NA -MIC
National Alliance for Medical Image Computing
http://na-mic.org

A Tutorial for RSS in Slicer

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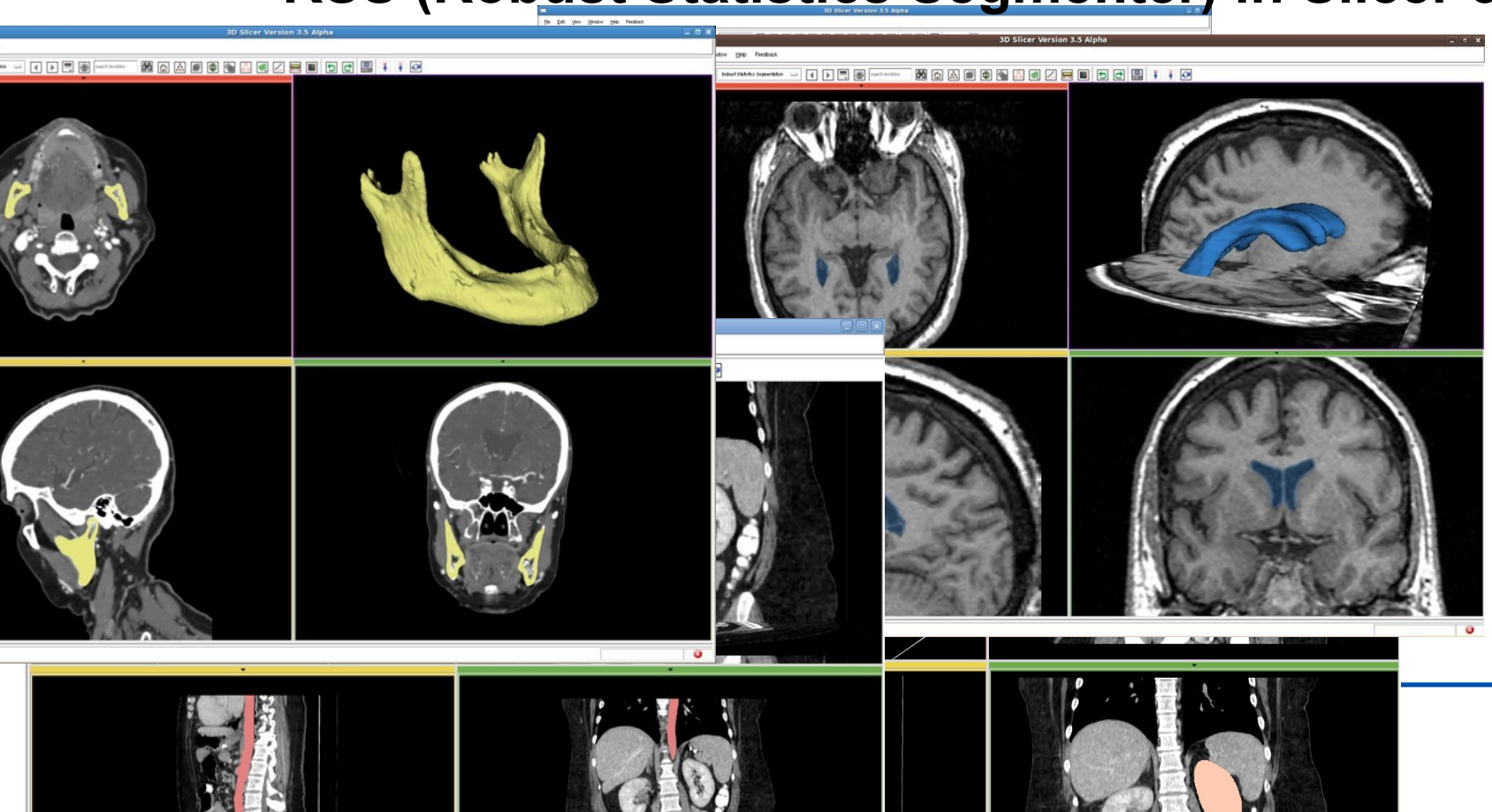
NA-MIC Tutorial Contest: Summer 2010

Learning Objective

How to use:

RSS (Robust Statistics Segmenter) in Slicer 3.6



Pre-requisite tutorials:

- **Slicer3Minute Tutorial**
  - **by Sonia Pujol**
  - **at** http://www.slicer.org/slicerWiki/images/e/e2/Slicer3.6MinuteTutorial_SoniaPujol.pdf

- **Slicer3Visualization Tutorial**
  - **by Sonia Pujol**
  - **at** http://www.slicer.org/slicerWiki/images/c/c9/3DDataLoadingAndVisualization_Slicer3.6_SoniaPujol.pdf

Material

- This tutorial requires the installation of the Slicer3.6 release and the tutorial dataset. They are available at the following locations:

- Slicer3.6 download page

http://www.slicer.org/pages/Downloads/

- Tutorial dataset:

http://wiki.na-mic.org/Wiki/images/2/20/RSSData_TutorialContestSummer2010.zip

Disclaimer: *It is the responsibility of the user of Slicer to comply with both the terms of the license and with the applicable laws, regulations, and rules.*

Platform

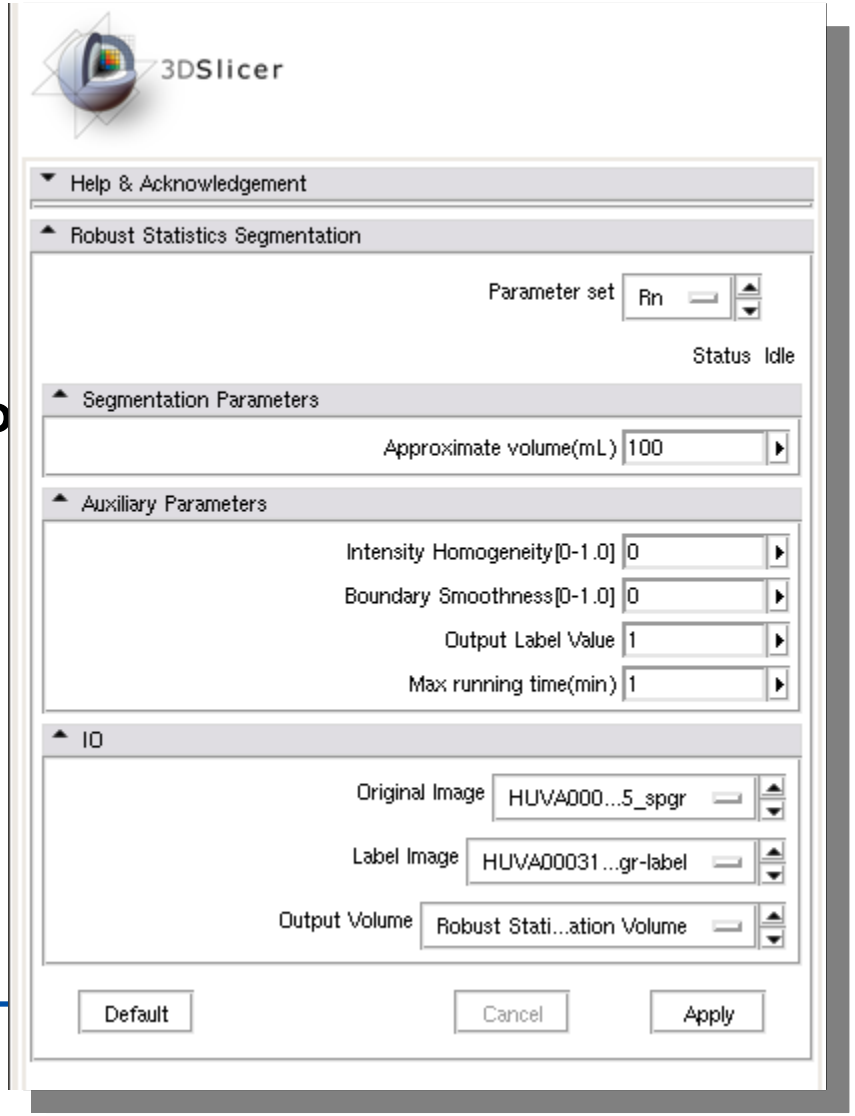
- Developed on Linux 64
- Tested on
  - Linux 64/32
  - Mac
  - Windows XP 32 (I don't have Win64 ...)

Overview

- Basic using steps
  - First try
- How to tune it
  - What if not satisfying
- Examples
- What's not for
  - Cases may need other tools

Basic usage, 1/4

- Slicer 3.6
- Module
  - Segmentation
    - Robust Statistics Segmentatio
- Module panel



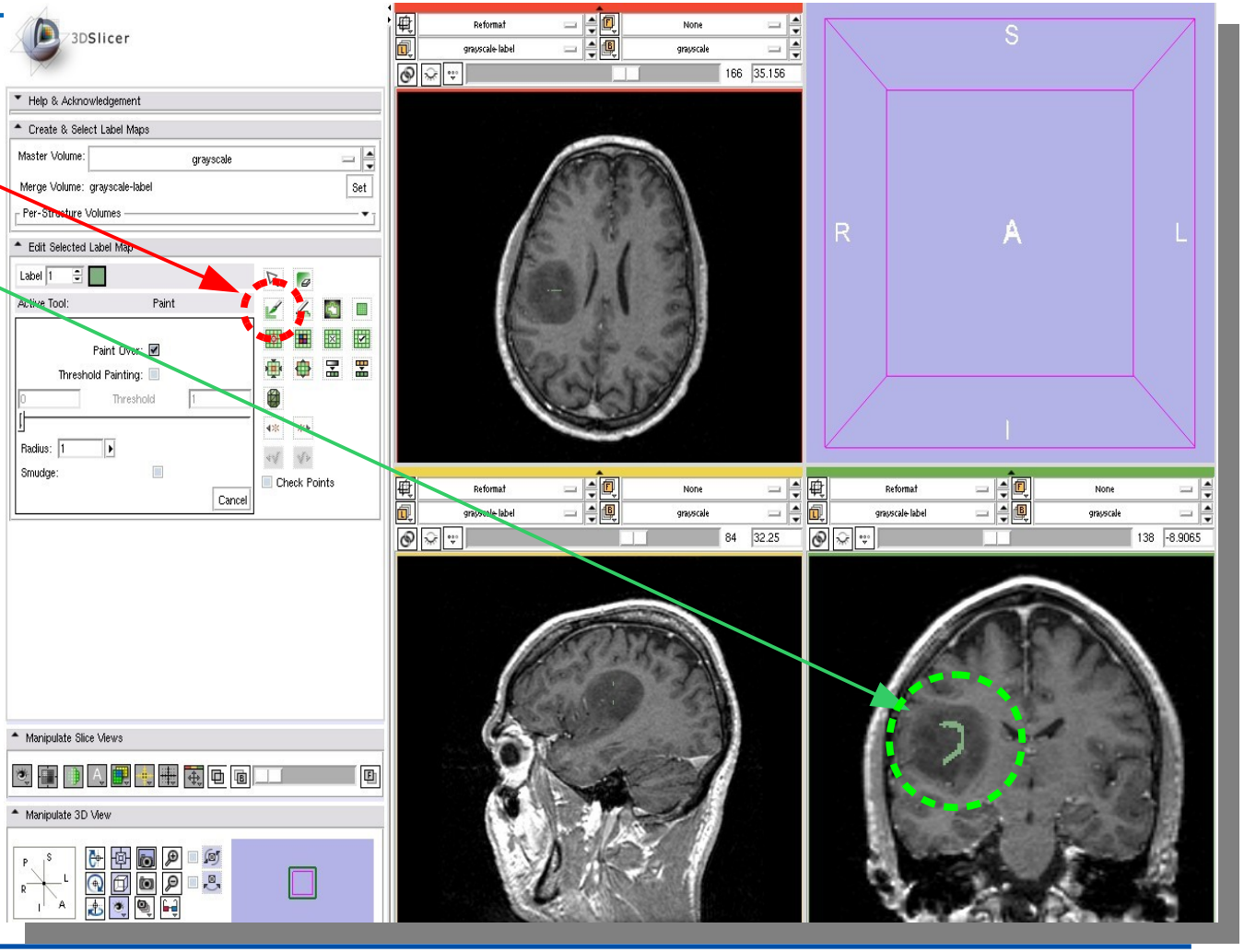
Basic usage, 2/4

- **Load in target image**
  - Slicer3/Applications/CLI/RobustStatisticsSegmenter/grayscale.nrrd
  - http://www.spl.harvard.edu/publications/item/view/1180
    - Tumorbase.zip at page bottom, case 3
- **Label map in Editor module**

- **In the editor, draw in the object (next page)**

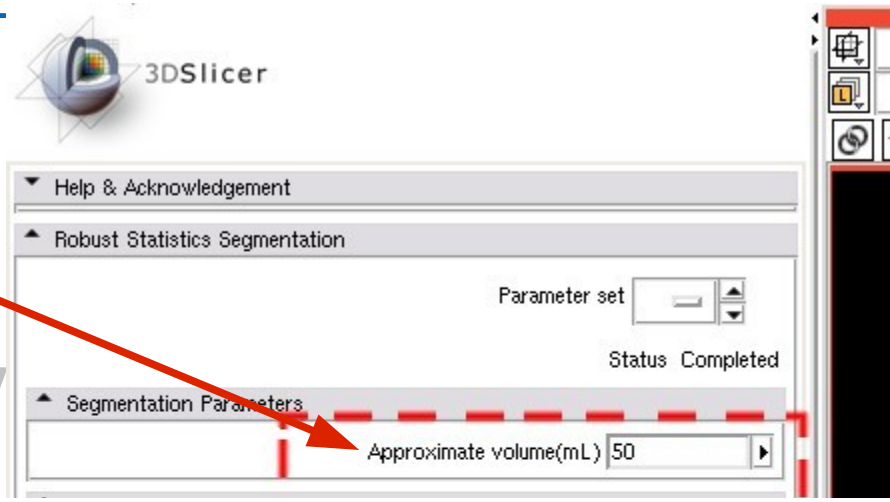
Basic usage, 3/4

- Use
- Draw



Basic usage, 4/4

- **Volume limit**



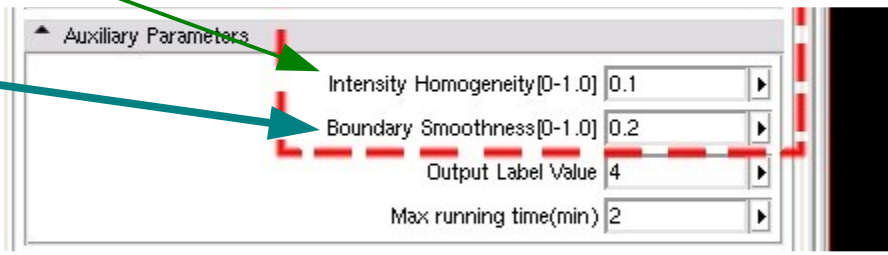
- Intensity homogeneity
- Smoothness

- Target image
- Label image
- “Create new volume”

Basic usage, 4

- Volume limit

- **Intensity homogeneity**
- **Smoothness**



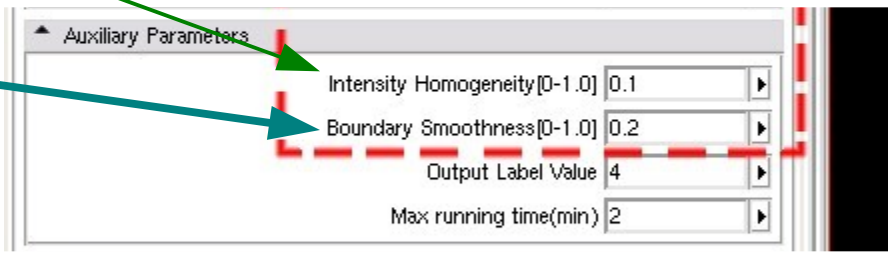
- Target image
- Label image
- "Create new volume"

Basic usage, 4

- Volume limit

- **Intensity homogeneity**
- **Smoothness**

If not sure, use default values (both set to 0). Let it run and adjust later.

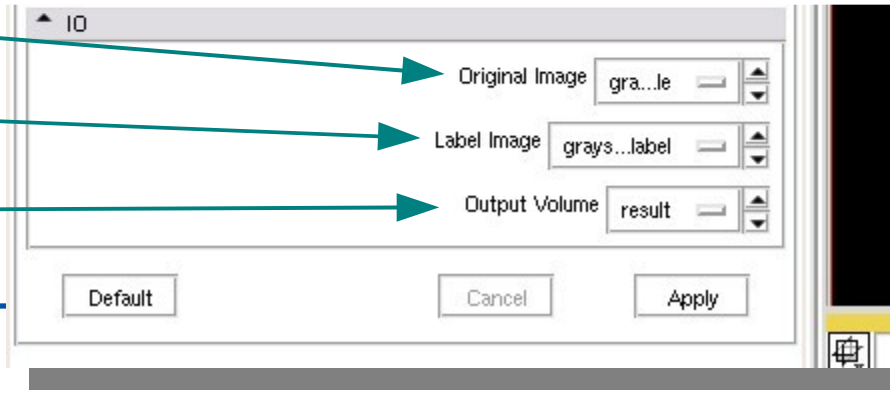


Basic usage, 4/4

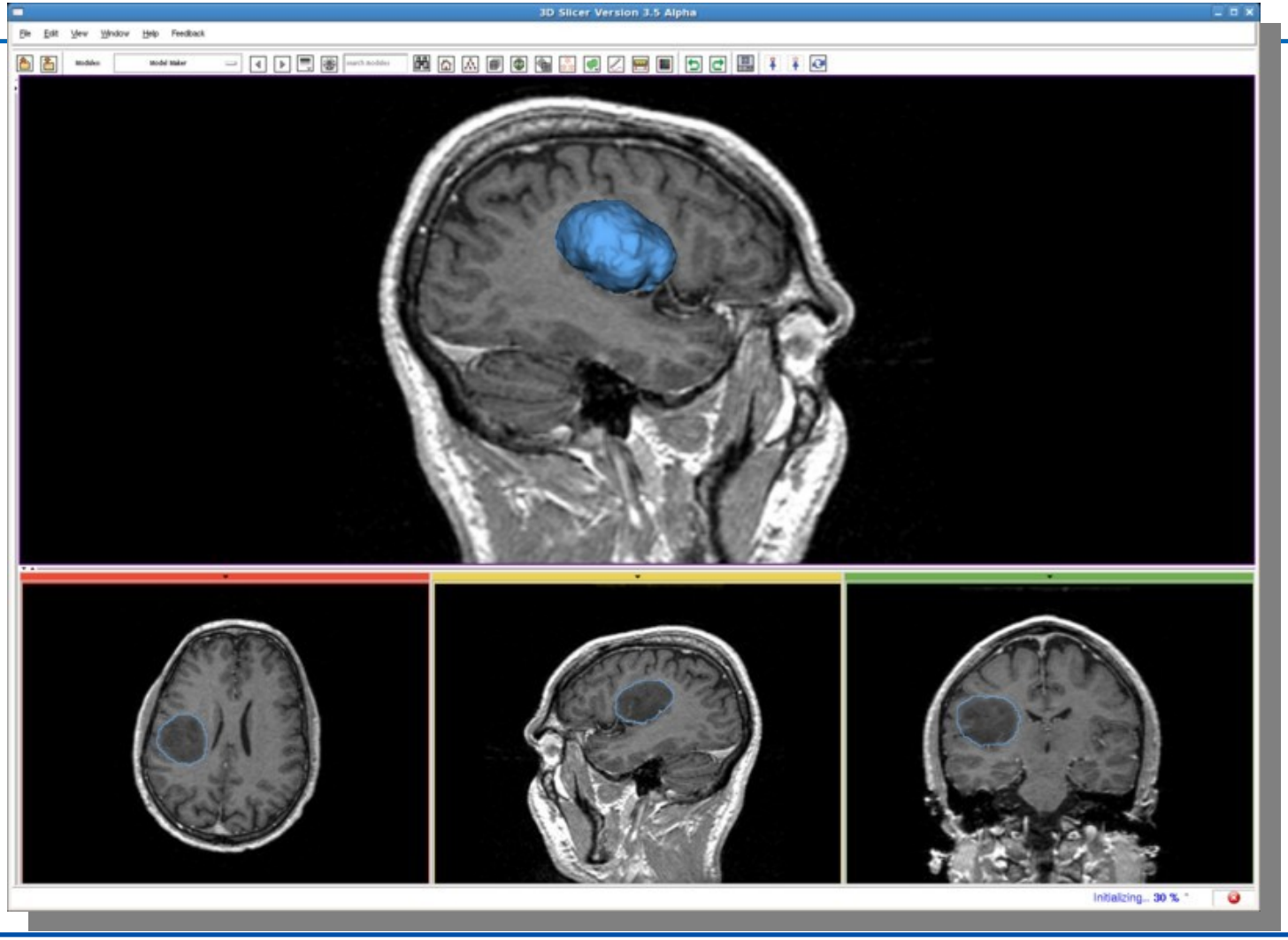
- Volume limit

- Intensity homogenei
- Smoothness

- **Target image**
- **Label image**
- **"Create new volume"**

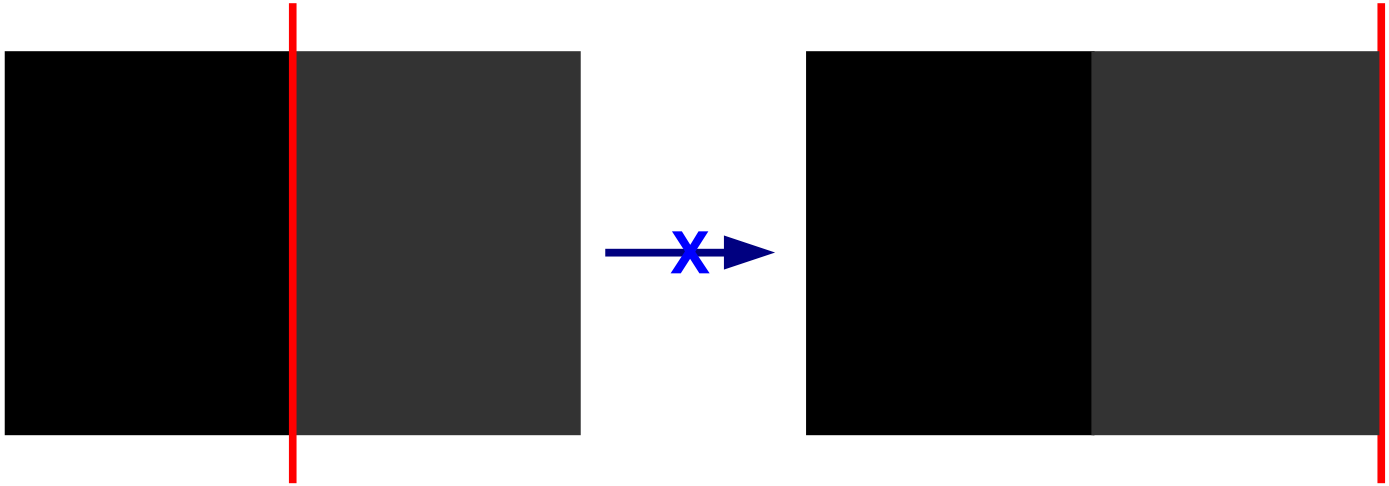


Wait 2.5 seconds...



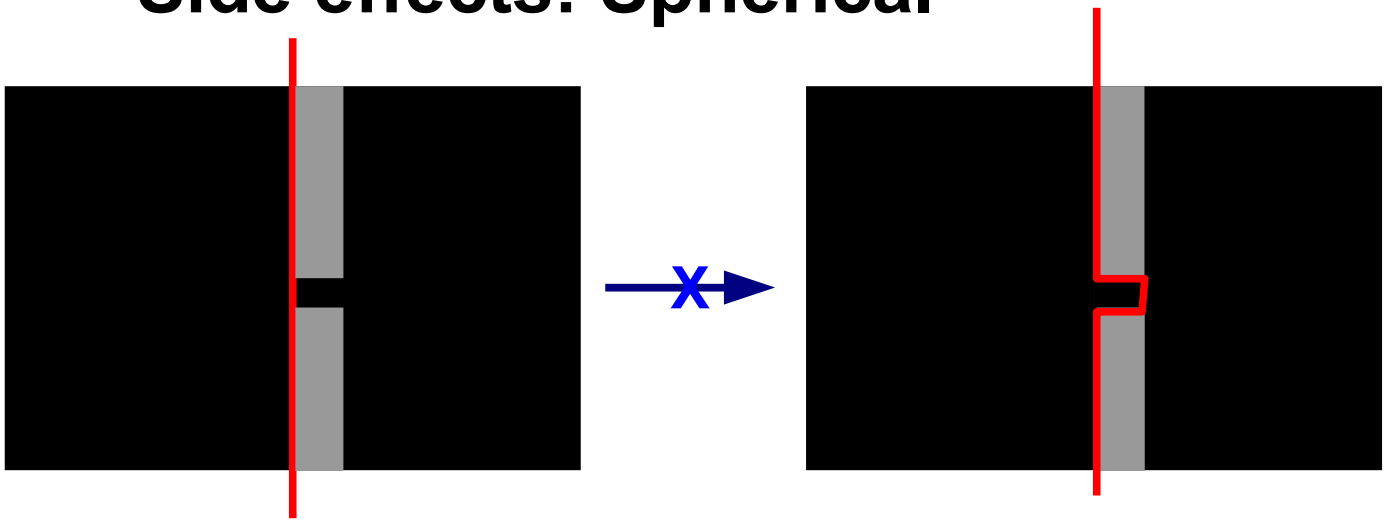
Fine tune, 1/2

- Intensity homogeneity ~1 means:
  - Homogeneous intensity in the target
  - Prevent leakage to *similar intensity region*
  - Be strict



Fine tune, 2/2

- Boundary smoothness ~1 means:
  - Boundary is smooth
  - Prevent leakage*through a thin gap*
  - Side effects: Spherical

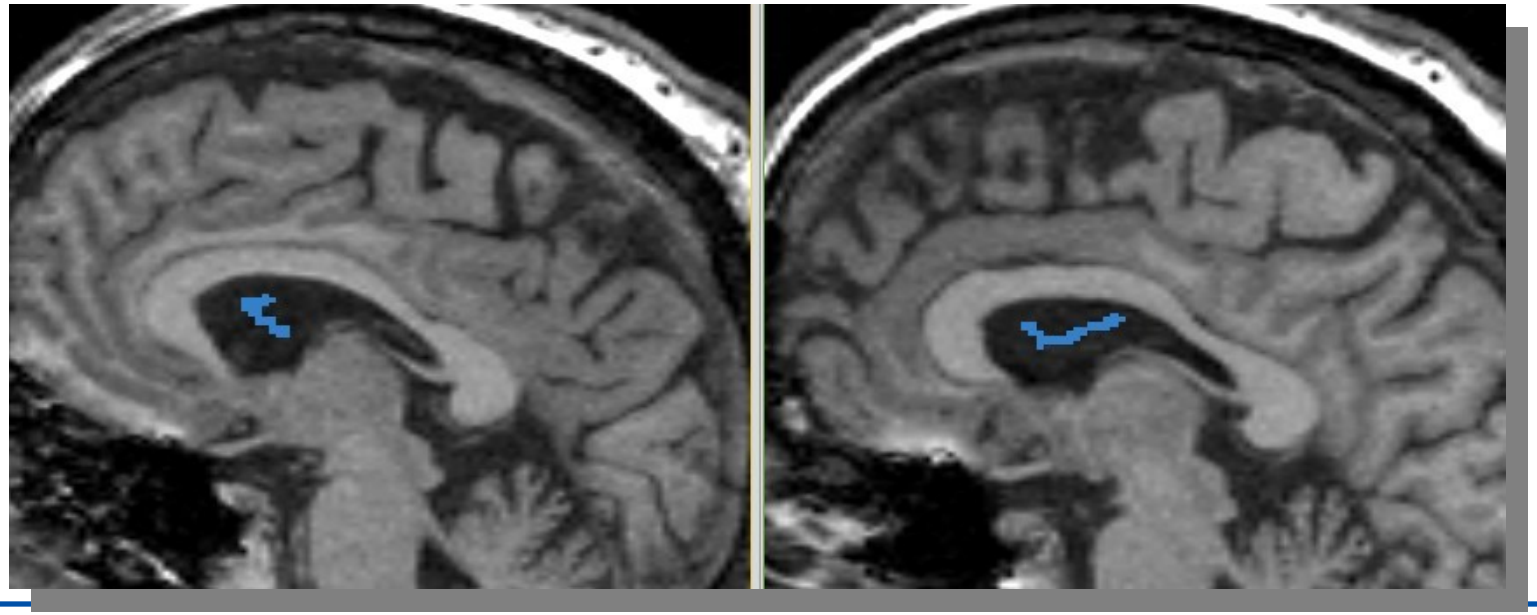


Fine tune, summery

- Small (~0)
  - IH, BS: encourage growth
- Large (~1)
  - IH, BS: discourage growth
  - BS: spherical shape
    - In the following examples, set BS to 0 because the objects (ventricle, aorta, mandible) are not spherical.

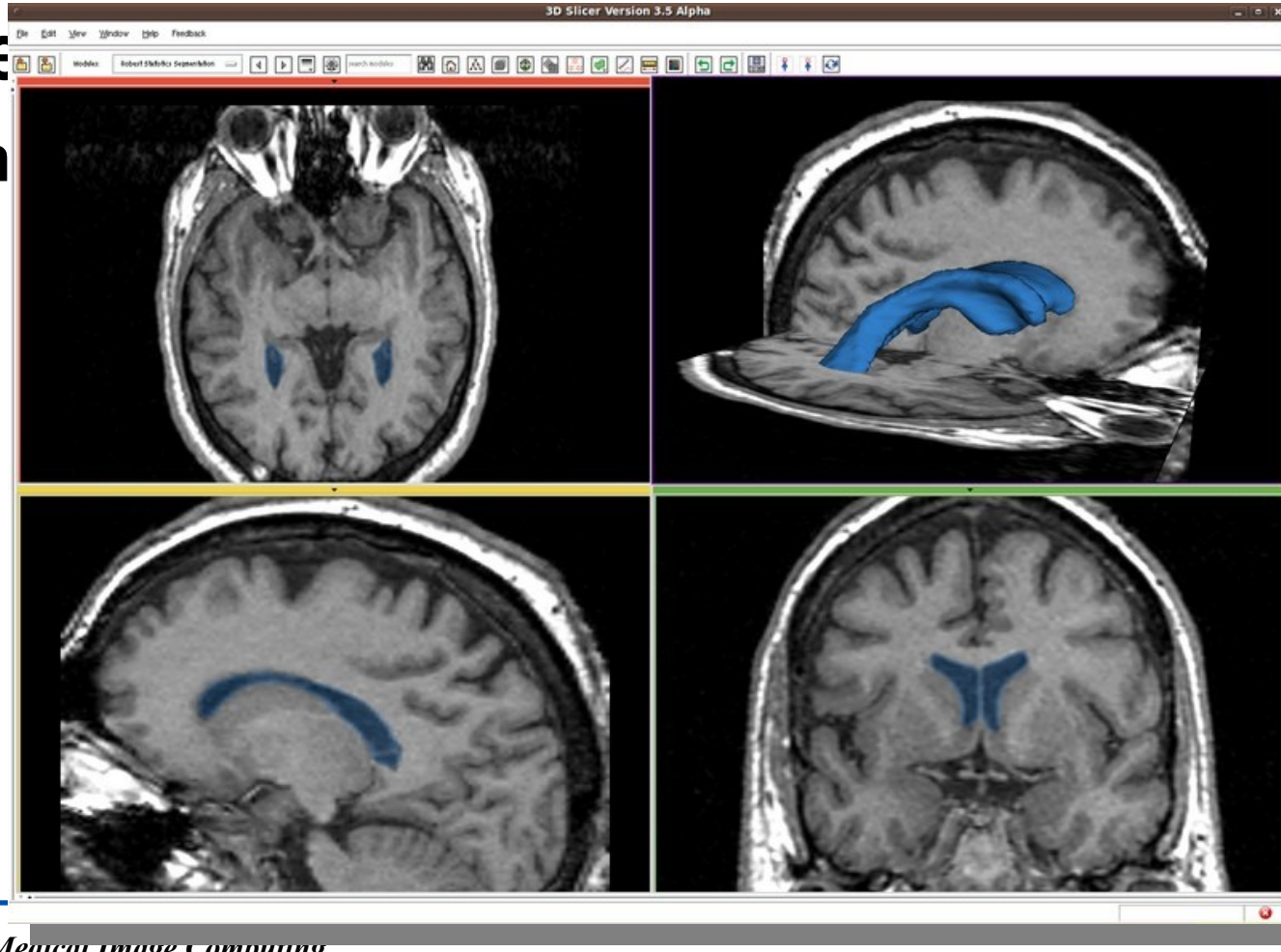
More examples, ventricle

- MRI
  - HUVA12611577_spgr.nrrd
  - Labels: in two sagittal slices



More examples, ventricle

- Paramete
  - Vol: 30m
  - IH: 0.02
  - BS: 0
- 2.5 sec

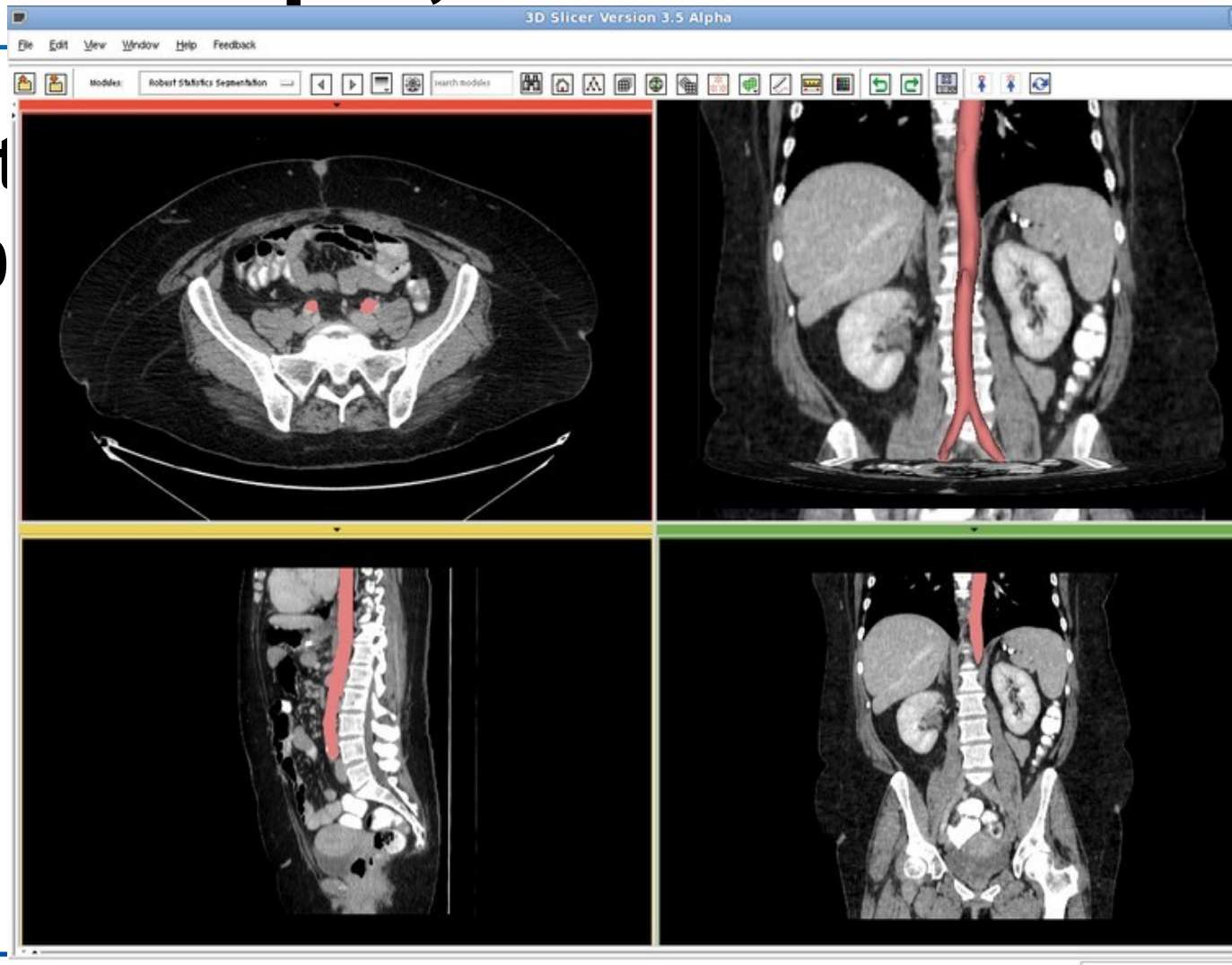


More example, aorta

- CT
  - IMCT.nrrd
- Label
  - 1 sagittal slice
  - Along center line

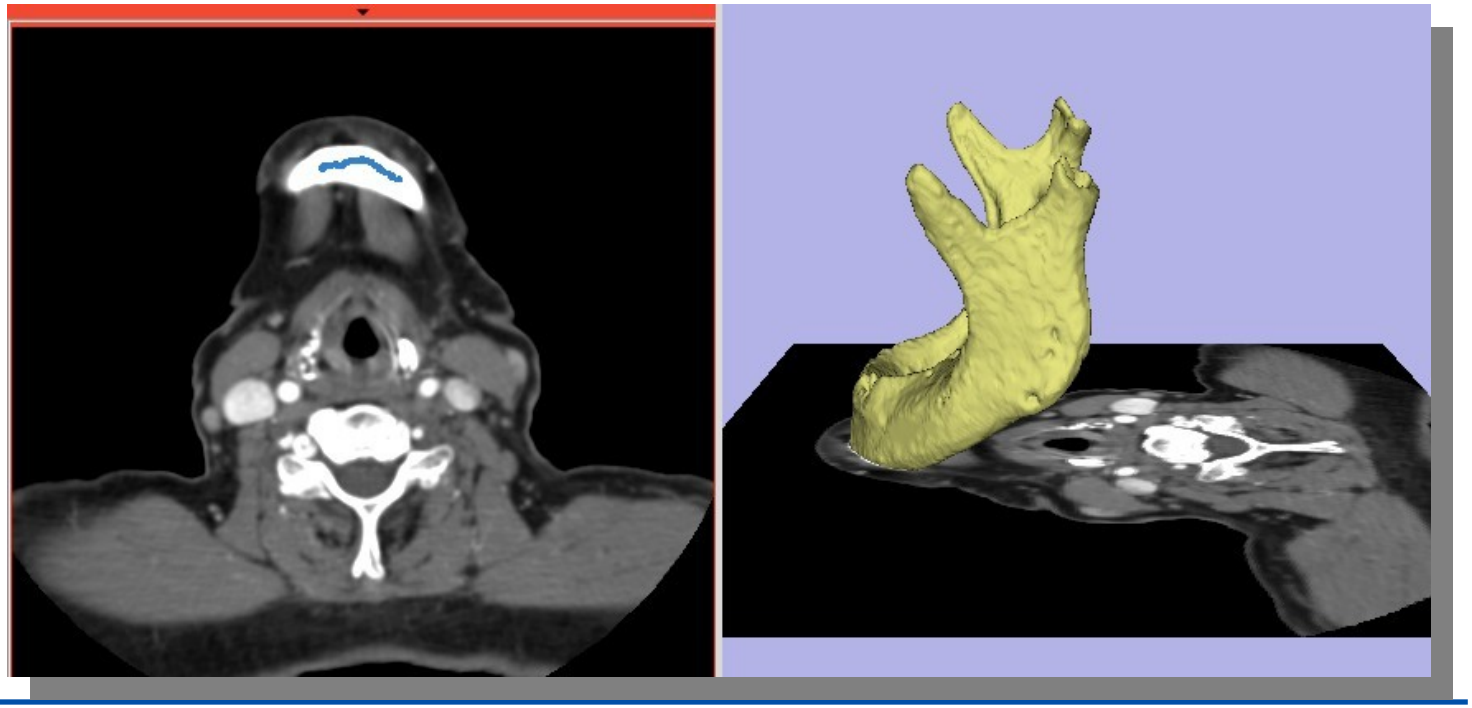
More example, aorta

- Paramet
  - Vol: 60
  - IH: 1.0
  - BS: 0
- 12 sec



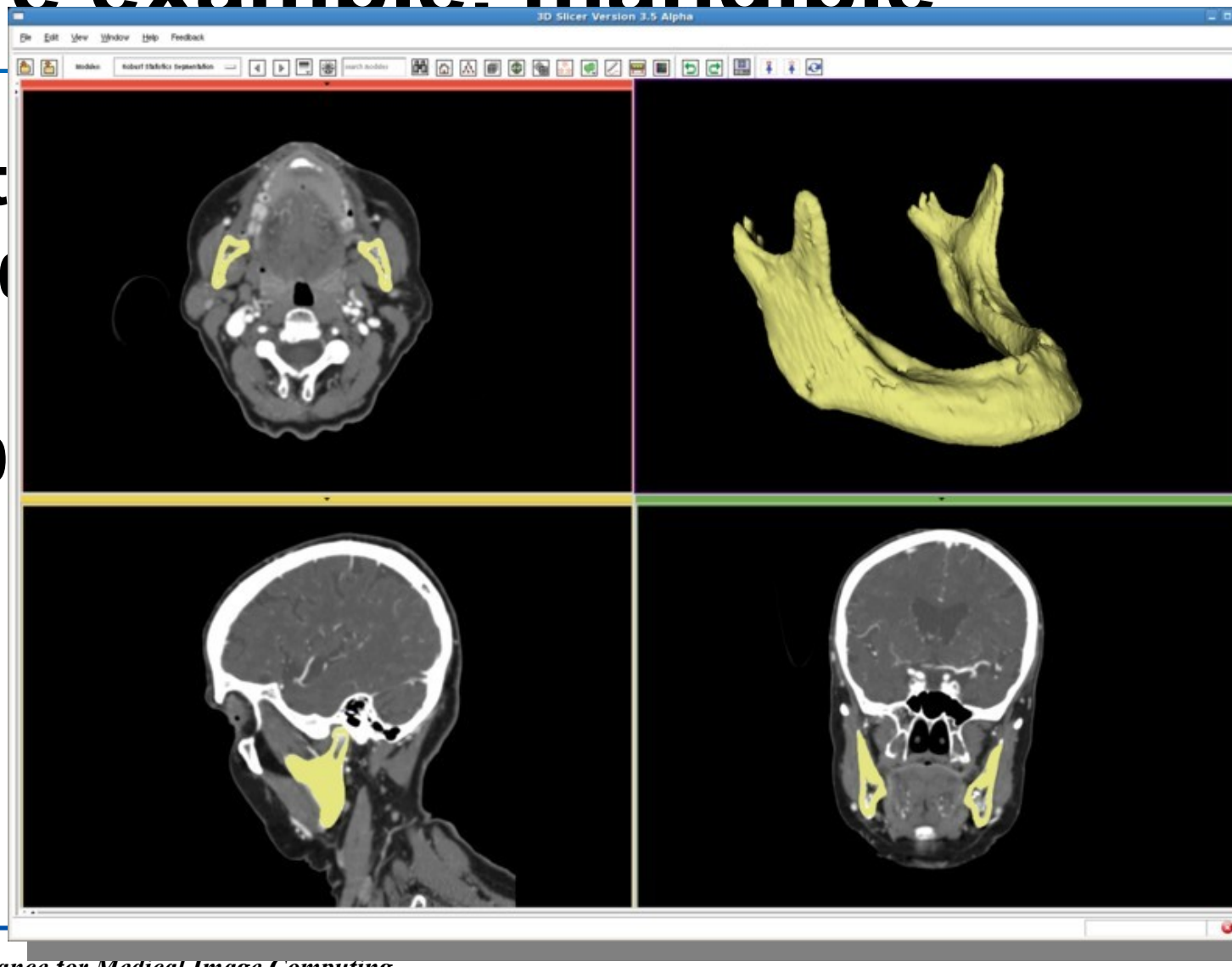
More example, mandible

- **CT** **http://pubimage.hcuge.ch:8080/ MANIX data set**
- **Label: 1 axial slice**

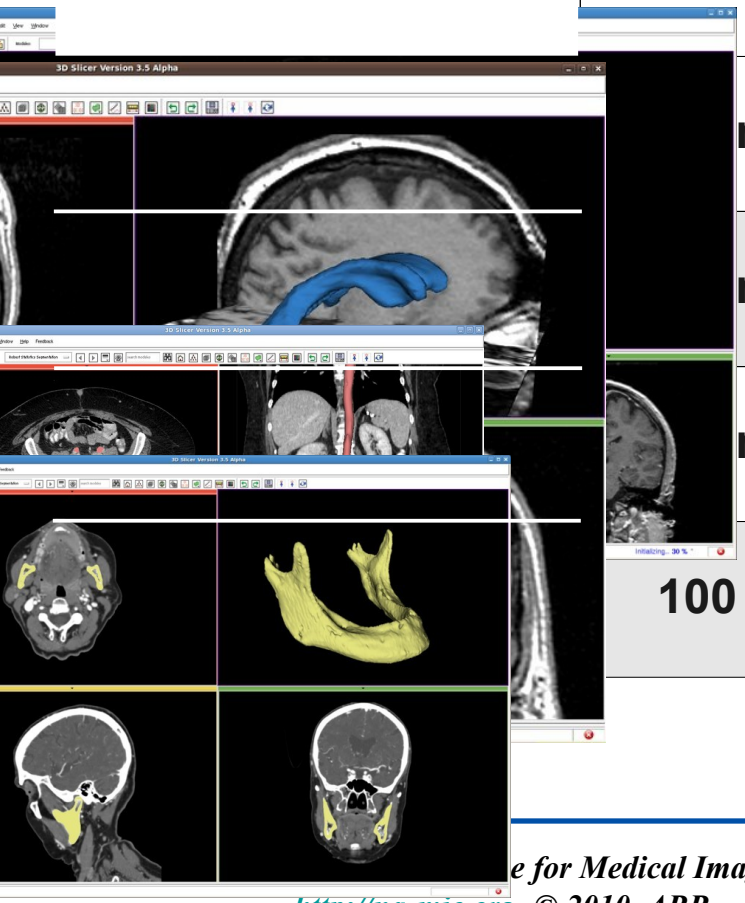


More example, mandible

- Paramet
  - Vol: 10
  - IH: 0.5
  - BS: 0.0
- 160 sec

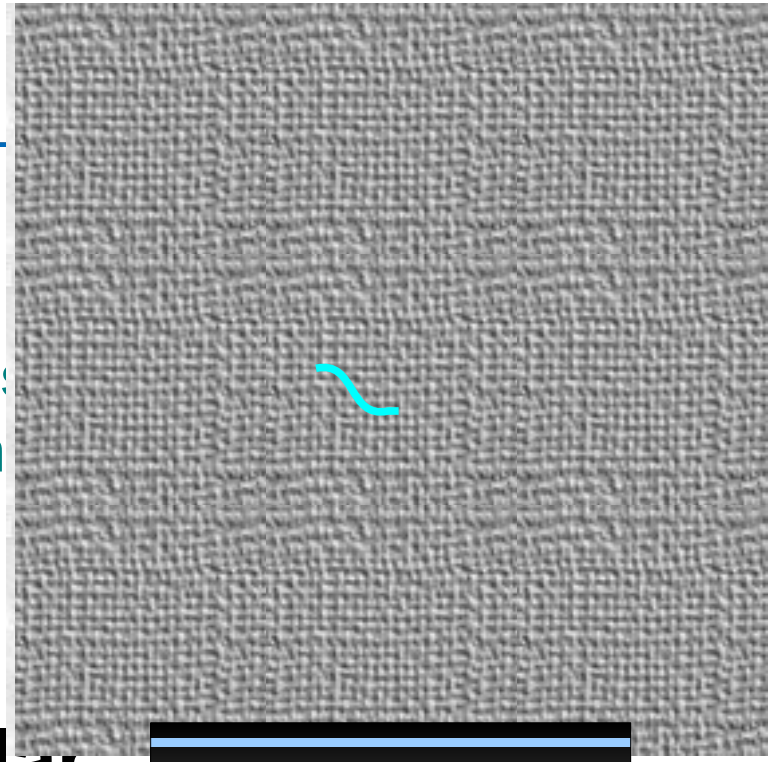


Example summery

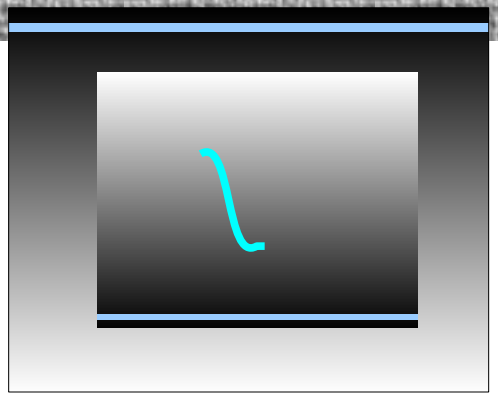


volume limit	homogeneity	smoothness	running time
ml	0.1	0.2	2.5 sec
ml	0.02	0	2.5 sec
ml	1.0	0	12 sec
100 ml	0.5	0	160

What's not for



- Texture images
  - Seeds cover many intens levels, also appearing in background



- Intensity range similar to background
  - Similar reason as above

Conclusion

- A new module, RSS, in Slicer3.6
- It's basic usage & How to tune it
- Examples
- Cases RSS won't work well

Acknowledgments

National Alliance for Medical Image Computing

NIH U54EB005149

- **Thank the creator of this template file, who makes tutorial preparation much easier.**

