Segmentation in ITK-SNAP

Supplement

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What is Segmentation?

- Process of partitioning an image into segments
- Segments are called superpixels
- Superpixels are made up several pixels that have similar properties
- Examples:
  - Color
  - Intensity
  - Texture

Why Segmentation?

- The goal of segmentation is to simplify and/or change the representation of an image into something more meaningful and easier to analyze.
- Applications:
  - Locate tumors
  - Measure tissue volumes
  - Computer-guided surgery
  - Diagnosis
  - Treatment planning
  - Study of anatomical structure

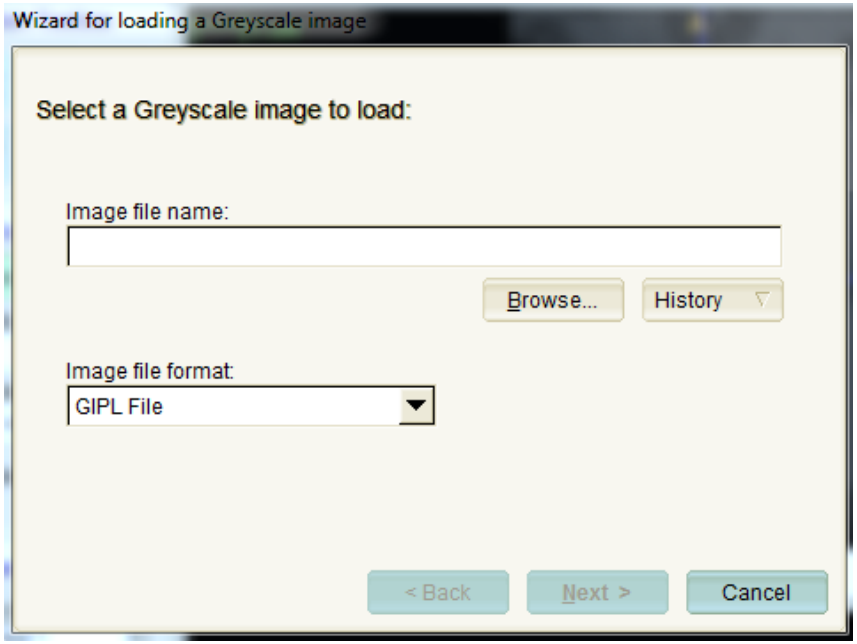
What is ITK-SNAP?

- ITK-SNAP is a free software application used in 3D medical image segmentation.
- Provides semi-automatic segmentation (snake tool).
- Provides manual segmentation in three orthogonal planes.
- Supports some color images.

Current Status

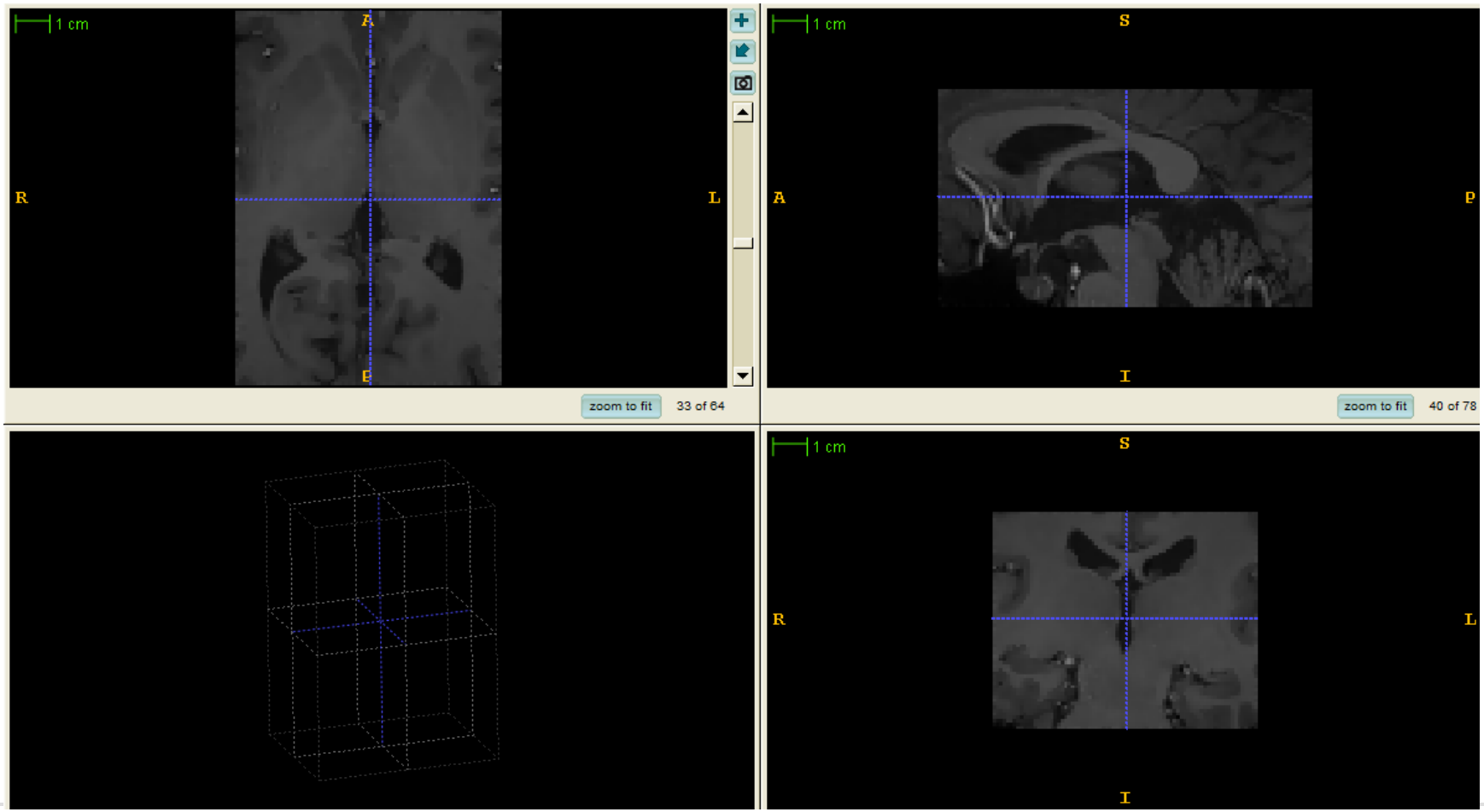
- Done:
  - Segmentation in a tutorial
  - Some segmentation of image4
- In progress:
  - SNAP theory research/discussion
  - Segmentation of assigned volume
- Issues:
  - ITK-SNAP is not recognizing the file types of the assigned volumes

A Brief Tutorial for ITK-SNAP

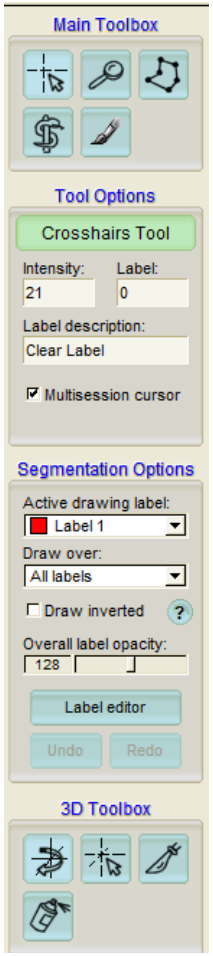


- First, the image file to be segmented needs to be loaded into ITK-SNAP
- Be sure to select the proper file type in order for ITK-SNAP to recognize and open the file
- Select an area in the file that you wish to segment

A File to be Segmented

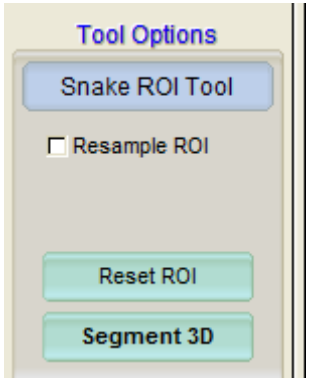


The Toolbox



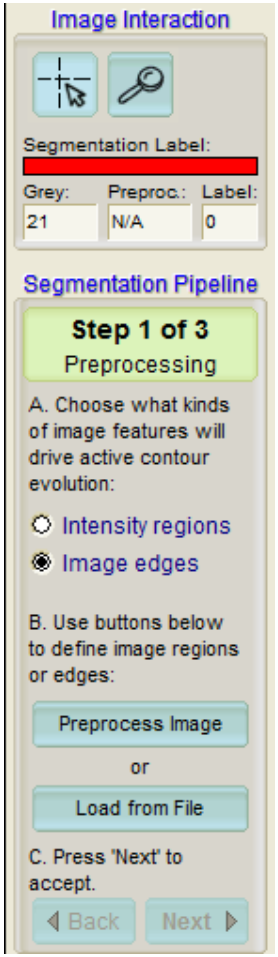
The toolbox is exactly what it sounds like: tools you will use to segment the image. For this segmentation, we will be using the Snake tool.

The Snake Tool



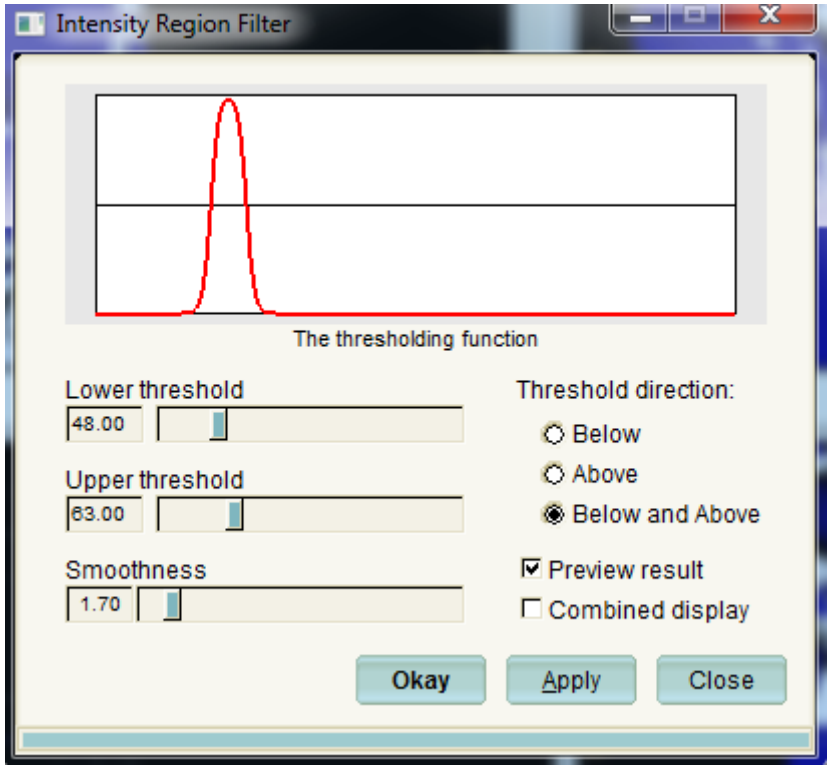
- Here we will select Segment 3D
- Choosing Reset will lose your hard work!
- After selecting Segment 3D, we will go to image preprocessing

Image Preprocessing



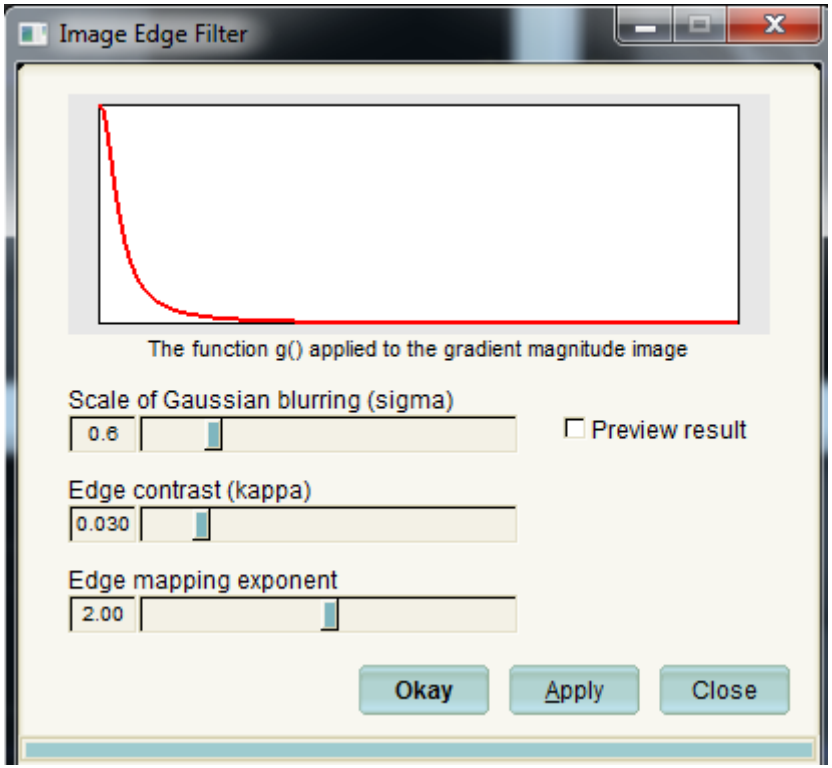
- Here, you can select the features to segment by: Intensity Regions or Image Edges.
- For this Image, we will be using Image Edges
- Select this option and click Preprocess Image

Intensity Region Filter



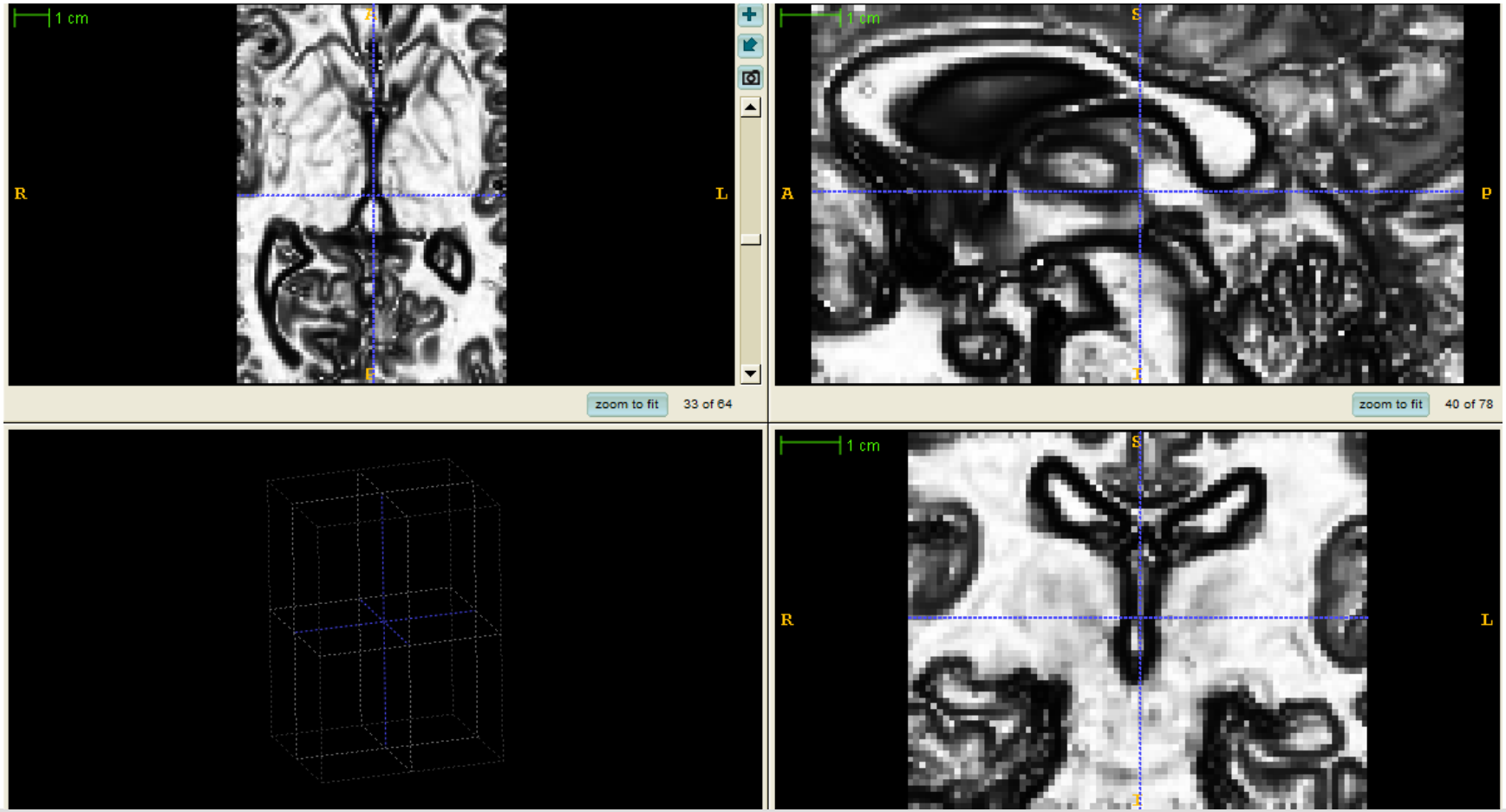
- If you had selected Intensity Region Filter, you would come to this screen.
- You can select your thresholds and smoothness here.
- This is the filter we would use for image4.

Image Edge Filter

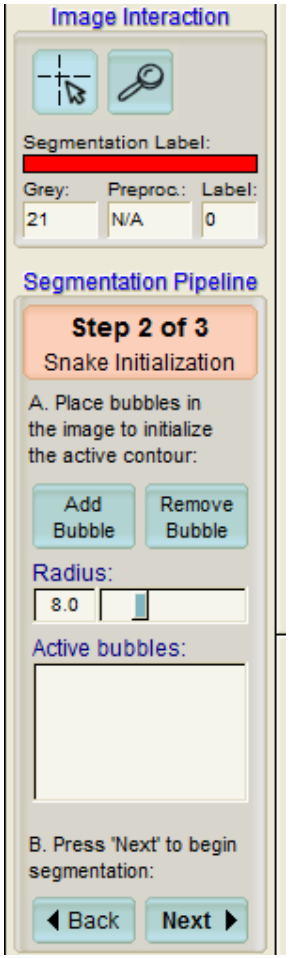


- Because we chose Image Edge Filter, this is the screen we SHOULD see.
- Here, you select values for Gaussian blurring, Edge contrast, and Edge mapping.
- Selecting the Preview result box will allow you to see the effects each change will have.

Preprocessed Image

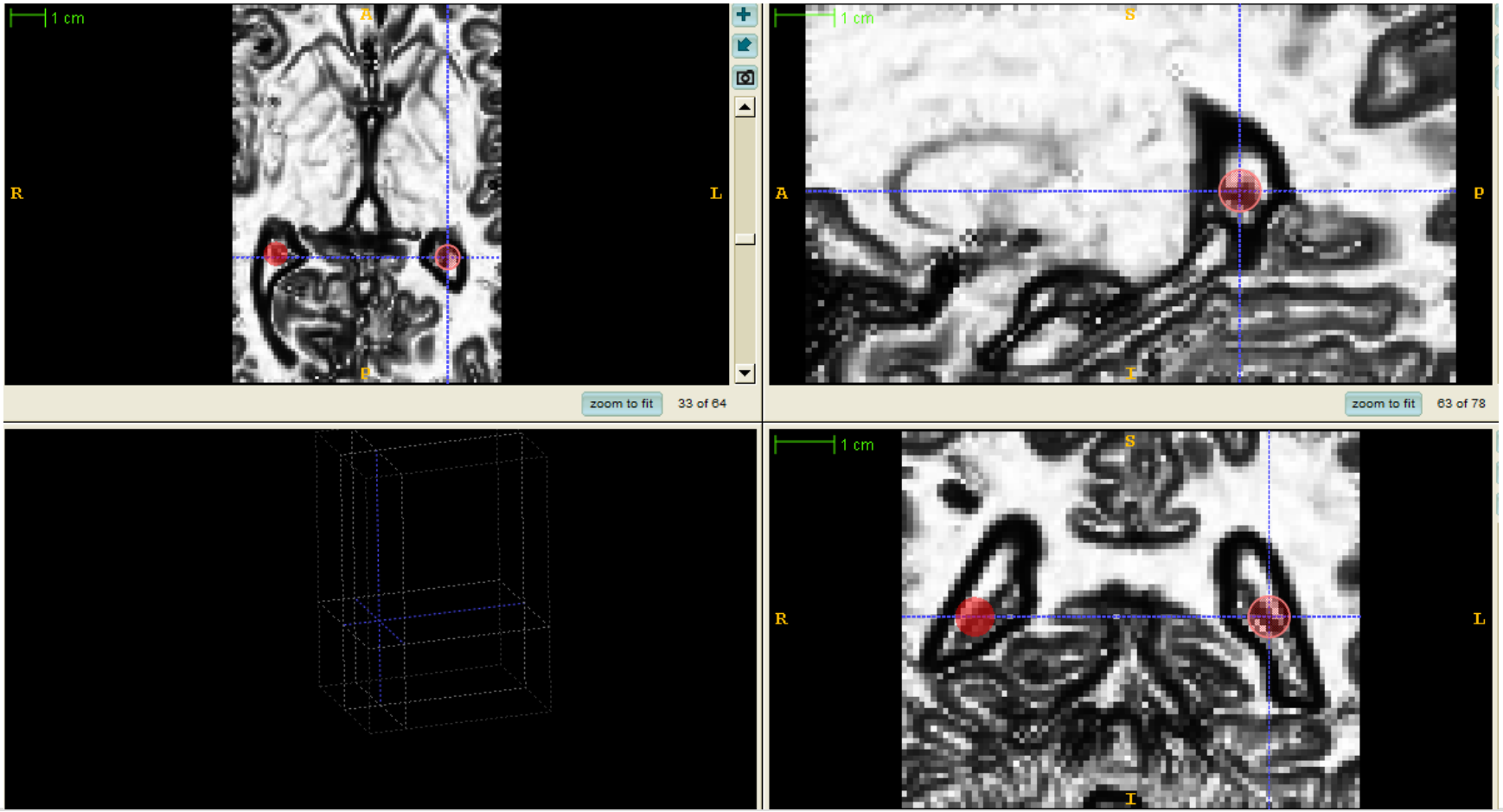


Snake Initialization

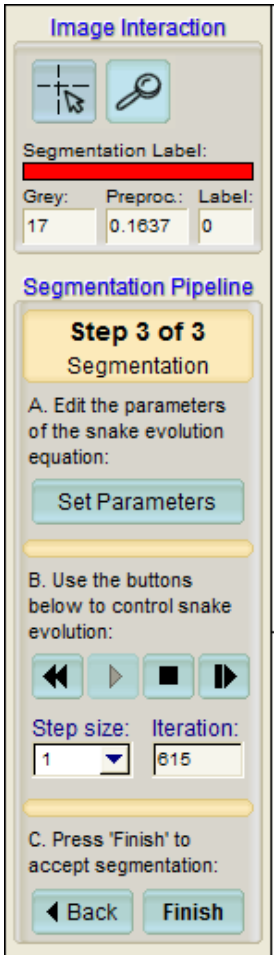


- In snake initialization, we will add “bubbles” which will mark areas of interest
- You can select the radius of each bubble to adjust to the region of interest

Bubbles on Image



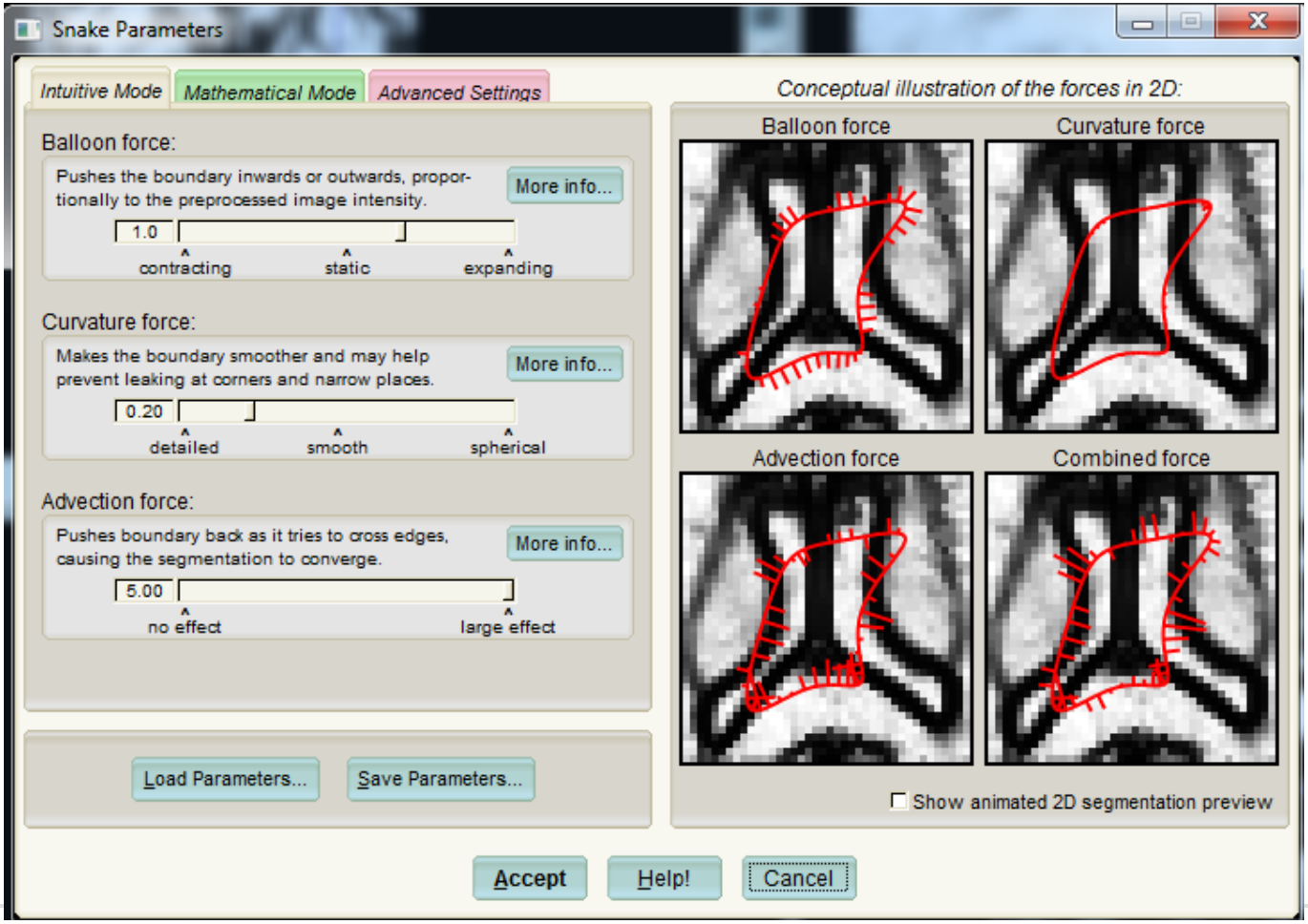
Segmentation!



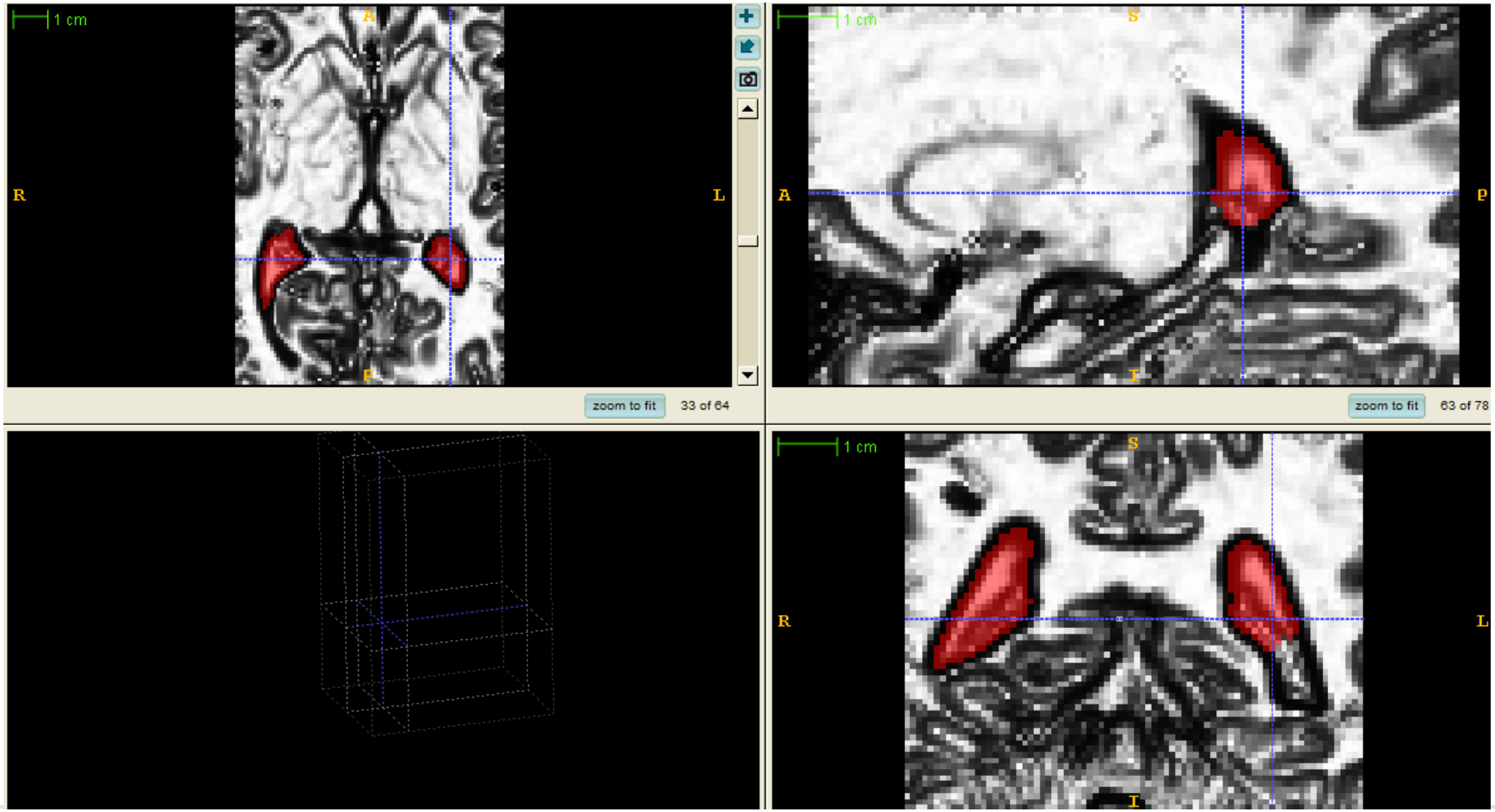
- Here, you will set the parameters so that you can finally segment!
- Once the parameters are set, you can hit the “play” button and let the automatic segmentation run.

Set Parameter Screen

We'll learn about these parameters when we learn about level-sets active contours and snakes…



Segmented Image



Final Segmented Image