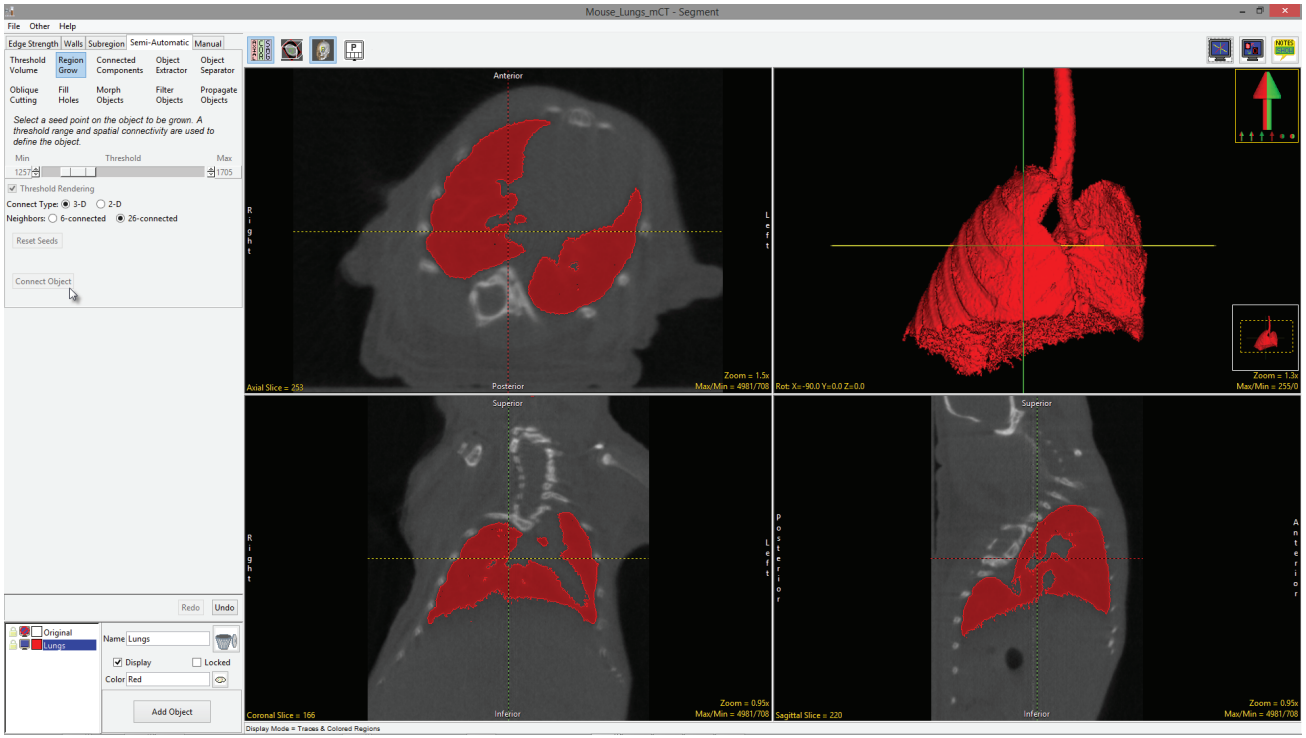
Filter Objects

Filtering objects is a simple and intuitive way to reduce noise, fill small holes, and smooth object edges. Filtering objects reduces the amount of variation between the pixels (2D) or voxels (3D) that make up the object. The filtering process simply replaces each pixel or voxel with a function of itself and its neighbors, defined by the element size selected.

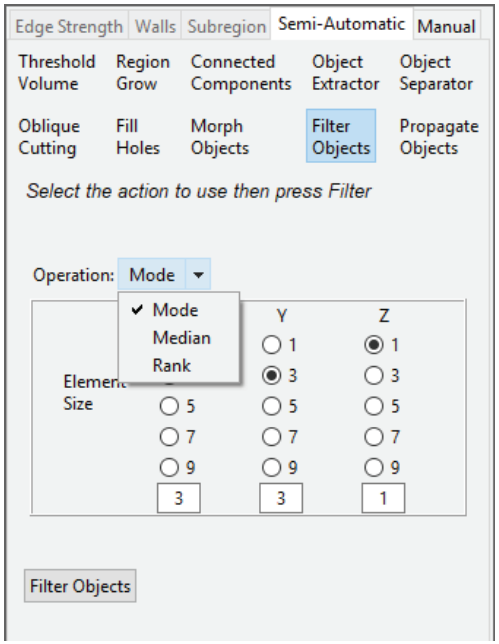


The filter is only applied to segmented objects and does not change the original data. If after attempting to segment a structure from a data set you decide that filtering the grayscale image data would improve the segmentation result refer to the Process module > Spatial Filters processing type to access all of the software's filtering options.

Filter Objects Options

Operation: Three filtering operations are available:

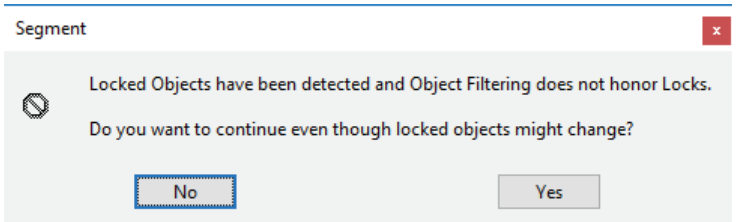
- Mode: The mode filter replaces the target voxel with the mode of the neighborhood of voxels specified by the element size. The value repeated most often is the mode.
- Median: Like the mode filter the median filter considers each voxel in the neighborhood specified by the element size to replace the target, however, instead of simply replacing the voxel with the mode of the neighboring voxel values, it replaces is with the median of those values. The median is calculated by first sorting all the voxel values into numerical order and then replacing the target voxel with the middle voxel value.
- Rank: Like the median filter the rank filter first sorts the values with in the neighborhood specified by the element size, numerically. However, the value used to replace the target voxel is dependent upon the rank value selected by the user using the Rank Slider.
  - Rank Slider: The slider allows users to specify of rank value used. The range of rank values is dependent on the neighborhood of voxels used for the filter, which is controlled by the element size. For example, in a 3x3x1 region the minimum rank value would be 1 while the maximum rank value would be 9. If the rank value was set to 6, the corresponding voxel value for that ranked voxel would by used to replace the target voxel.



Element Size: Allows users to set the X, Y, and Z dimensions of the rectilinear element to be used in the selected filtering operation.

- X: allows users to specify the width of the element. Select 1, 3, 5, 7, 9, or enter an odd numbered value into the text entry field.
- Y: allows users to specify the height of the element. Select 1, 3, 5, 7, 9, or enter an odd numbered value into the text entry field.
- Z: allows users to specify the depth of the element. Select 1, 3, 5, 7, 9, or enter an odd numbered value into the text entry field.

Filter Objects: Initiates object filtering. Note that object filtering does not honor object locking, and locked objects will be filtered. If any objects in the object list are locked a message will be returned stating that locked objects have been detected and object filtering does not honor locks. The option to cancel (No) or to continue (Yes) with the filtering operation will be given.

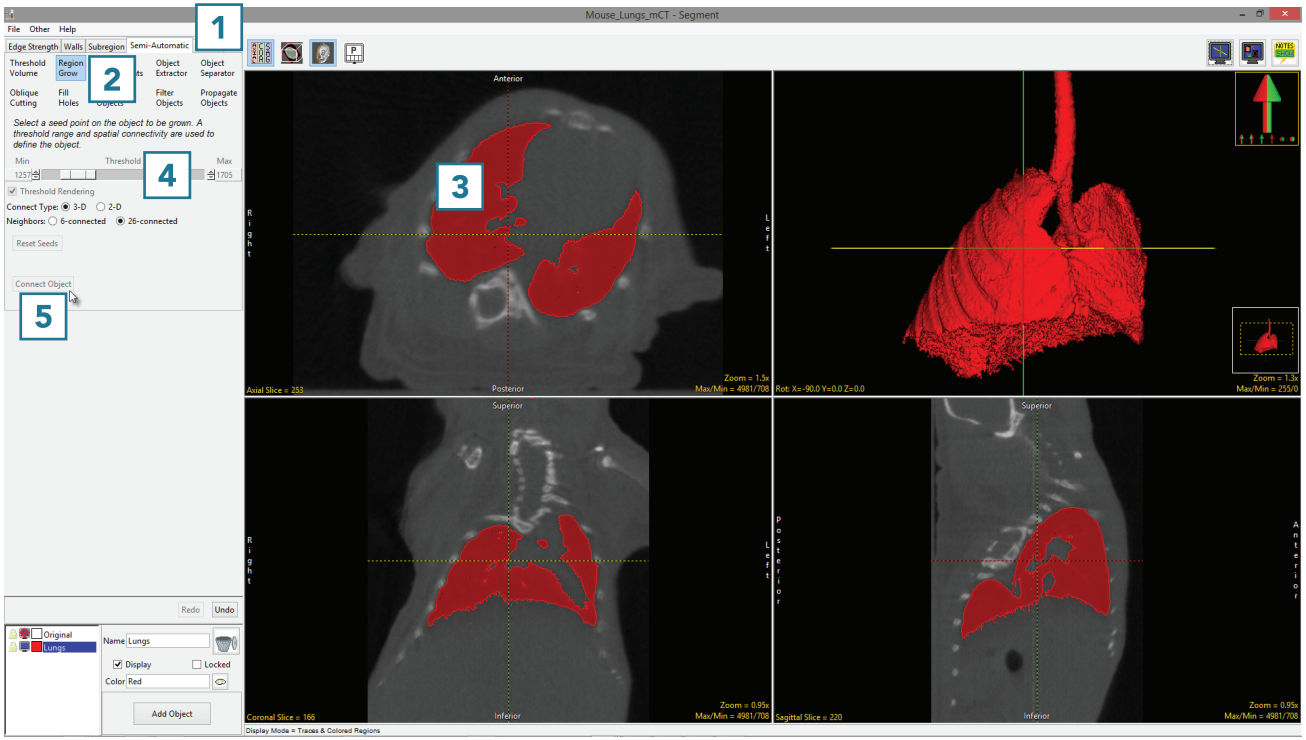


Using Filter Objects to Improve Segmentation

Here we will improve the segmentation of an object by using Filter Objects.

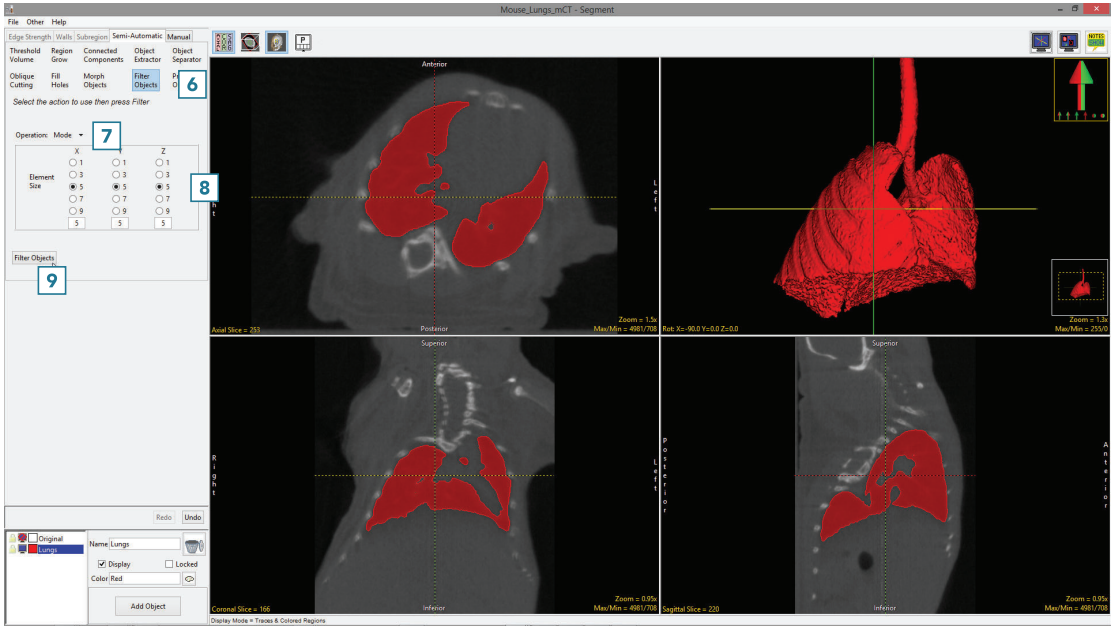
To follow along, download the data set Mouse_Lungs from analyzedirect.com/data and load into Analyze using Input/Output.

- Select the data set and open Segment.
- Select Semi-Automatic [1] and choose Region Grow [2].
- Set a seed point on the object you want to isolate [3] and set a threshold range [4] that describes the object.
- Click Connect Object [5].



Using Filter Objects to Improve Segmentation (continued)

- Select Filter Objects. [6].
- Set the Operation to Mode. [7]
- Set the Element Size to 5 X 5 X 5 [8] and select Filter Objects [9].



Note the difference in the 2D and 3D regions between the unfiltered [10] and filtered [11] segmentation results. Filtering has filled small holes, removed noise around the surface of the lung parenchyma and smoothed the contours of the segmentation.