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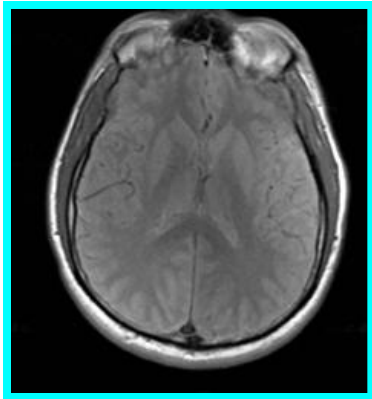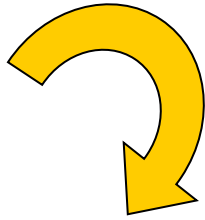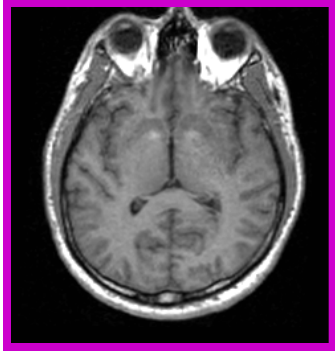*http://na-mic.org*

Slicer3 Tutorial

Manual Registration

Dominik Meier, Ron Kikinis, Sonia Pujol
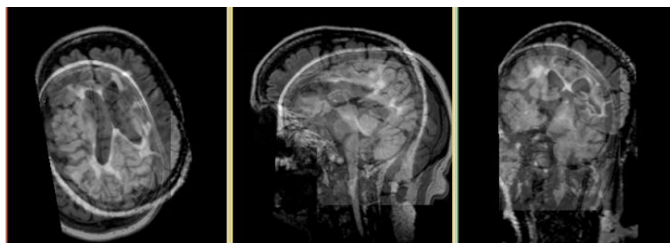Surgical Planning Laboratory, Harvard Medical School

Motivation

Registration algorithms bring multiple image data sets into spatial alignment, in order to achieve **anatomical agreement**.

Material

- Slicer version 3.6.1 release version

- The Slicer_ManualRegExample dataset contains two MRI scans of the same subject acquired with different head positions

- Download and extract the dataset for this tutorial:.It should contain:

    – ManualRegistrationExample_SlicerScene.mrml: Slicer scene

    – ManualRegistrationExample_fixed.nrrd: first MRI image

    – ManualRegistrationExample_moving.nrrd: second MRI image to be aligned with first
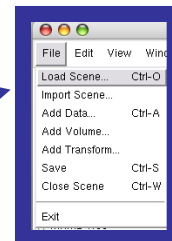
Initial mis-alignment
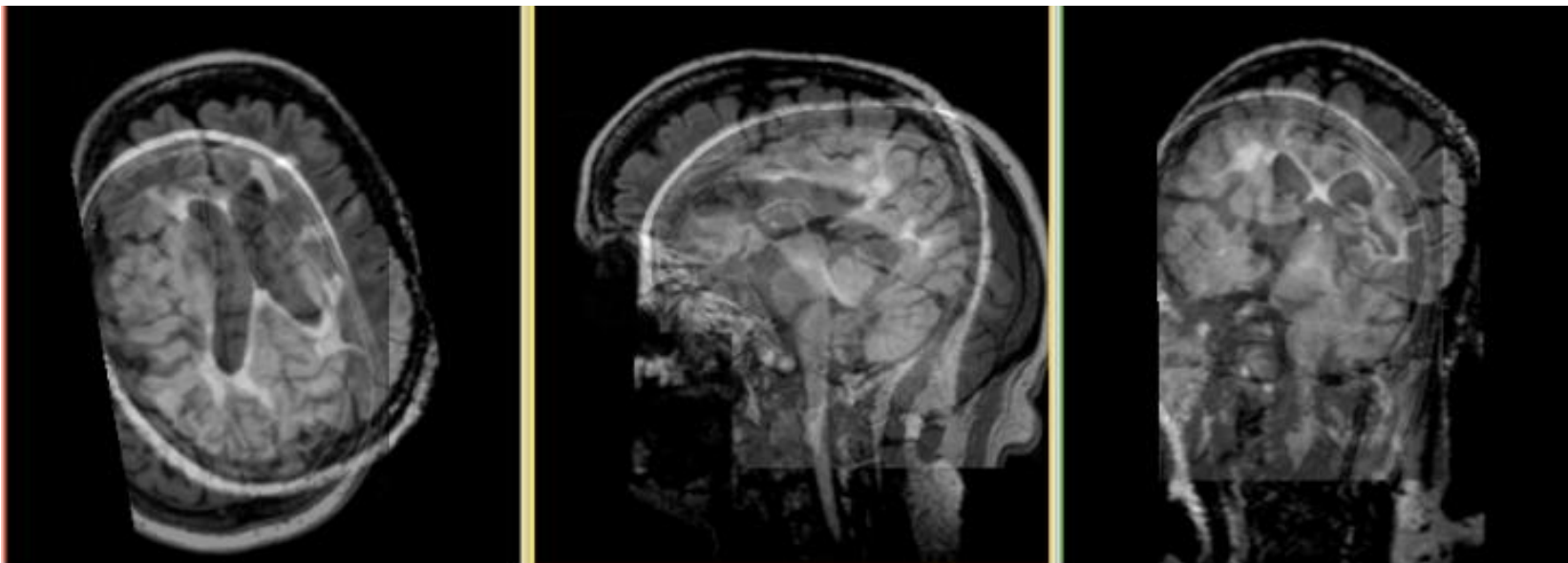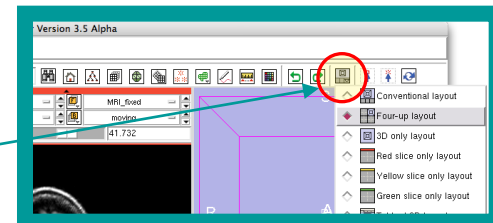
1. Loading Example Dataset

To get the Example Dataset loaded into Slicer:

1. [File] Select Menu→File→ Load Scene…

   – *Select the Slicer Scene file*
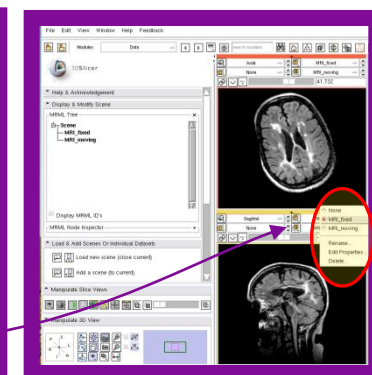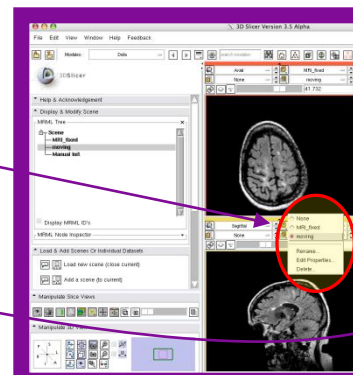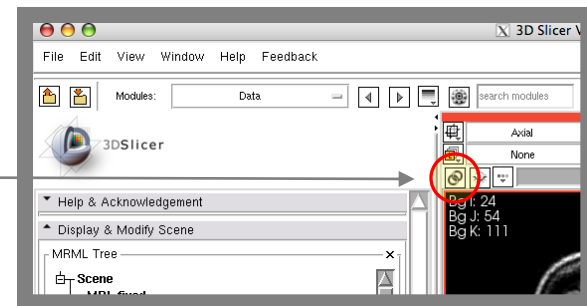   ***ManualRegistrationExample_SlicerScene.mrml***

2. Link Views: Click on the Ring Icon in any of the slice views to link all the views together. This will save you the work of making selections for each slice window separately.

3. Choose Foreground: MRI_moving

4. Choose Background: MRI_fixed.

Visualize the initial misalignment
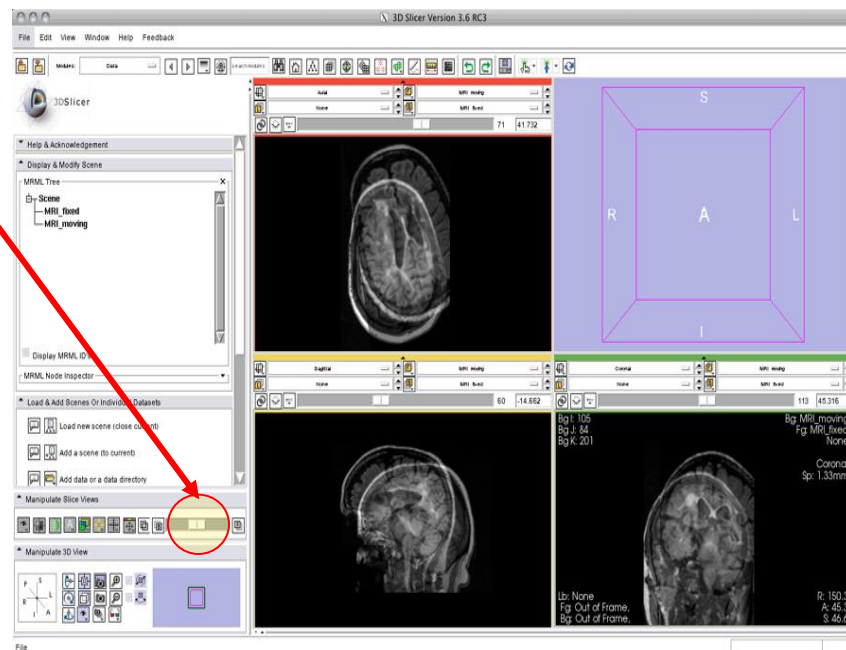
- To interactively align images, we need to see them both at the same time:

- Set Visibility Slider to halfway between foreground and background. This allows you to see both images.

- Note how the display changes as you move the slider.

Note: For your own dataset, you may need to adjust the level as well as each image's Window & Level settings to comfortably see both images.

Create New (blank) Transform

1. You can create a new Transform in the Data module directly:

2. Right-click on the "Scene" node in the MRML tree. From the pulldown menu select: "Insert Transform Node"

3. We change the name of the new transform:

    1. Click on the little triangle to expand the "MRML Node Inspector" tab at the bottom of the panel

    2. select the new node ("vtkMRMLLinearTransformNode")

    3. type the new name, e.g. "ManualInit"

    4. hit "ENTER"
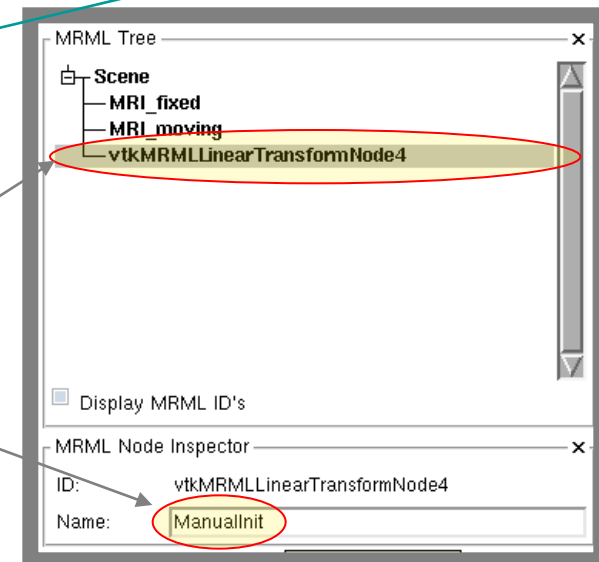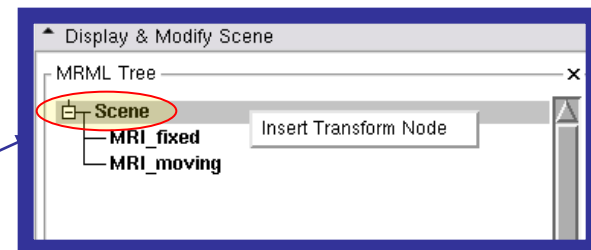
Link Image to New Transform

1. You see the newly created transform listed along with the two image volumes. We now associate the moving image with the transform:

2. In the MRML tree window, select the node for the "MRI_moving" image and drag it on top of the "Manual Init" transform. You should now see the diagram updated with the volume listed within the transform
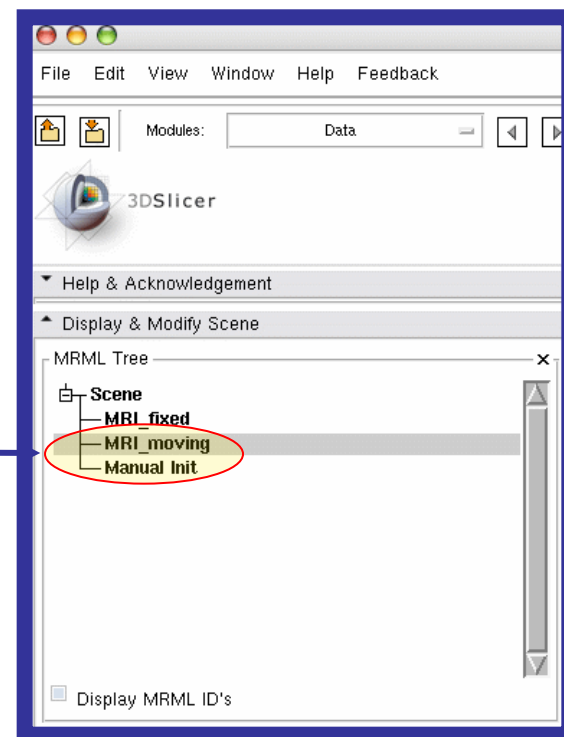
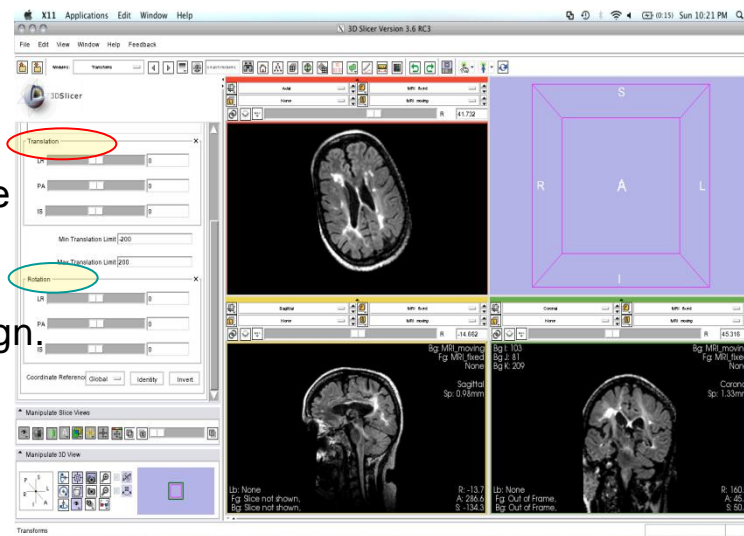animated GIF: view in Presentation Mode

Move Image

1. Return To the Transforms module

2. Move the sliders to align the two images:

   1. Move the translation sliders labeled "IS" to the left until it reads about "-21". Watch the display update as you move the slider

   2. Move the "PA" translation slider to the left while watching the display until the two brain roughly align. The "PA" slider should read around "-24"

   3. Move the "IS" rotation slider to rotate the volume clockwise until the axial planes have roughly the same orientation. (ca. 14 degrees).

   4. Move the "LR" translation slider to the right to compensate for the shift that occurred from the rotation. Reading now is ca."+26".

   Notes: - If you want to start over, click the "Identity" button at the bottom, which will reset the transform.

   - You can tune the sensitivity of the translation sliders by setting the min and max. Setting smaller range allows more precise changes.

   - You can also move by entering the numbers in the text fields and the hit the "TAB" or "Return" key.

animated GIF: view in Presentation Mode
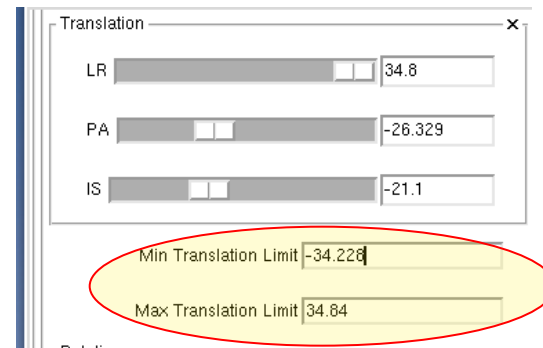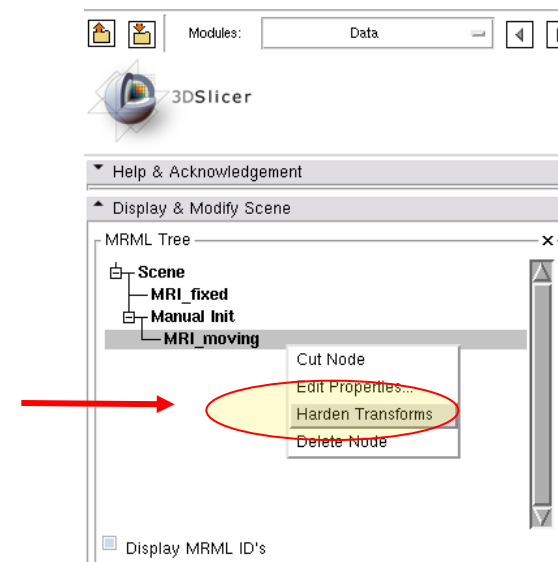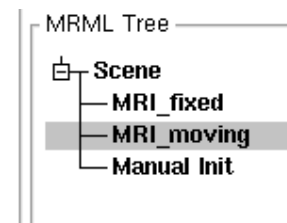
Apply & Save

We apply the transform to the moving image and save the result volume:

1. [icon] Go back to the "Data" module

2. Right-click on the "MRI_moving" image. From the pulldown menu, select "Harden Transforms".

This finalizes the transform and it resamples the volume in the new orientation. You will see the "MRI_moving" node moved back out into the main hierarchy level.

Save

1.   Select "Save" from the File Menu. In the Dialog uncheck all lines except for "MRI_moving". In the "FileName" field, double click and select a new filename, e.g. "ManualResult.nrrd"

2.   To also save the transform, check the box next to "Manual Init". The transorm will be saved as a small text file containing all the necessary parameters.

3.   click "Save".
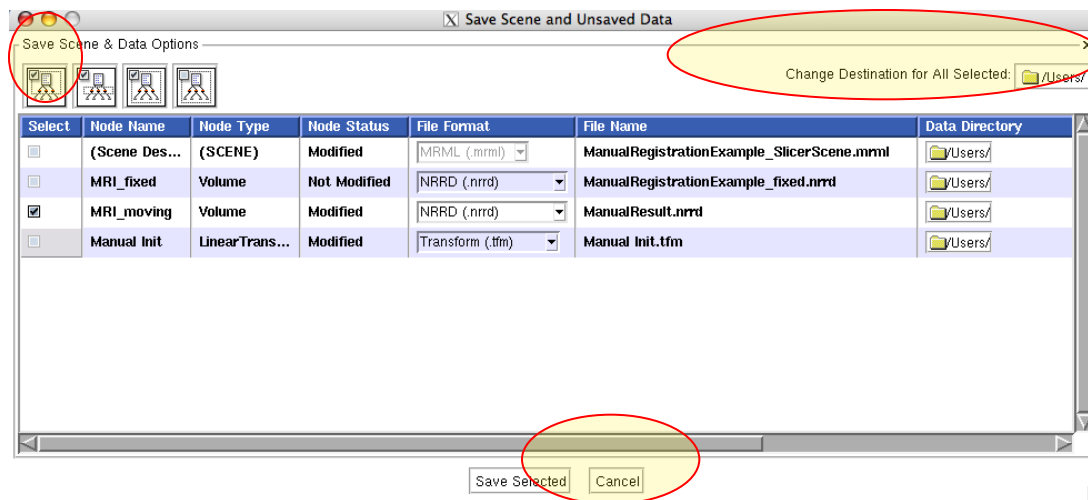
Quality Assessment
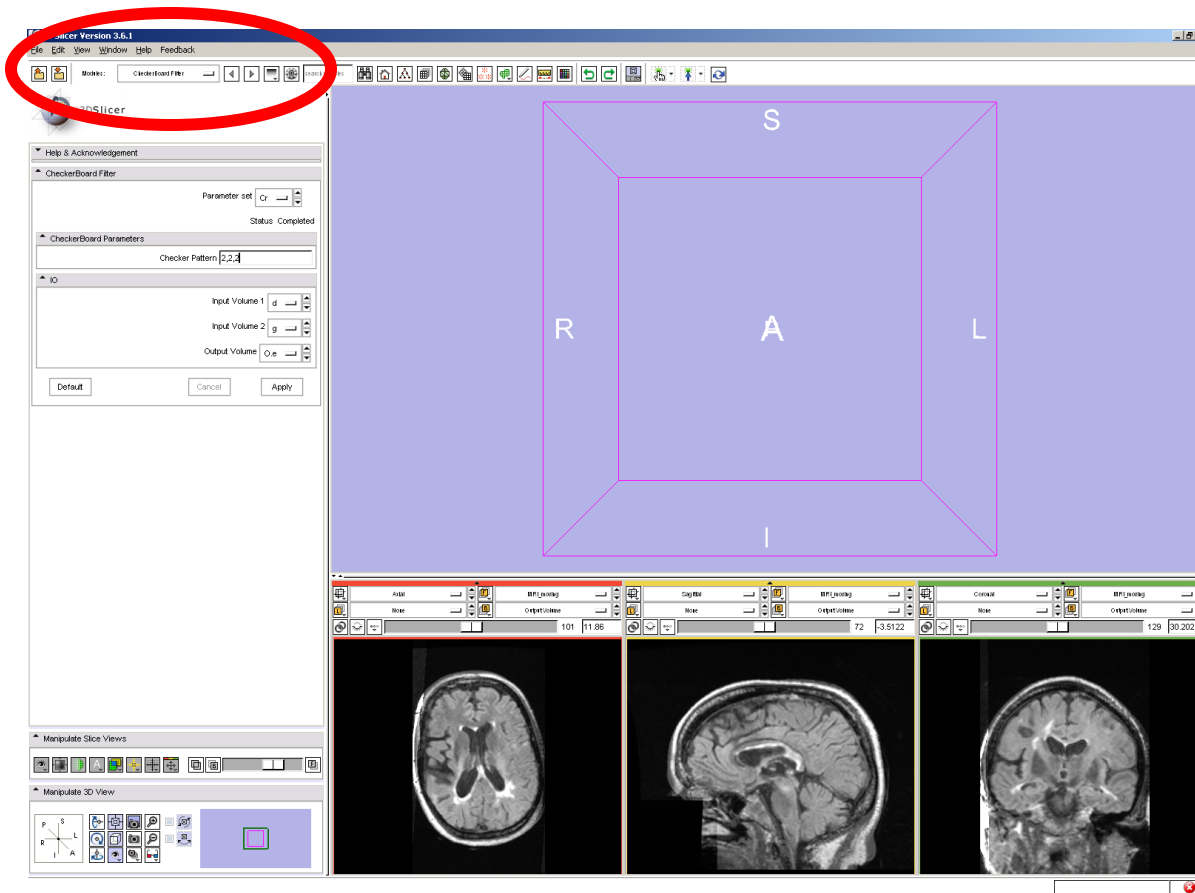
Select the module Checkerboard Filter in the main menu
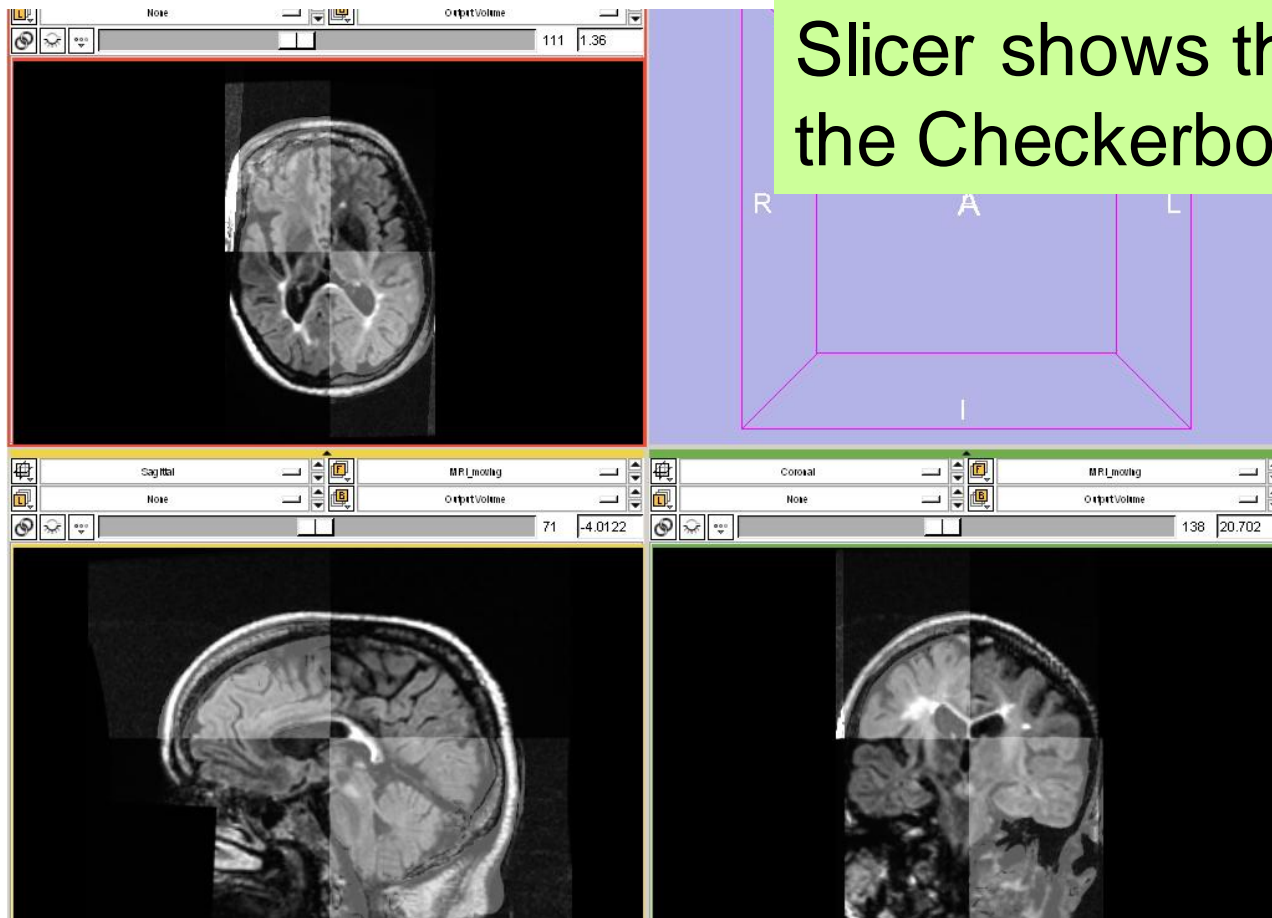
Quality Assessment

Select the input volume **'MR_fixed'**
Select the inputvolume2 **'MR_moving'**
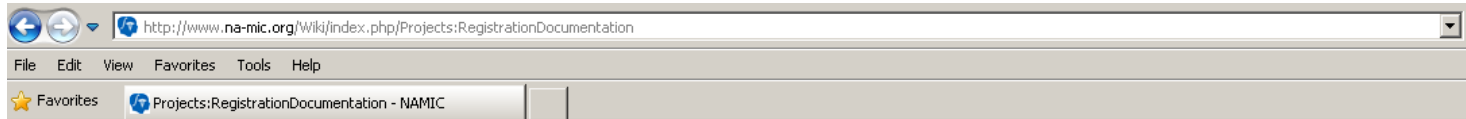Select the output volume **'Create New Volume'**
Click on **Apply**

Quality Assessment

Slicer shows the output of the Checkerboard filter

Registration Documentation

File   Edit   View   Favorites   Tools   Help

⭐ Favorites   Projects:RegistrationDocumentation - NAMIC

page | discussion | view source | history

Projects:RegistrationDocumentation

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    6.1 Bundled Registration and Tests

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Google™ Custom Search
[GO]

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- Wiki Main Page
- NA-MIC-Kit
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- Events
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administration

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toolbox

- What links here

Use Case Library

- **Registration Case Library**
- **Use Case Sharing Advertisment Page**
- Notes & concepts about the Registration Case Library

Development Efforts

- **Notes & ideas for GUI and algorithm implementation. Discussion platform with the developer group**
- **Effects of Voxel Anisotropy and Intensity-Inhomogeneity on Image-Based 3D Registration**
- Parameter Exploration
- Result Evaluation & Visualization

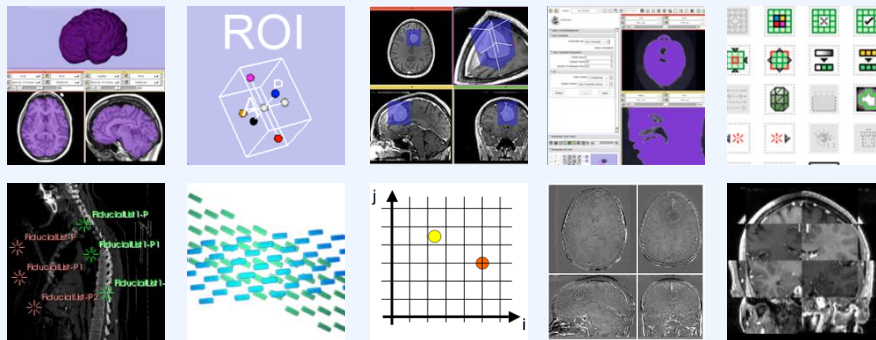# Registration Tools in 3D Slicer

Registration Main Modules

manual | rigid | affine | rigid+affine | non-rigid

AC-PC | fiducial | HAMMER | demons | surface
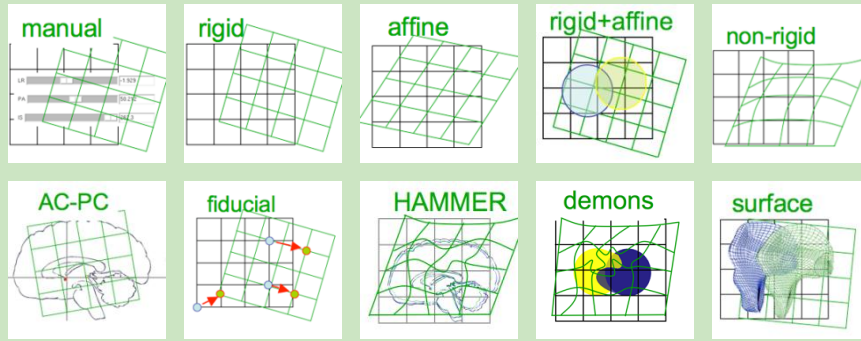
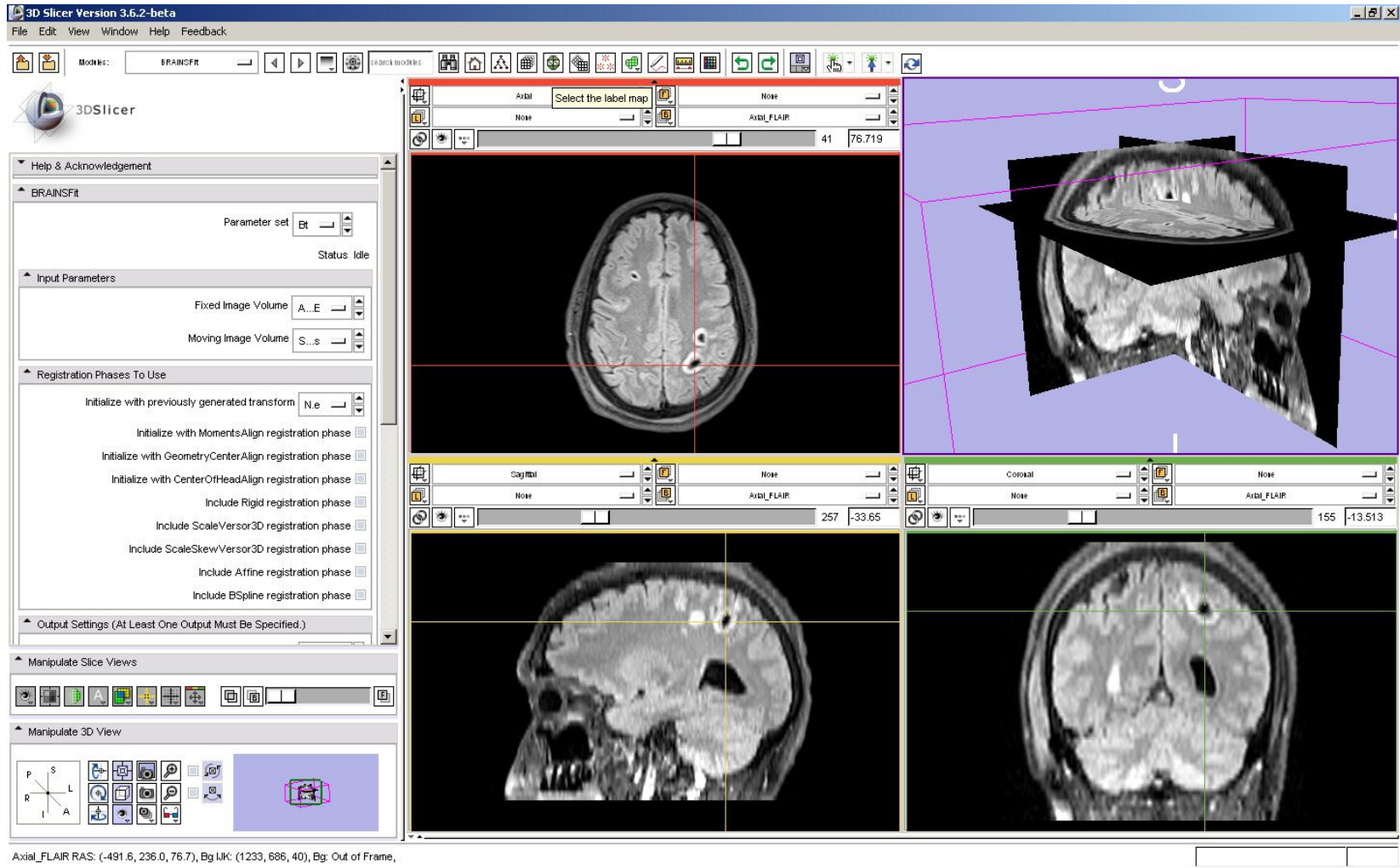| Driver:	DOF:
•manual	6
•intensity	7
•surfaces	9
•fiducials	12
•segmentation	$27 \sim 10^3$

Registration Auxilary Modules

ROI

Support for:
•fiducials
•ROI definition
•mask building & editing
•resampling
•visualization/evaluation

Automatic Registration: BRAINSFit

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