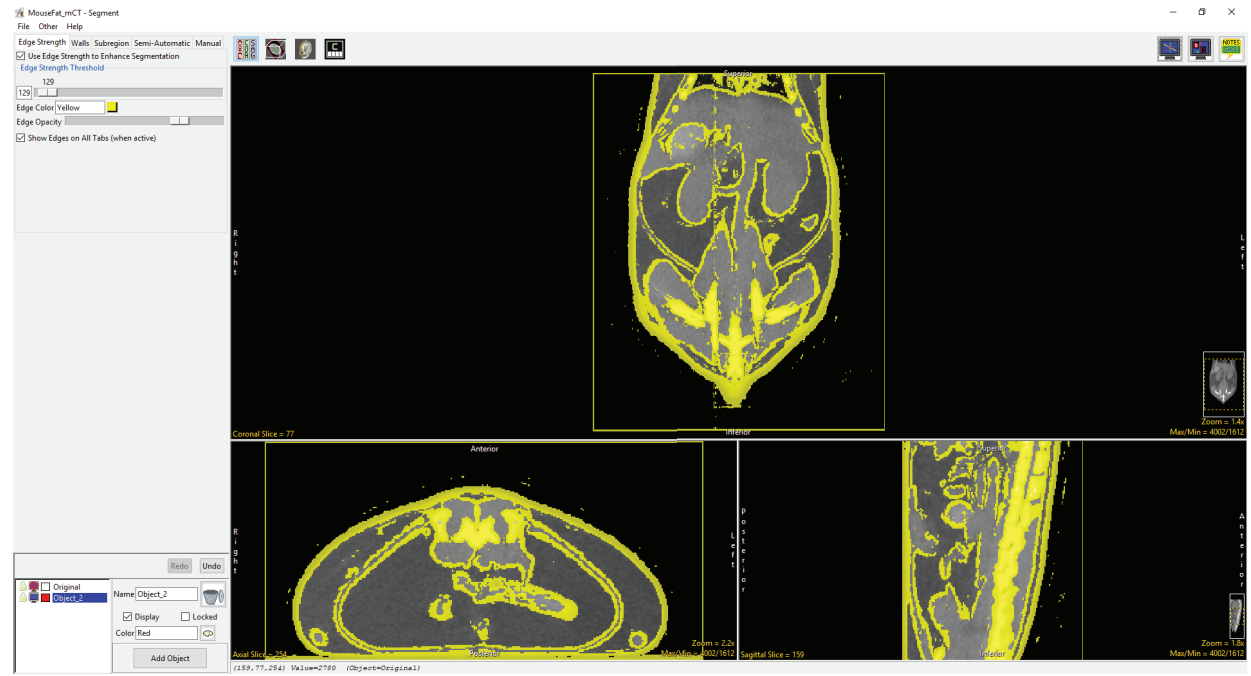


Edge Strength

The Edge Strength option allows users to mask the input data with a set of enhanced gradients that act as limits aiding in the segmentation of structures. Edge strength works by applying a 3 X 3 X 3 Sobel filter to the image data, which can be interactively adjusted using the Edge Strength Threshold slider. All voxels with gradient values less than or equal to the selected threshold value are displayed with a definable edge color and form boundaries around structures. The boundaries act as limits, restricting semi-automatic segmentation operations. The following controls are available:



Use Edge Strength to Enhance Segmentation: When this option is checked the Edge Strength option is enabled for the image data, a 3 by 3 by 3 Sobel filter is applied to the volume and the Edge Strength Threshold slider and additional options are enabled.

Edge Strength Threshold: This slider defines the upper threshold value for the Sobel filtered gradient volume. When the left mouse button is used to drag the slider, all of the voxels with gradient values less than or equal to the threshold value are highlighted. Semi-automated segmentation algorithms are applied to the voxels within the threshold range.

Edge Color and Edge Opacity: Allows users to specify the color and adjust the opacity display of the edge overlay on the image data.

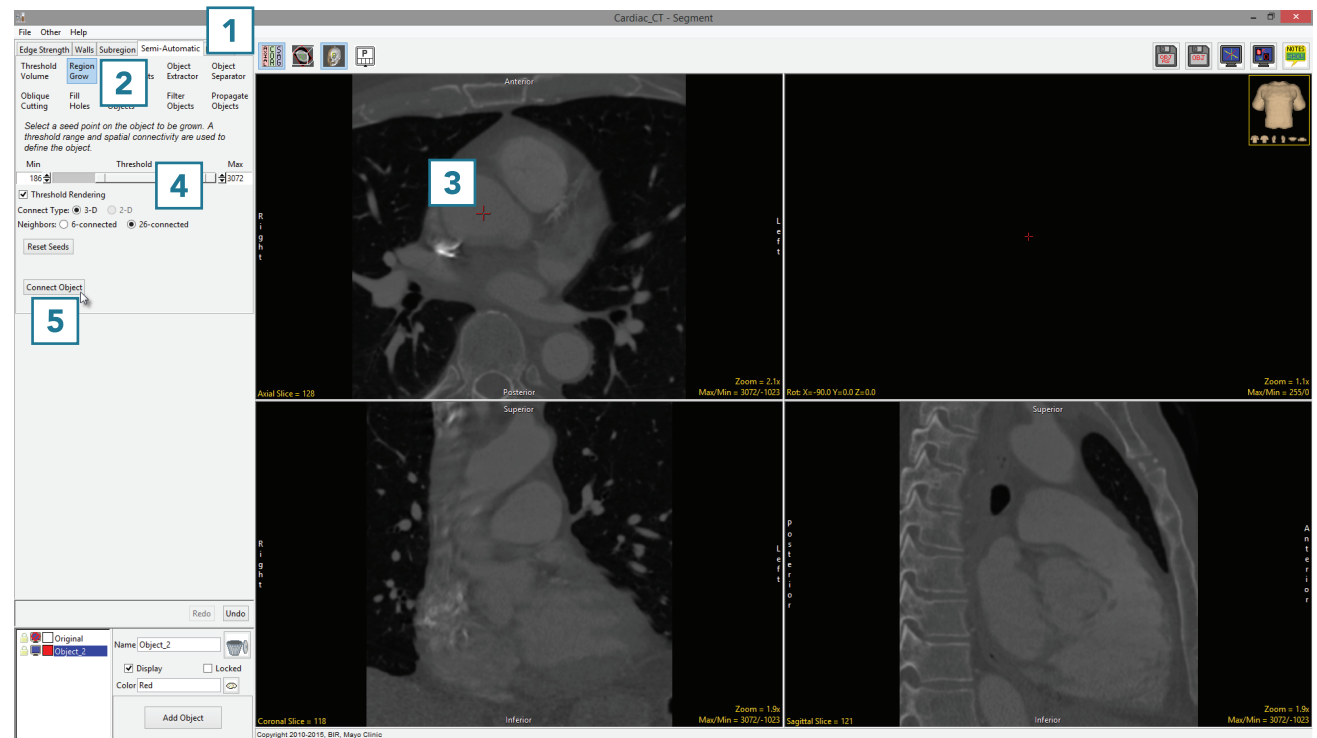
Show Edges on All Tabs (when active): maintains the display of the edges on the image data when moving to different segment tabs.

Using Edge Strength

First we will attempt to segment the heart from this CT data set *without* using edge strength.

To follow along, download the data set CT_Heart from analyzedirect.com/data and load into Analyze using Input/Output.

- Select the data set and open Segment.
- Select Semi-Automatic [1], and choose Region Grow [2].
- Click on the image data to set a seed point [3]. The seed point should be in the object you would like to isolate.
- Set the threshold Min/Max values to define the object [4] and click Connect Object [5].

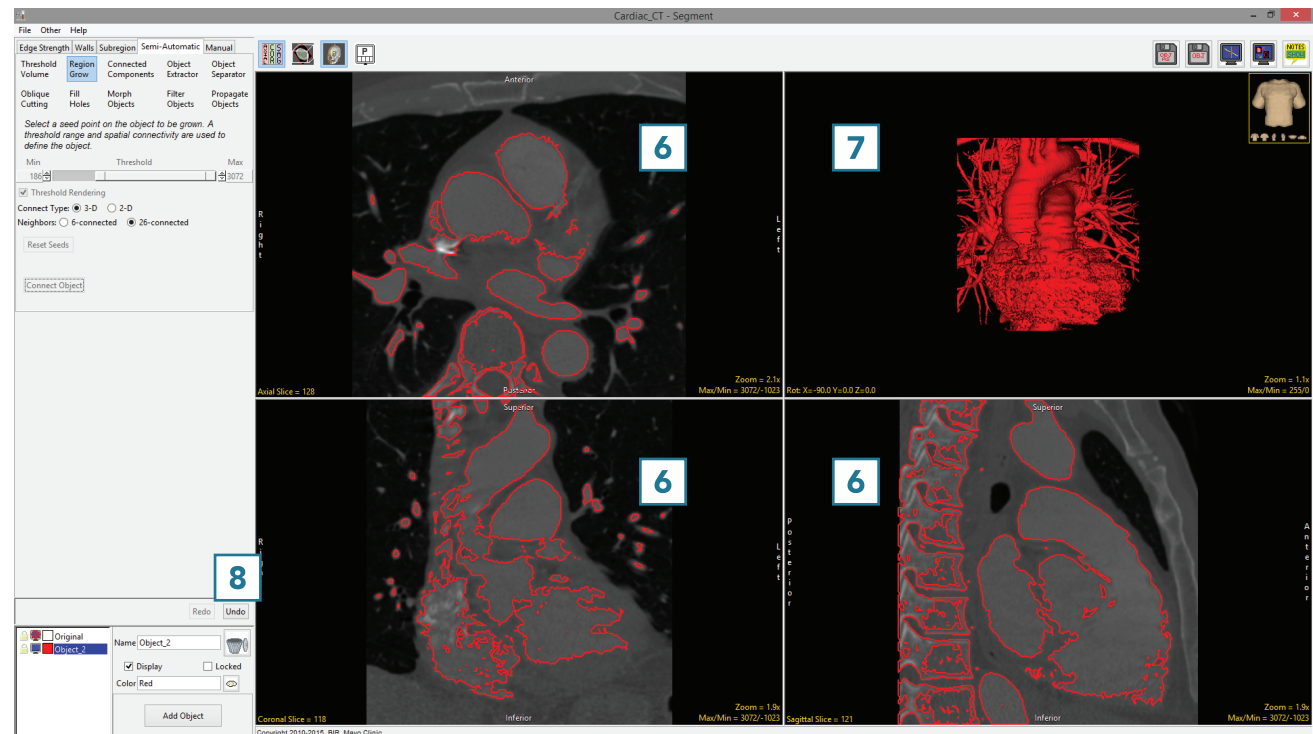


Using Edge Strength (continued)

- The results of the region grow are shown below.
- The segmented object is shown overlaid on the 2D slice data [6] and a 3D representation [7] is displayed.

Note that both the heart and the spine have been assigned to Object_2 [8].

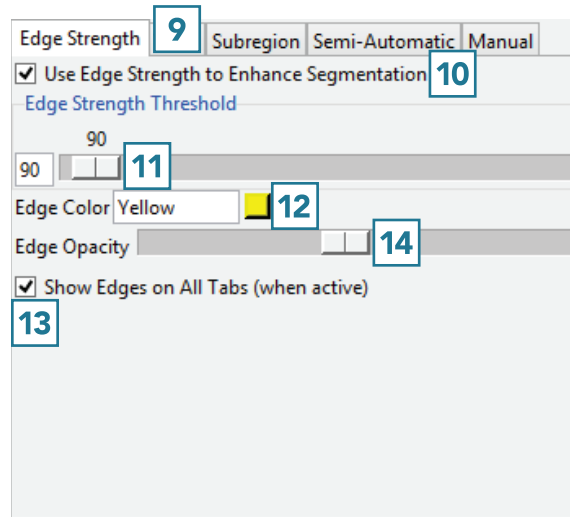
- Click Undo.



Using Edge Strength (continued)

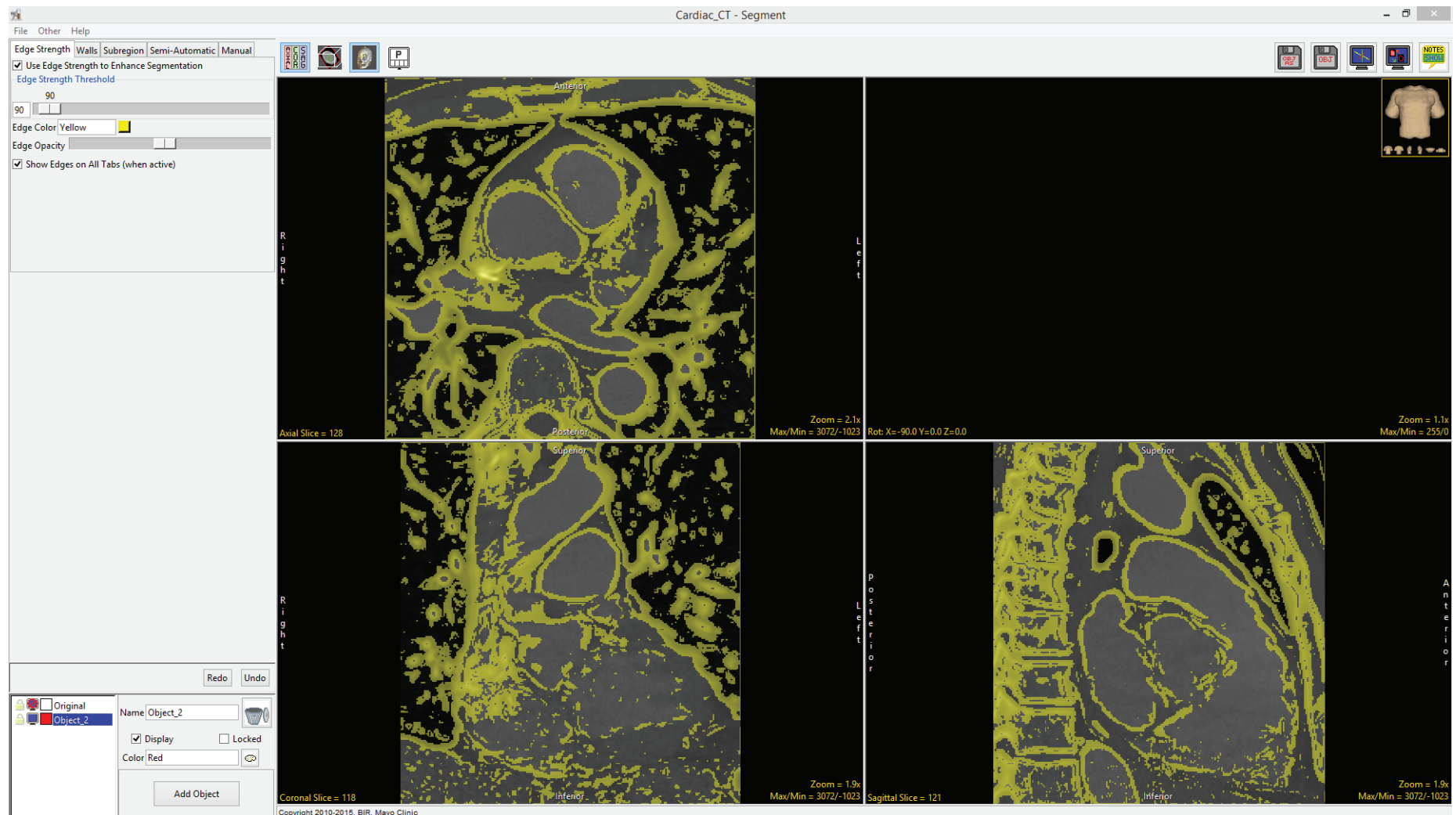
Now we will repeat this segmentation using edge strength to separate the heart from the rest of the data set.

- Select Edge Strength [9] and check Use Edge Strength to Enhance Segmentation [10].
- Set the Edge Strength Threshold to 90. Note that this value will be different for each data set. In general, adjust the edge strength using the slider [11] until you find a suitable value. The edges will interactively update on the data set. Use the edge display to determine the suitable edge strength value.
- Optionally, change the color of the edge by entering the desired color in the text field or by using the color selector [12].
- When performing the segmentation, leave the Show Edges checkbox [13] selected. If required, reduce the Edge Opacity using the slider [14].



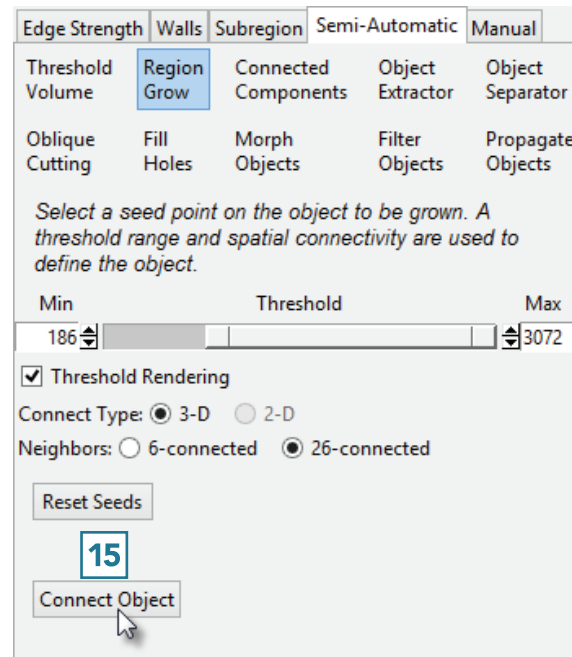
Using Edge Strength (continued)

The edges detected on this data set using the Edge Strength algorithm with an edge strength threshold of 90 are shown overlaid on the data below.



Using Edge Strength (continued)

- Repeat the segmentation. Select Semi-Automatic, then choose Region Grow.
- Click on the image data to set a seed point. The seed point should be in the object you would like to isolate.
- The Threshold Min/Max values should still be set to the previous values. If not, reset them to define the object and then click Connect Object [15].



Using Edge Strength (continued)

Note that this time, only the heart was segmented. The Edge Strength technique prevented the region grow algorithm from including the spine in the object. Further segmentation can now be achieved with or without Edge Strength enabled. Select File > Save Object Map to save your work.

