slice number and orientation can always be seen in the lower left corner of the image display.
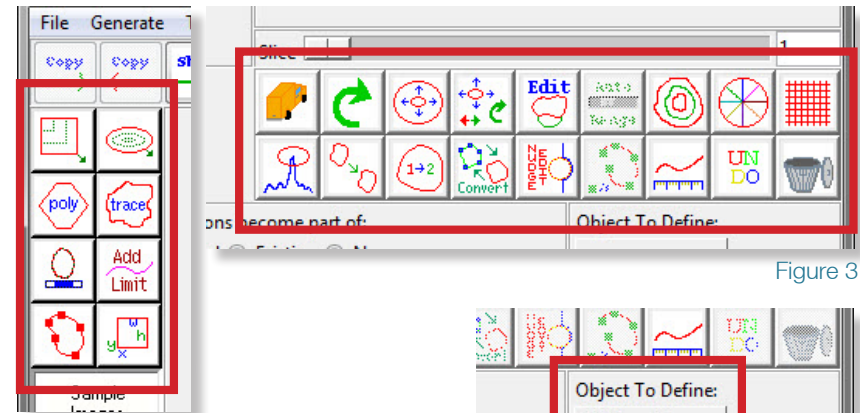
Rectangle Tool

6. Define a rectangular region on slice 1 using the **Rectangle tool**. Position the cursor on the image display, then, click and drag the cursor out to size the rectangle, when you release the mouse button the new region '1.Object' will be created and added to the object map (figure 4).

7. Copy the region to the next slice (slice 2) by pressing the **Copy Regions Forward** PowerBar button once.

8. Regions can be modified using the buttons found below the image display. Select the **Move** button. Position the cursor near the region you wish to modify, then click and drag the cursor; any movement of the cursor will move the region. Also try using the **Rotate** and **Scale** buttons (found directly to the right of the Move button).

Figure 3

Figure 1

Figure 2

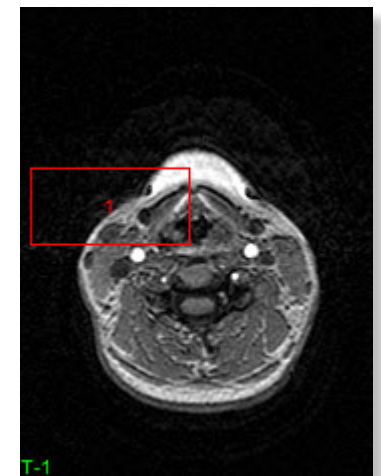*tip* Holding the <Ctrl> key while sizing will force a square.

Figure 4

AnalyzeDirect

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Oval Tool

9. Add a new region to slice 2 using the **Oval tool** (figure 5).

10. Press **Copy Regions Forward** to copy the regions to slice 3.

11. Select the **Move** button again. To move all regions on a slice simultaneously, hold the <**Ctrl**> key while moving the regions as described in step 8. When you release the mouse button, a dialog box will be returned asking if you would like to 'Move Regions in: This Slice Only, the Entire Object Map, or Cancel the move', click **This Slice Only**.

12. Move to slice 4.

Polygon Tool

13. There are currently no regions defined on slice 4, define a region on slice 4 using the Polygon tool.

14. To begin defining the polygonal region, position the cursor on the image display and click once to set a starting point. Move the cursor outward to specify the length and direction of the first polygon side. To set a vertex and begin drawing another side, click once. Double-click to close the polygon (figure 6).

15. If after defining the region it is unsatisfactory, click the Undo button.

16. Move to slice 5.

Manual Trace Tool

17. Define a region on slice 5 using the **Manual Trace** tool. Position your cursor on the image display, then click and hold the mouse button to begin drawing the trace, release the mouse button to end the trace. The last point of the trace will be automatically connected to the first point of the trace.
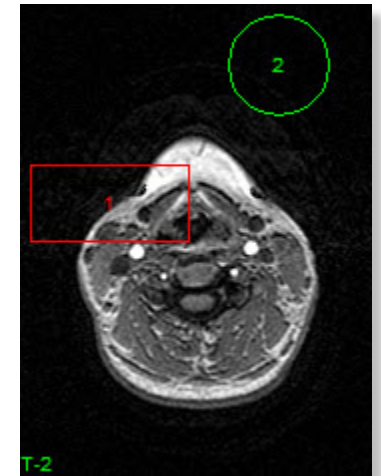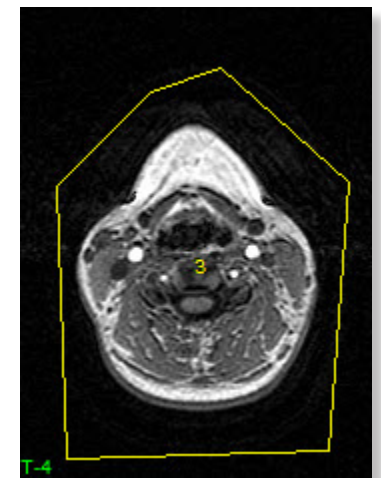

Figure 5

Figure 6

AnalyzeDirect

18. If you make a mistake while tracing, continue holding the mouse button down, and press the **<u>** keyboard key. The trace will slowly back up from the current position until the <u> key is released. Try this by drawing a line on the image, and while continuing to hold the mouse button down, press the <u> key. Once the trace has backed up half way, release the <u> key and continue your trace in a different direction.

19. To define a region without having to continuously hold down the mouse button, right-click on the image display and choose the **Button Passive** option. When 'Button Passive' is selected, simply click on the image display to begin the trace, and then click again when you are ready to end the trace and define the region. The 'Button Passive' option is available for all region definition tools.

20. Right-click and deselect the Button Passive option. Then, click **Clear Regions** on the left side of the window to clear all regions defined on this slice.

21. With the **Manual Trace** tool still selected, check the **Smart Edge** option. The 'Smart Edge' option searches for edges (areas of high gradient) when drawing a trace with the **Manual Trace** or **Spline** tools. Click once to begin a trace along an edge in the image display, letting 'Smart Edge' determine the path, click again to lock that portion of the trace. When the region of interest has been defined, double-click to end the trace. Uncheck the Smart Edge option.

22. Move to slice 6.

Spline Tool

23. Define a new region on slice 6 using the **Spline** tool. The Spline tool enables the drawing of splines with moveable control points. Position the cursor on the image display and click once to begin drawing a spline, click once again to set a control point. When the region of interest has been defined, double-click to close the spline.

24. To modify the region with the spline control points, select the **Move** button and then drag any control point to a new location.
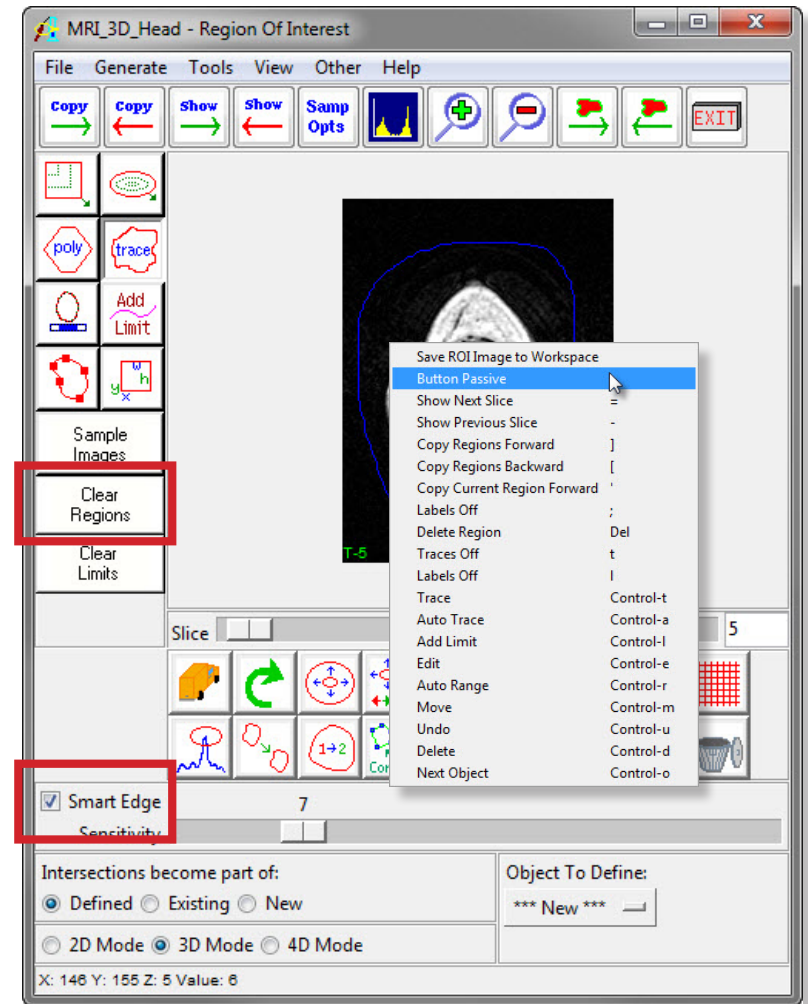

Figure 7

Region of Interest: *Intersecting Regions*

1. When objects overlap, the resulting regions may not appear as expected. Since the object map is a one-to-one mapping of the voxels to an object, a voxel cannot be part of more than one object. The '**Intersections become part of:**' option (in the lower left hand corner) allows you to control how intersecting regions are handled.

2. Move to slice 7.

3. Choose **File > Reset Object Map** to clear all regions from the volume. In the dialog box returned, click **Continue without Saving**.

4. Ensure that **Intersections become part of:** is set to **Defined** (figure 8).

5. Select the **Rectangle** tool and define a region.

6. Now, select the **Oval** tool and define a region that overlaps the rectangle.

7. The intersecting area becomes part of the region being defined, 2.Object (figure 8).

8. Click **Undo** button and then set **Intersections become part of:** to **Existing**.

9. Select the **Oval** tool and again define a region that overlaps the rectangle.

10. The intersecting area now becomes part of the existing region, 1.Object (figure 9).

11. Click **Undo** and then set **Intersections become part of:** to **New**.

12. Select the **Oval** tool and again define a region that overlaps the rectangle.

13. The intersecting area now becomes a new region, 3.Object (figure 10).

14. Close the Region of Interest module before proceeding to the next exercise.
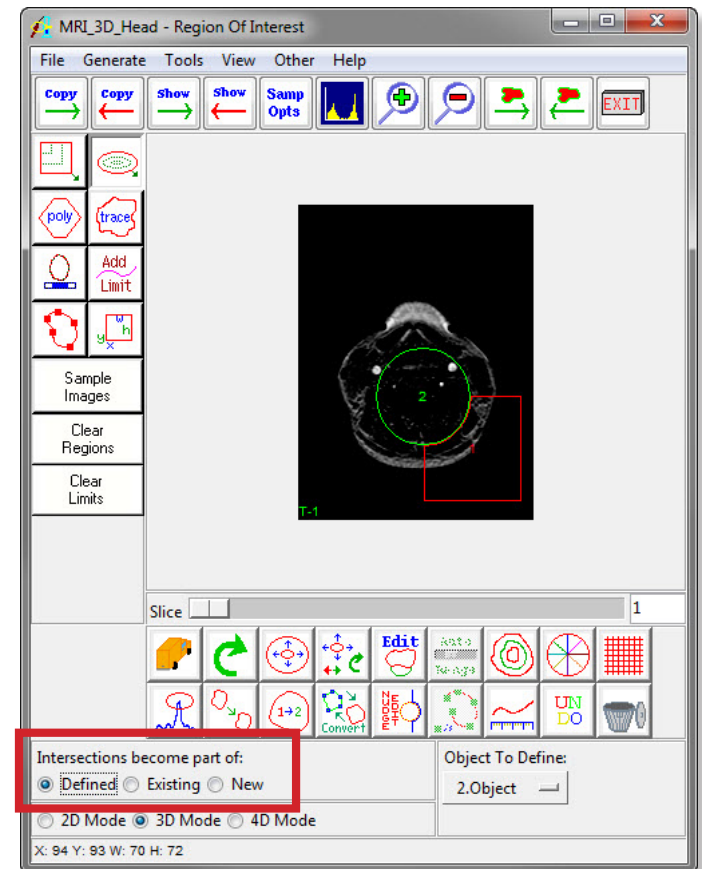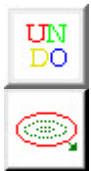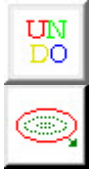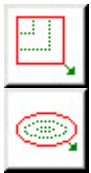

Figure 8

Figure 9

Figure 10