

Lung Segmentation Workflow

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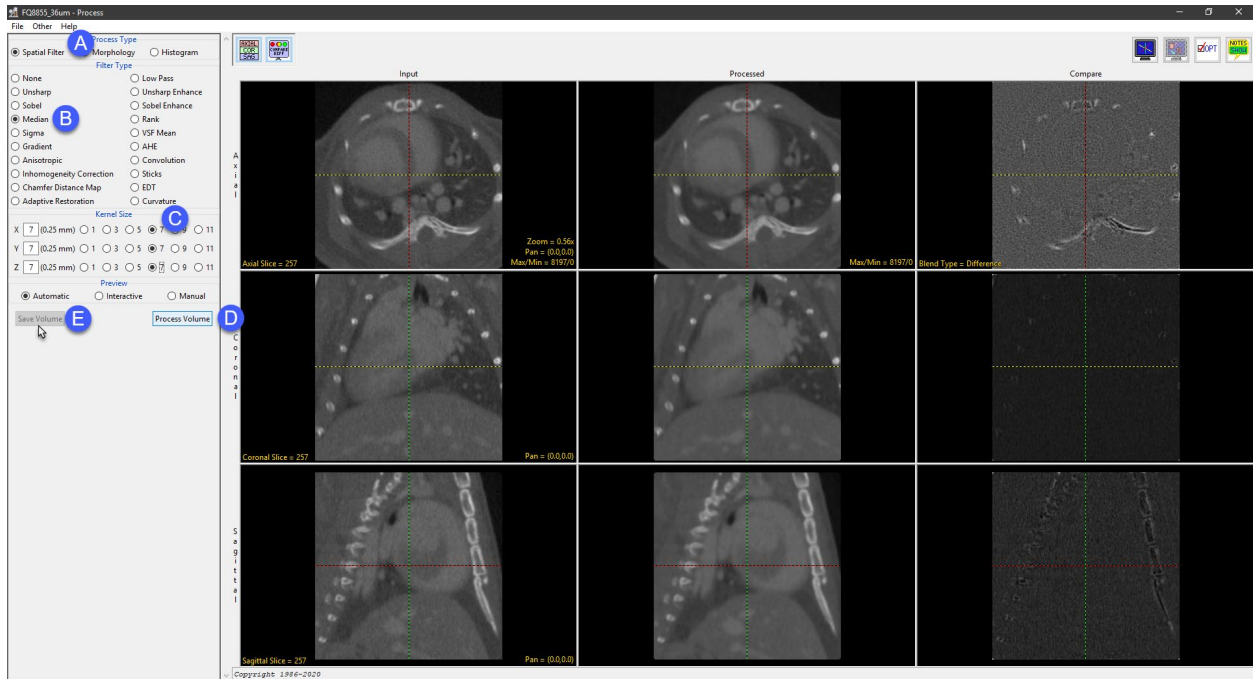
Data Load

1. Load the .vox data into Analyze 14.0 via the Input/Output module.

Image Filtering

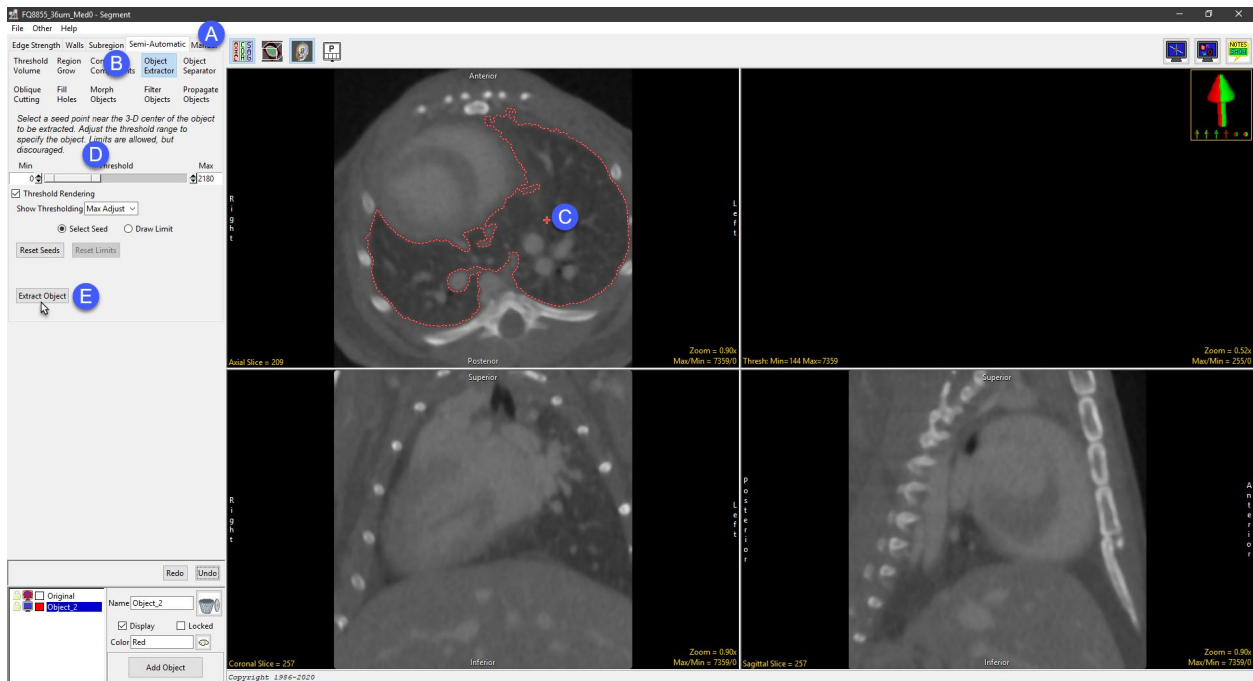
Filtering the image data is an optional step. If the lung parenchyma is difficult to segment, then applying a filter to smooth the data can help isolate the lungs from surrounding tissue. Take the following steps to filter your data.

1. Select the data from the workspace and then open Process.
2. In Process set the Process Type to Spatial Filters (default). [A]
3. Set the Filter Type to Median. [B] Note: The Median filter dampens noise by smoothing the volume. The filter works by replacing the value of each voxel with the median value of the neighborhood of voxels surrounding the target voxel as specified by the kernel size.
4. Set the Kernel Size to 7 by 7 by 7. [C]
5. Click Process Volume. [D]
6. Once filtering is complete click Save Volume [E] to save the filtered data set to the workspace. Note _Med will be appended to the name of the filtered data set to indicate a Median filter has been applied.
7. Close the module.

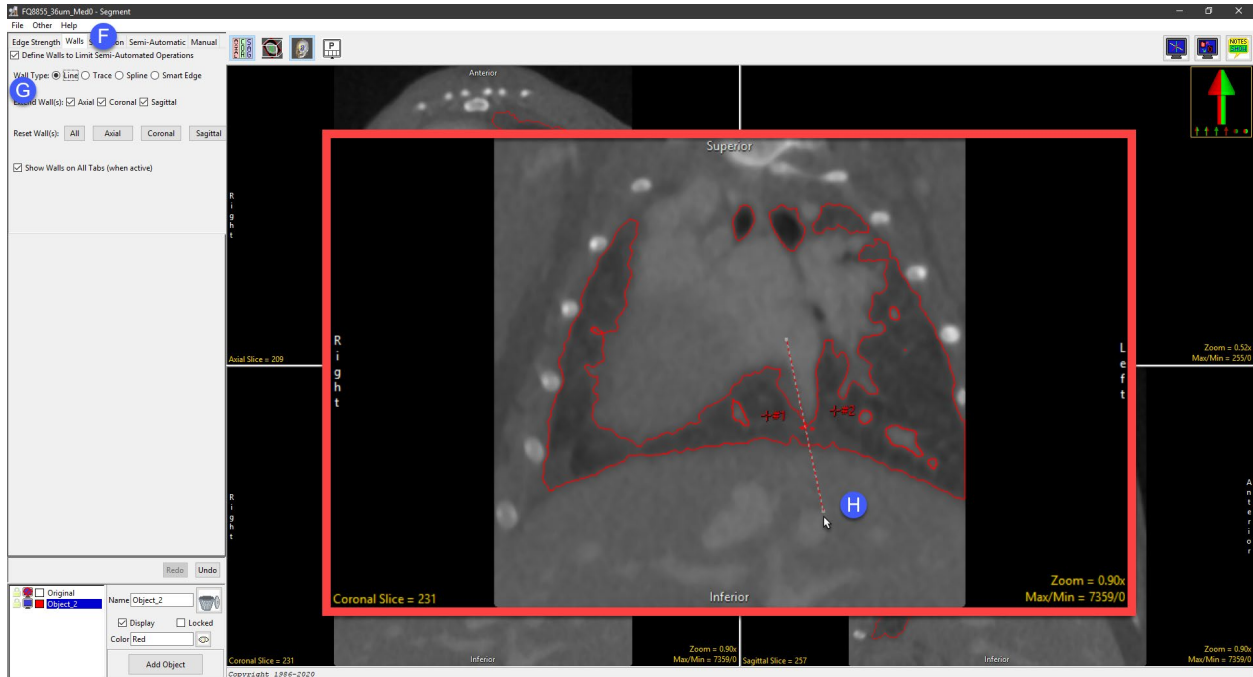


Lung Segmentation

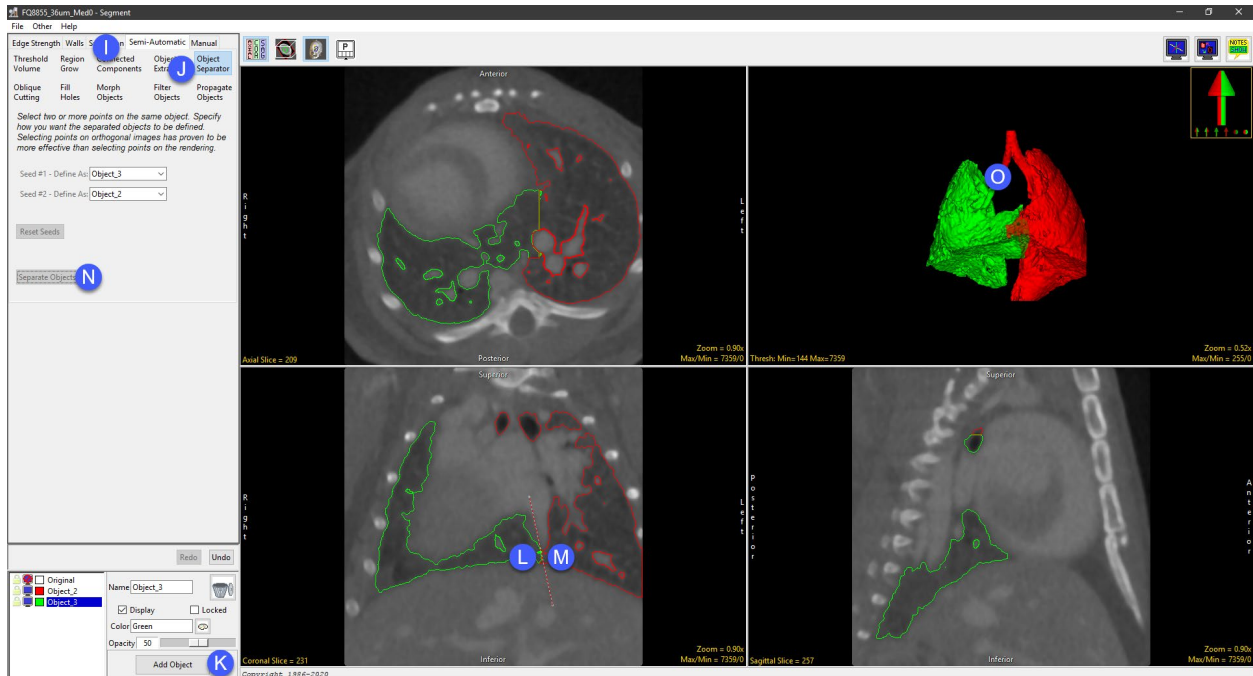
1. Select the data set from the workspace and then open Segment.
2. Select the Semi-Automatic tab (default) [A] and then choose the Object Extractor [B] tool.
3. Select a mid-axial slice where both lungs are visible and then click in the lung parenchyma to set a seed point. [C]
4. Use the minimum/maximum threshold slider to define the lung on this slice.
5. Click Extract Object [E] to begin segmentation.



6. Once segmentation is complete review the isolated lung object. If only one lung is isolated add a new object and then set a seed point in the other lung and repeat the process outlined above.
7. If both lungs are segmented as a single object, assign each lung to its own object.
8. Navigate through the data and determine the location where the lungs are connected.
9. Select the Walls tab [F] and choose a Wall Type. [G]
10. Define a wall where the two lungs are connected. [H]



11. Select the Semi-Automatic tab [I] and then choose the Object Extractor [J] tool.
12. Click Add Object [K] to add a new object to the object map and then place a seed point at either side of the wall [L + M].
13. Click Separate Objects. [N]



14. Once the lungs are separated rename the objects to something more descriptive of each object and then select File > Save Object Map to save your work.
15. Close the module.

Sampling Lung Volume

1. Select the data from the workspace and open Measure. If the object map doesn't load automatically use the File > Load Object Map option to load the object map.
2. Set the Sample Type to 3-D [A] and then choose the Enabled Objects option. [B]
3. Select the Size Intensity tab and check all stats you wish to sample. [C]
4. Check the Auto Log Stats option. [D]
5. Switch the display of all objects to off except for the Left Lung and Right Lung objects. [E]
6. Click the Sample Enabled Objects button [F] to begin sampling.
7. Once sampling is complete measurements will be returned to the Log Stats File [G], right-click to save as a .csv file.

File Other Help
 Sample 1
 1-D 2-D 3-D A
 Box B Enabled Objects Entire Volume Stereology
 Sample Options
 Combine Enabled Objects Name Combined
 Sample Enabled Objects F
 States to Show
 General Info C
 Orient Number of Voxels Histogram
 Name Area Mode & Median
 Slice Volume Boundary Coordinates
 Maximum Mean St. Dev.
 Max Location St. Dev. Region
 Minimum Sum Pixels
 Min Location Entropy
 Log Stats D Auto Log Stats
 Data File = FQ8855_36um_Med0
 Name = Left Lung
 Volume = 364.43 mm³
 Mean = 1825.22
 Name = Right Lung
 Volume = 262.54 mm³
 Mean = 1856.70
 Display E
 Original Name: Original
 Left Lung Display
 Right Lung Color: White
 Copyright 1988-2000

Axial Slice = 217
 Zoom = 0.69
 Max/Min = 759/0
 Rot: X= -90.0 Y=0.0 Z=0.0
 Twist: Min= 144 Max= 7399
 Zoom = 0.40
 Max/Min = 252/0
 Coronal Slice = 237
 Zoom = 0.69
 Max/Min = 759/0
 Sagittal Slice = 257
 Zoom = 0.69
 Max/Min = 759/0

Data File	Index	Object Name	Volume mm ³	Mean	Comment
FQ8855_36um_Med0	1	Left Lung	364.43	1825.22	
FQ8855_36um_Med0	2	Right Lung	262.54	1856.70	