



NA-MIC

National Alliance for Medical Image Computing

<http://na-mic.org>

Slicer3 Tutorial

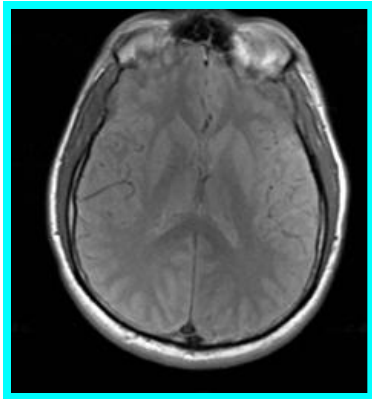
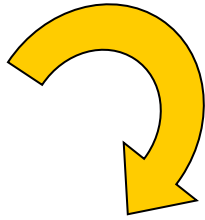
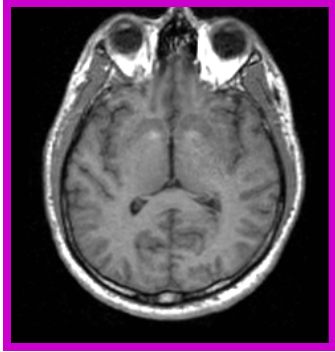
Manual Registration

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Surgical Planning Laboratory, Harvard Medical School



Motivation

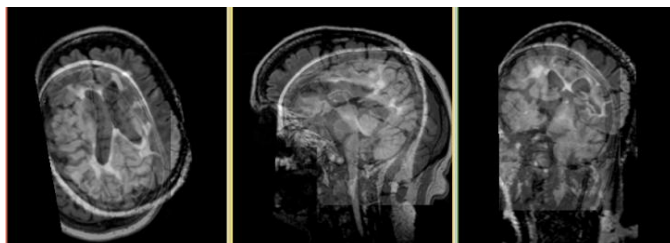


Registration algorithms bring multiple image data sets into spatial alignment, in order to achieve **anatomical agreement**.



Material

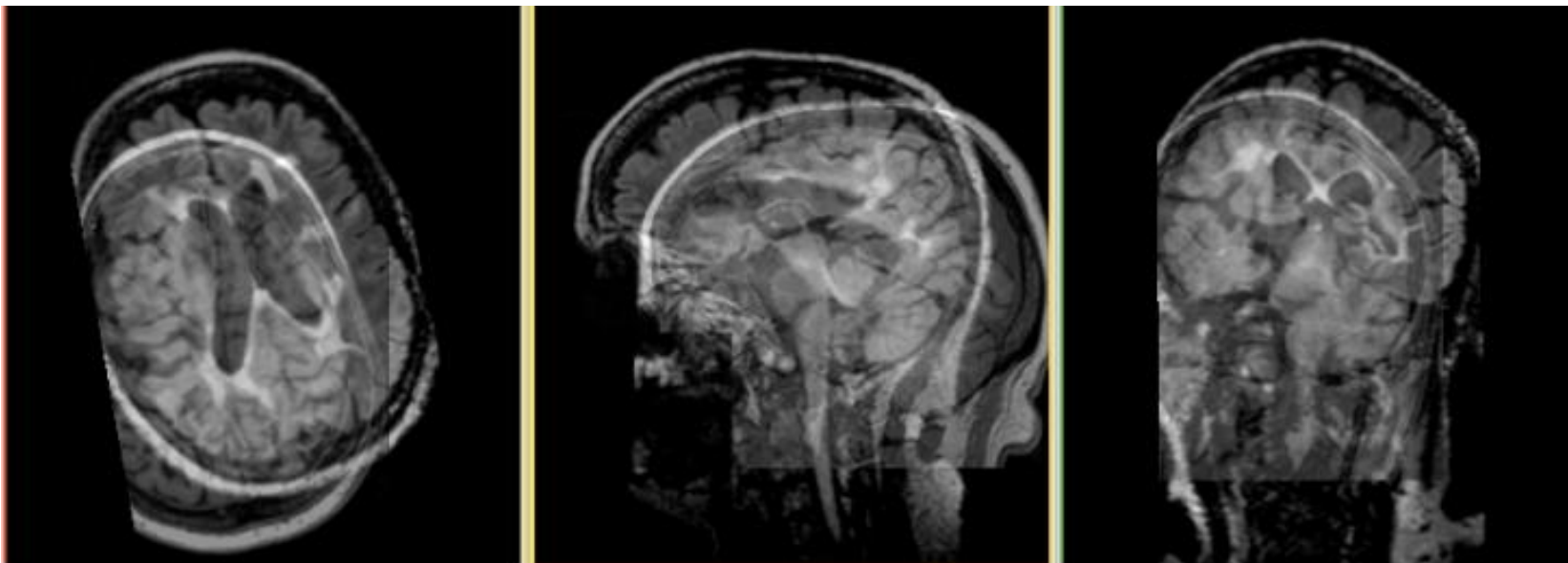
- Slicer version 3.6.1 release version
- The Slicer_ManualRegExample dataset contains two MRI scans of the same subject acquired with different head positions



- 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



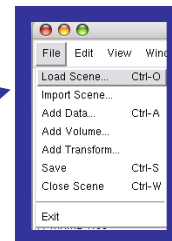



1. Loading Example Dataset

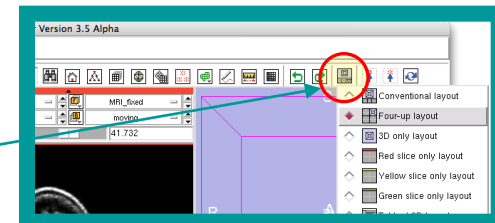
To get the Example Dataset loaded into Slicer:

1.  Select Menu → File → Load Scene...

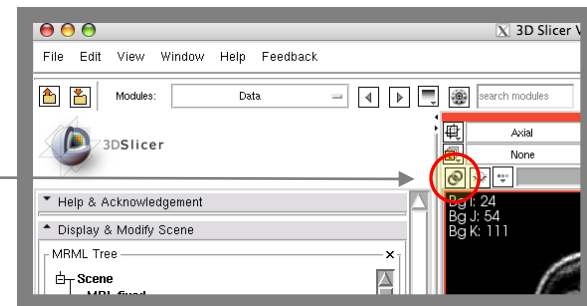
- Select the Slicer Scene file
ManualRegistrationExample_SlicerScene.mrml



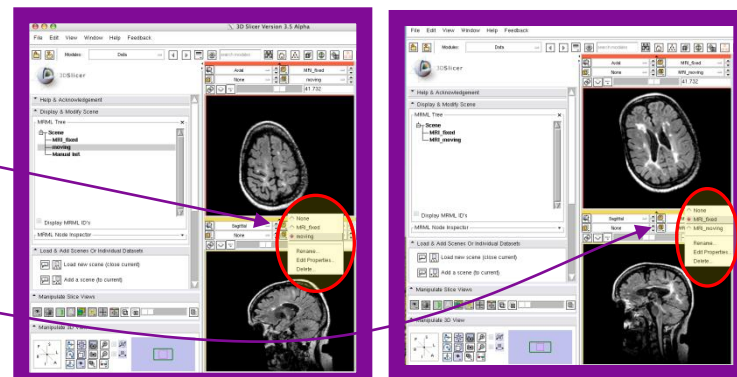
2.  Link Views: Click on the Ring Icon in any of the slice views to link all the views together. This will save you the work of making selections for each slice window separately.



3.  Choose Foreground: MRI_moving



4.  Choose Background: MRI_fixed.

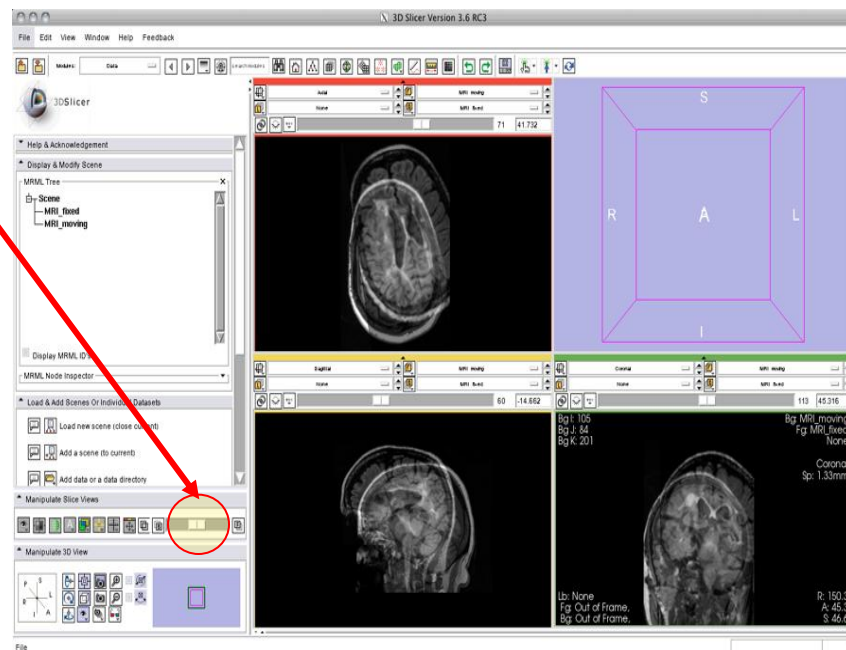




Visualize the initial misalignment


- 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.

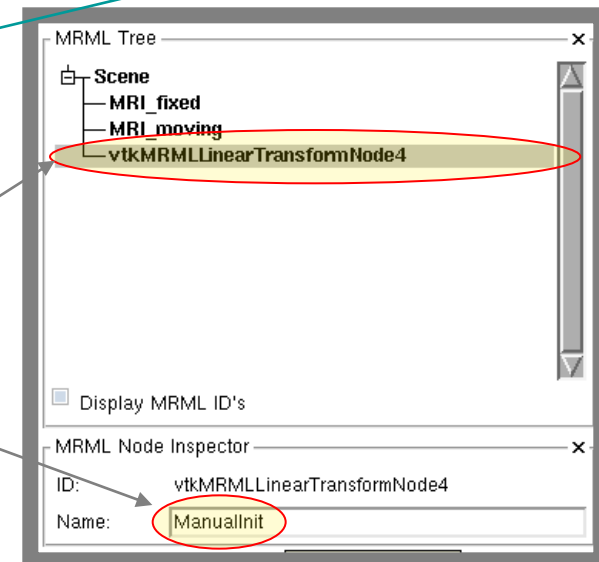
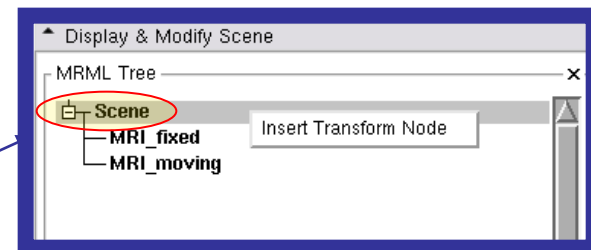
Note: For your own dataset, you may need to adjust the level as well as each image's Window & Level settings to comfortably see both images.






Create New (blank) Transform

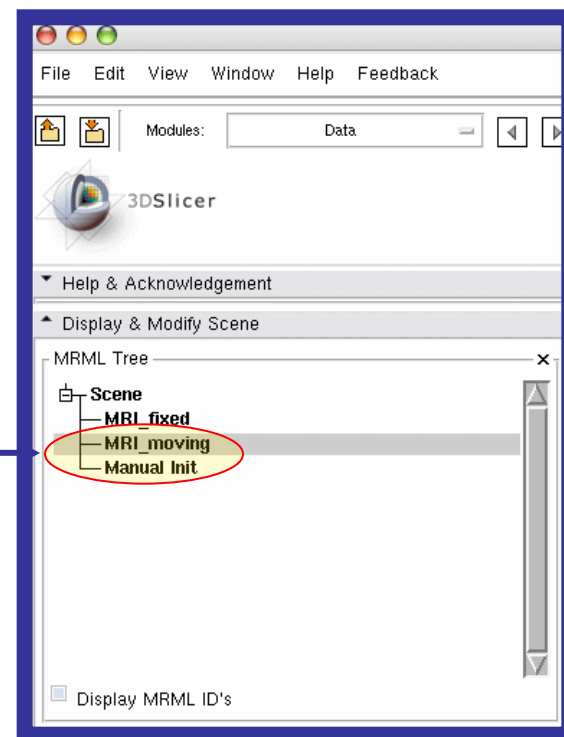
1.  You can create a new Transform in the Data module directly:
2. Right-click on the “Scene” node in the MRML tree. From the pulldown menu select: “Insert Transform Node”
3. We change the name of the new transform:
 1. Click on the little triangle to expand the “MRML Node Inspector” tab at the bottom of the panel
 2. select the new node (“vtkMRMLLinearTransformNode”)
 3. type the new name, e.g. “Manuallnit”
 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



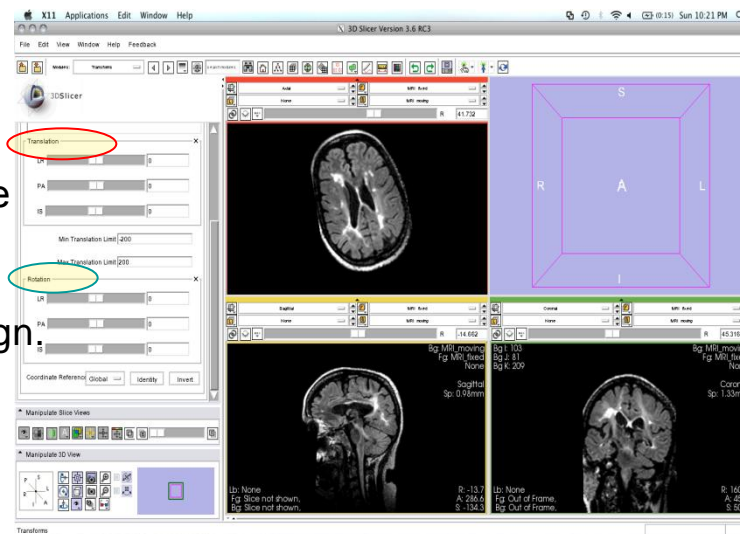
Move Image

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”.

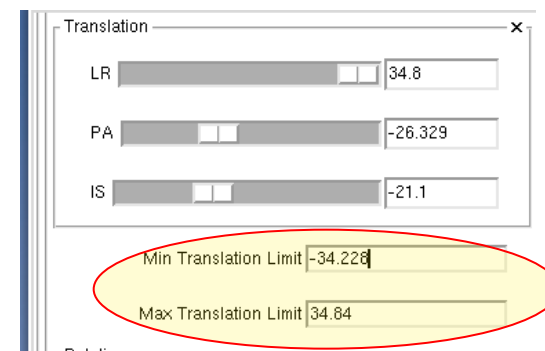
Notes: - If you want to start over, click the “Identity” button at the bottom, which will reset the transform.

- 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 then hit the “TAB” or “Return” key.




animated GIF: view in Presentation Mode



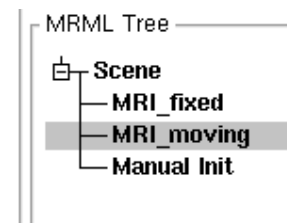
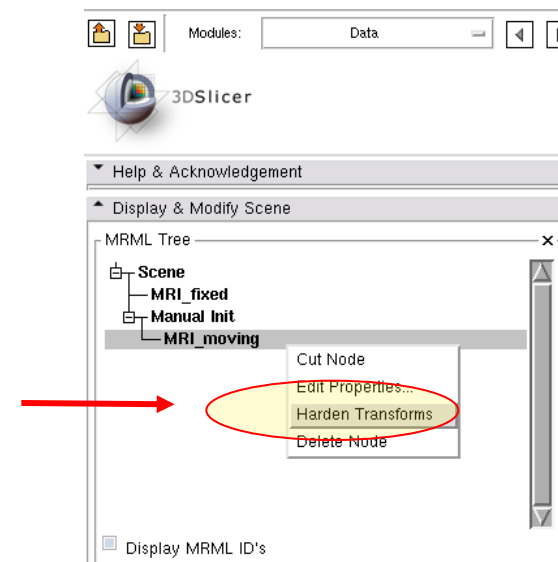


Apply & Save

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

1.  Go back to the “Data” module
2. Right-click on the “MRI_moving” image. From the pulldown menu, select “**Harden Transforms**”.

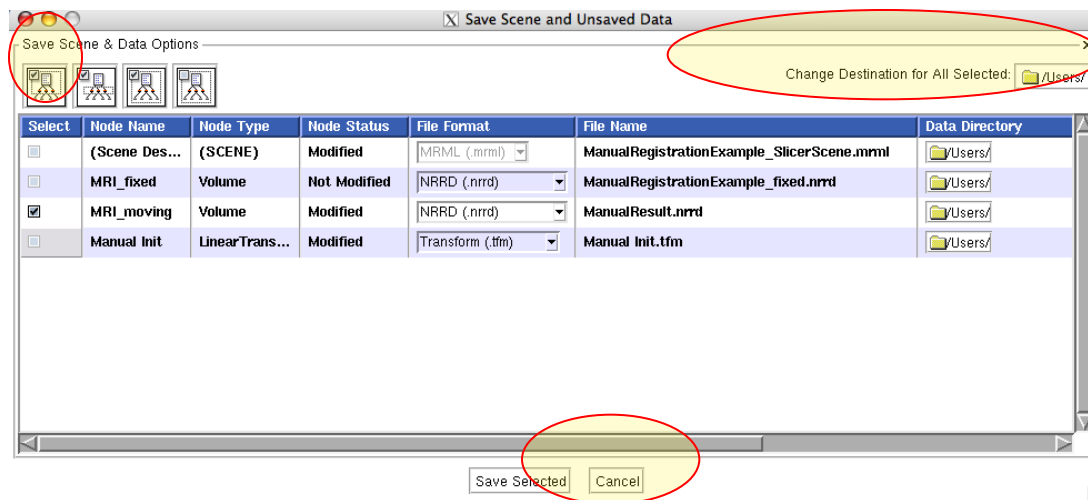
This finalizes the transform and it resamples the volume in the new orientation. You will see the “MRI_moving” node moved back out into the main hierarchy level.





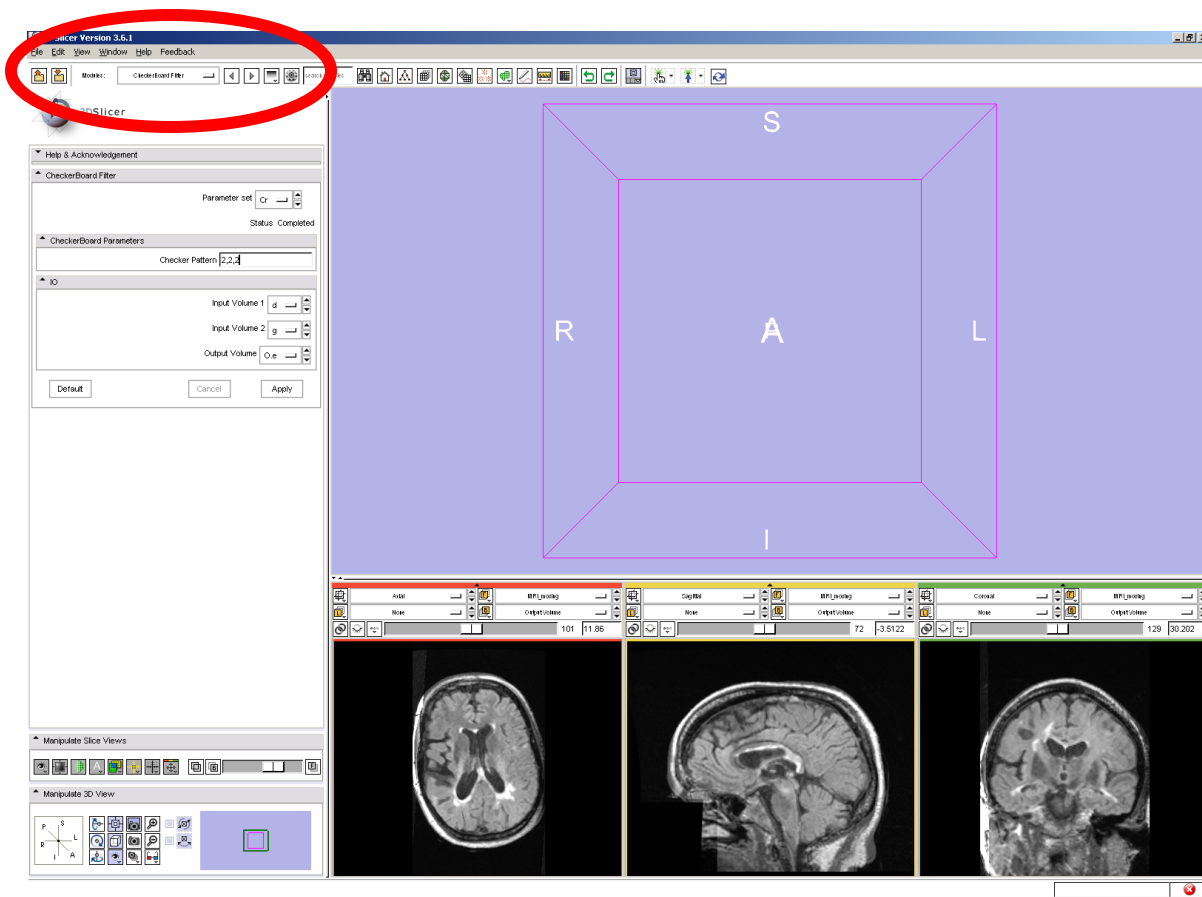
Save

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 transform will be saved as a small text file containing all the necessary parameters.
3. click “Save”.





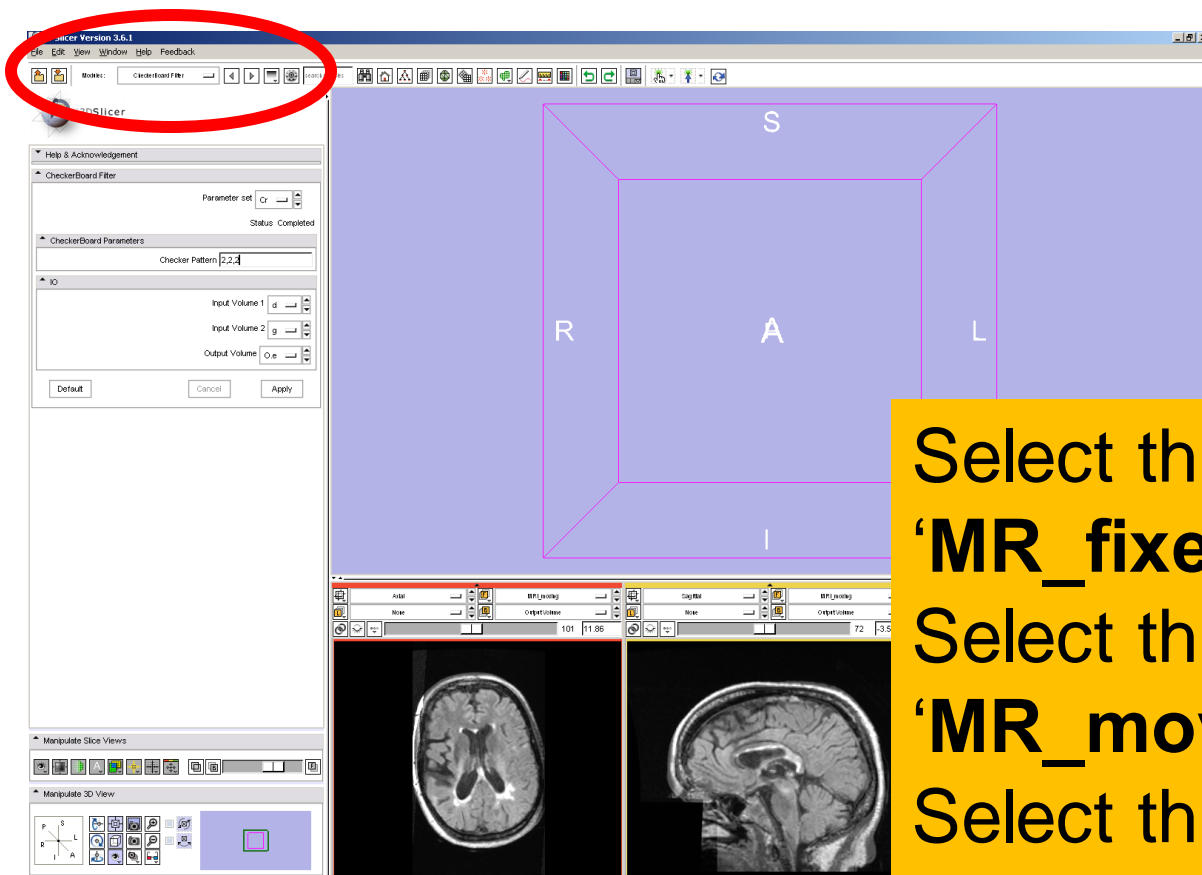
Quality Assessment



Select the
module
Checkerboard
Filter in the
main menu



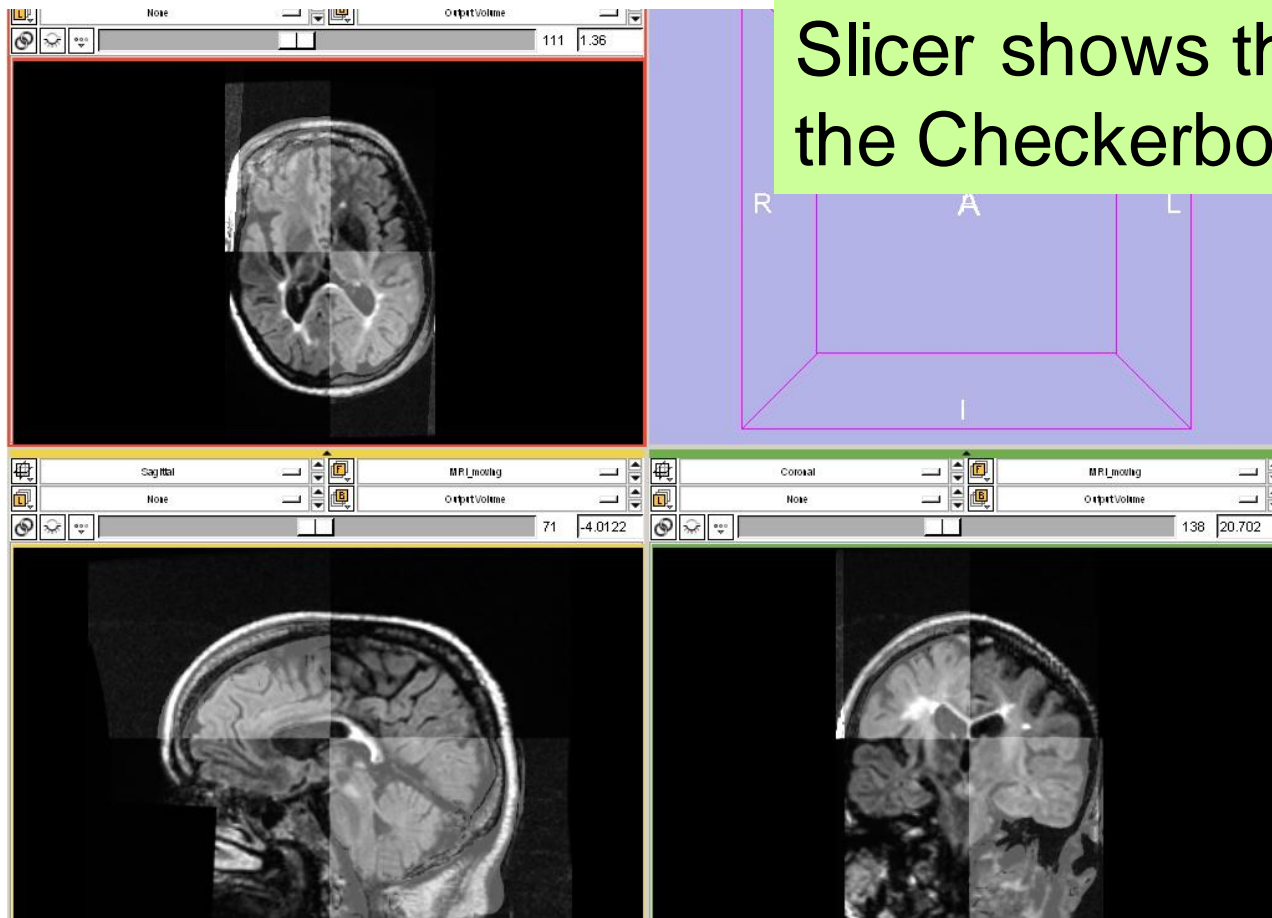
Quality Assessment



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

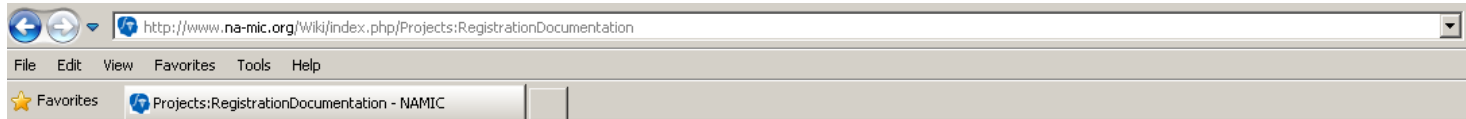


Quality Assessment





Registration Documentation



search



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Use Case Library

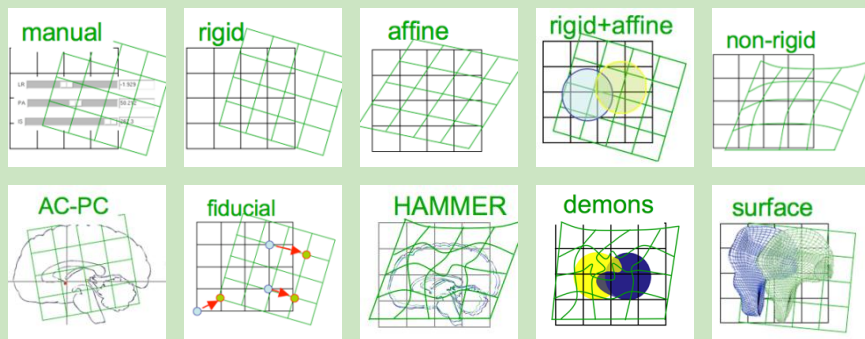
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- [Use Case Sharing Advertisement Page](#)
- [Notes & concepts about the Registration Case Library](#)

Development Efforts

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- [Parameter Exploration](#)
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Registration Tools in 3D Slicer

Registration Main Modules



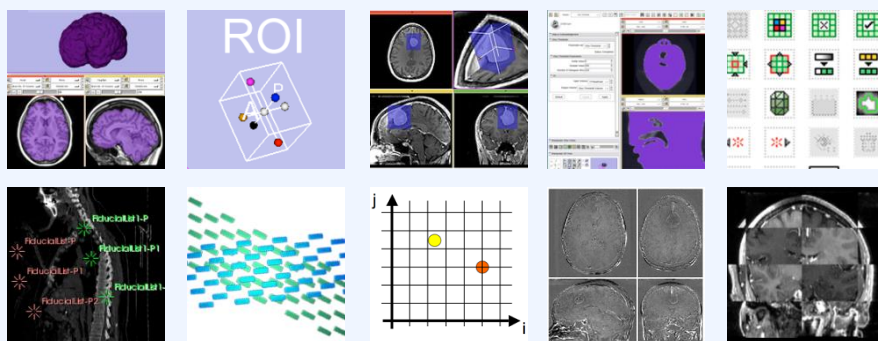
Driver:

- manual
- intensity
- surfaces
- fiducials
- segmentation

DOF:

- 6
- 7
- 9
- 12
- 27 ~ 10^3

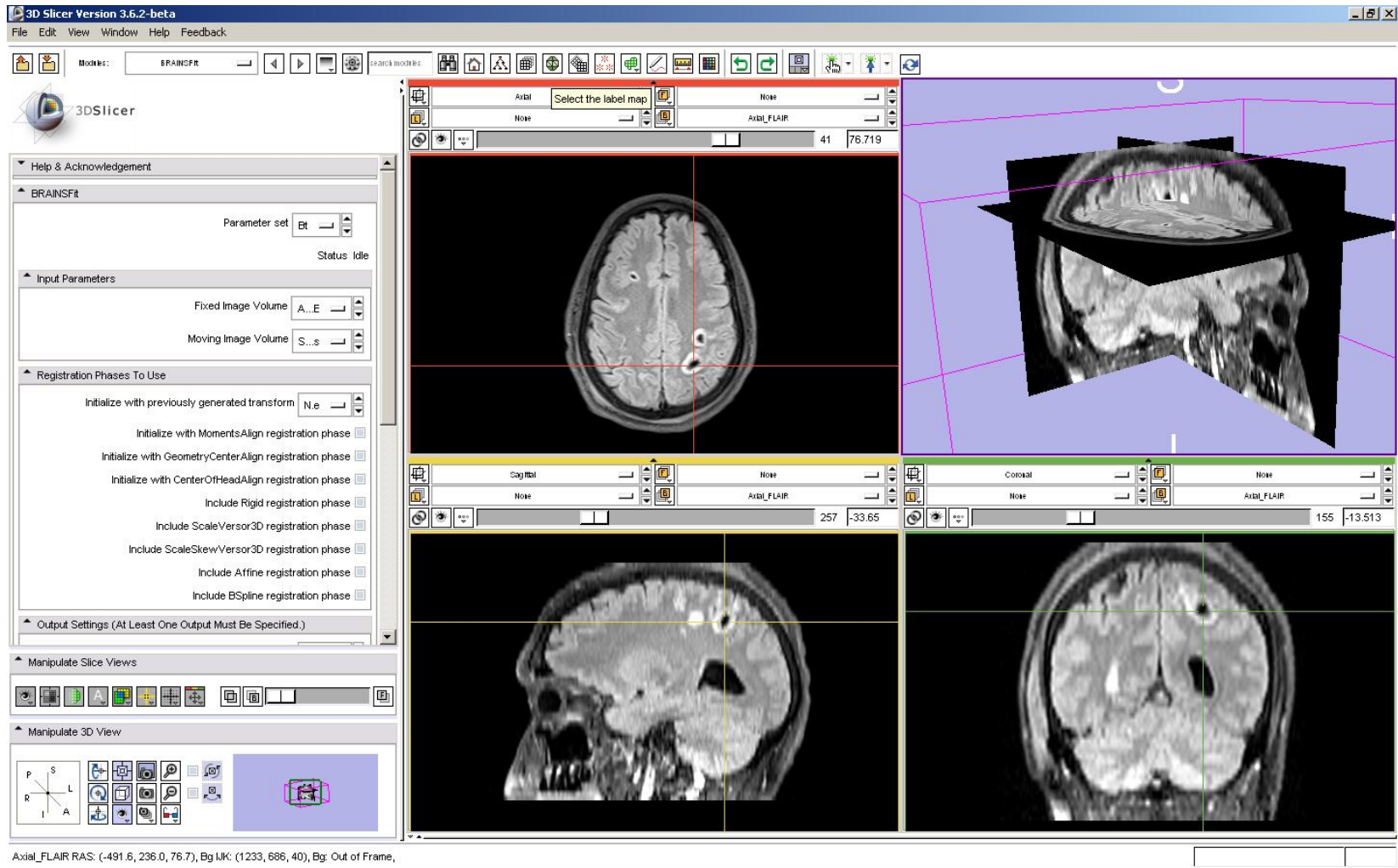
Registration Auxiliary Modules



Support for:

- fiducials
- ROI definition
- mask building & editing
- resampling
- visualization/evaluation

Automatic Registration: BRAINSFit





Acknowledgements



National Alliance for Medical Image Computing
NIH U54EB005149



Neuroimage Analysis Center
NIH P41RR013218 -12S1 (ARRA Suppl)