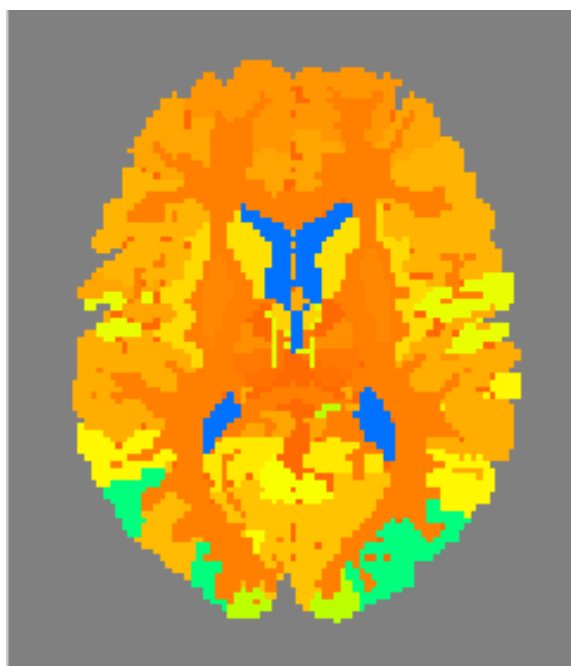# Is it left or is it right?

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Before one tries to determine orientation of an image, you have to consider some facts.

- Images from Sunnybrook & Images off our Siemens scanner, come out in Radiological convention (meaning left side of brain is on the right, otherwise known as RPI).
- SiemenstoAfni script does not change orientation of the image, keeps it radiological just like the scanner.
- Images may flip after that when we convert them, using the 3dAFNItoANALYZE
- Or when we Normalize in certain software's, like spm, which behaves differently depending on the version used.
- Then you have the problem with various softwares and how they display the image:

So please be wary of the software and how it displays images, for justification, Mricron has been used for this document, currently found on IO.

Let us look at a few examples to illustrate orientation issues. Using brain 1051 which is a left lesioned brain we will try the following:

- We will reconstruct the image, and view it
- We will first go ahead and reconstruct it into AFNI and then convert it into ANALYZE using the LPI tag (which keeps it in Radiological convention) for orient and see how it is displayed
- Then for each image above we will run it through spm2, and spm5 normalization to see if the image is being flipped.

a) Off the scanner 1051 looks as follows in Mricron:
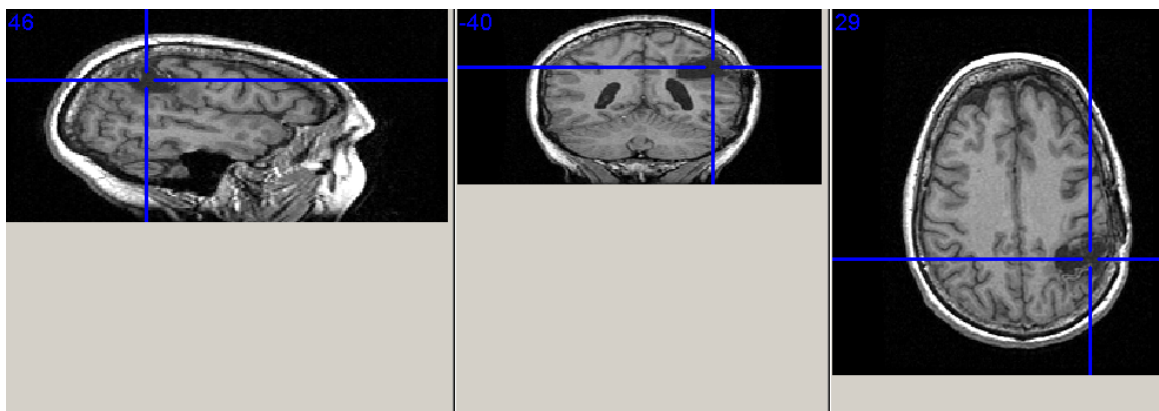
Notice: how the lesion shows up on the right, and since we know it's a left lesion we know that the image is in Radiological convention, left is right.

b) Now taking that same image lets normalize it using spm2 and see what happens:
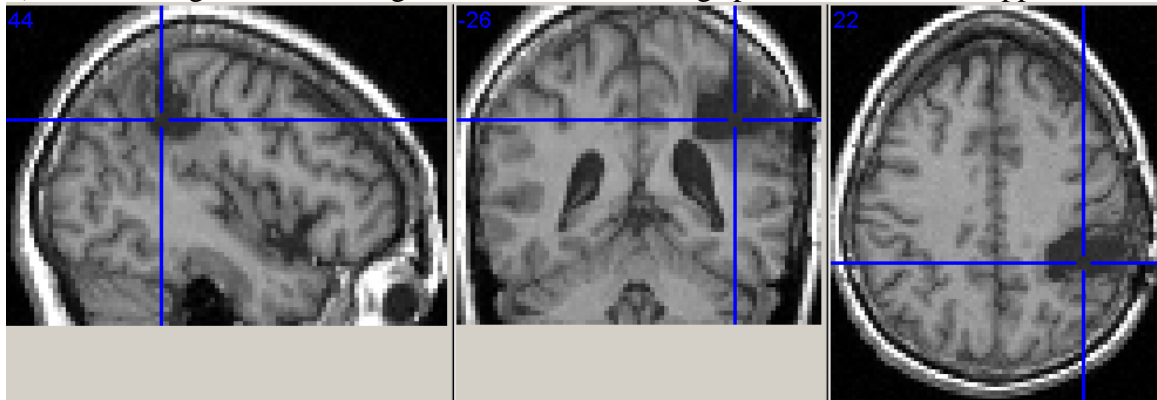
The image is still in radiological convention, looking the same as part a,

c) Now let us get the image again, from part a and now Normalize it using spm5
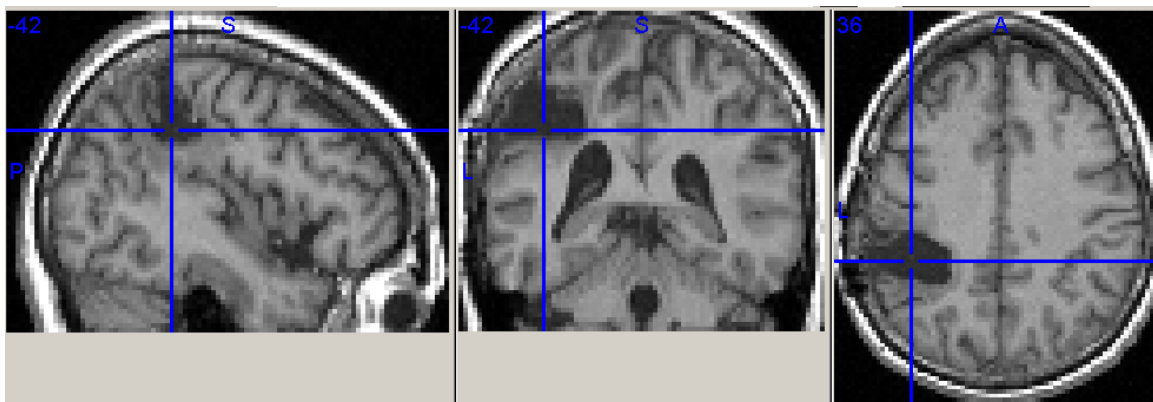
Notice now what happened, the lesion shows up on the left hand side; therefore we can conclude that spm5 flips images in its normalization step. So if you have a radiological image, and use spm5 for normalization you end up with images in neurological convention.

Now let us try some other tack tick, we will get our images from the scanner, and flip them into neurological convention using the RPI tag in 3dAFNItoANALYZE, and let us notice what happens, to the images doing the same steps a-c above.

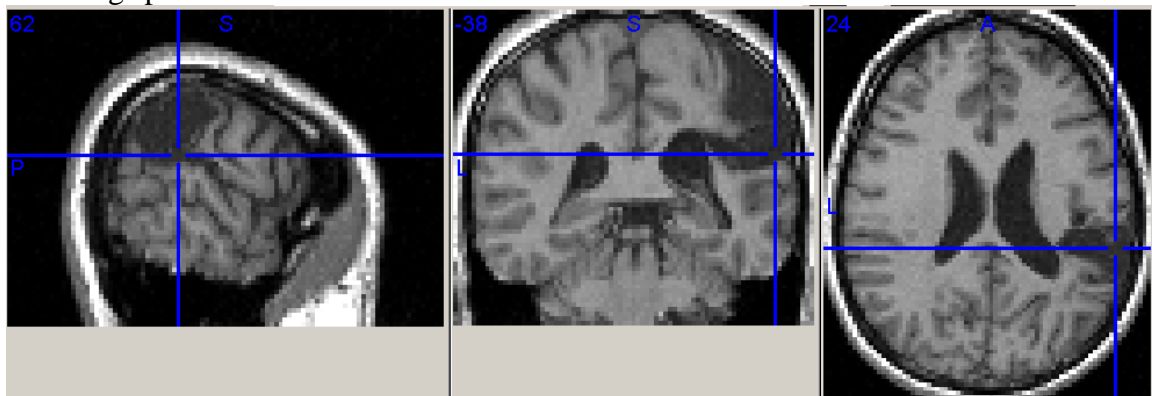a) Now 1051 is in neurological convention and will look like the following:
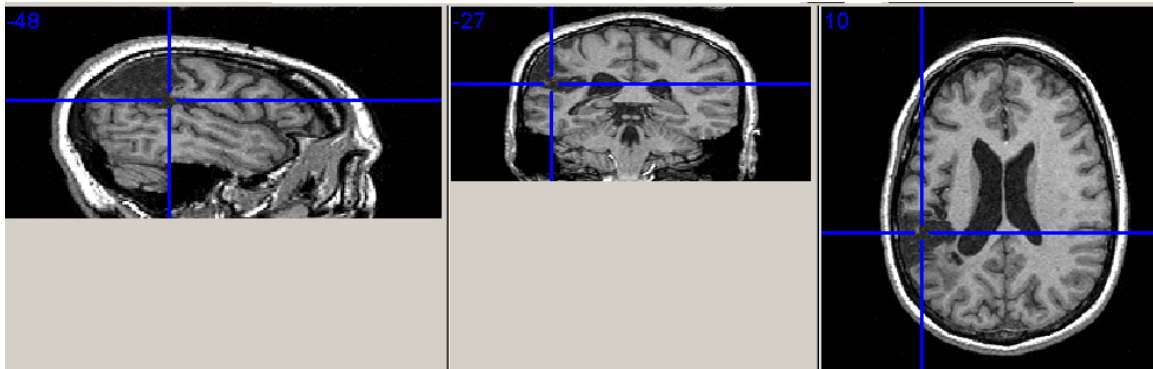
Notice that left is left now, the image is in Neurological convention.

b) Now taking that same neurological image lets normalize it using spm2 and see what happens:
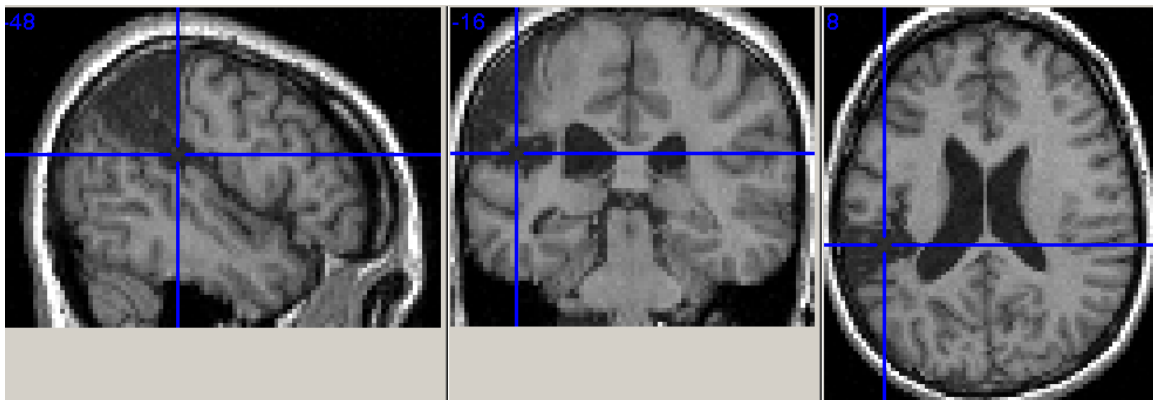
c) Now let us get the neurological image again, from part a and now Normalize it using spm5

We notice that the output after the normalization in spm5 is now in Radiological convention left is right.

So to summarize:

SPM5 flips your images, so if they go in neurological they come out radiological
And if they go in, radiological then they come out neurological

SPM2 does not flip your images,

3dAFNI to ANALYZE –orient RPI anat_RPI anat+orig your image will be in
NEUROLOGICAL convention

3dAFNI to ANALYZE –orient LPI anat_LPI anat+orig your image will be in
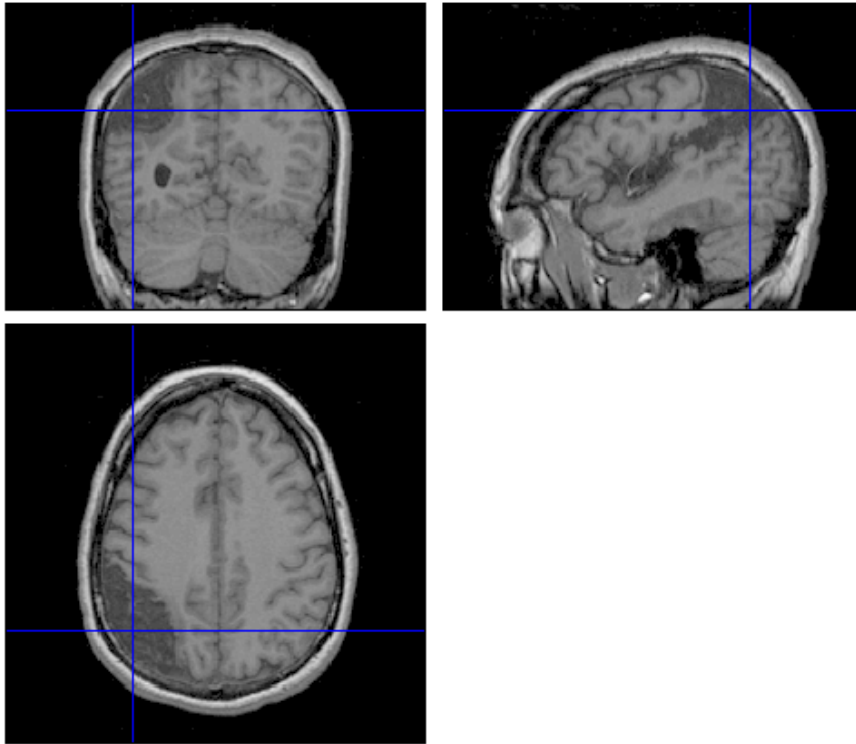RADIOLOGICAL convention

Now let me demonstrate the various viewers:

Let us start with AFNI, on telesto. Using our Radiological lesioned brain we will
see how different software's display images differently.
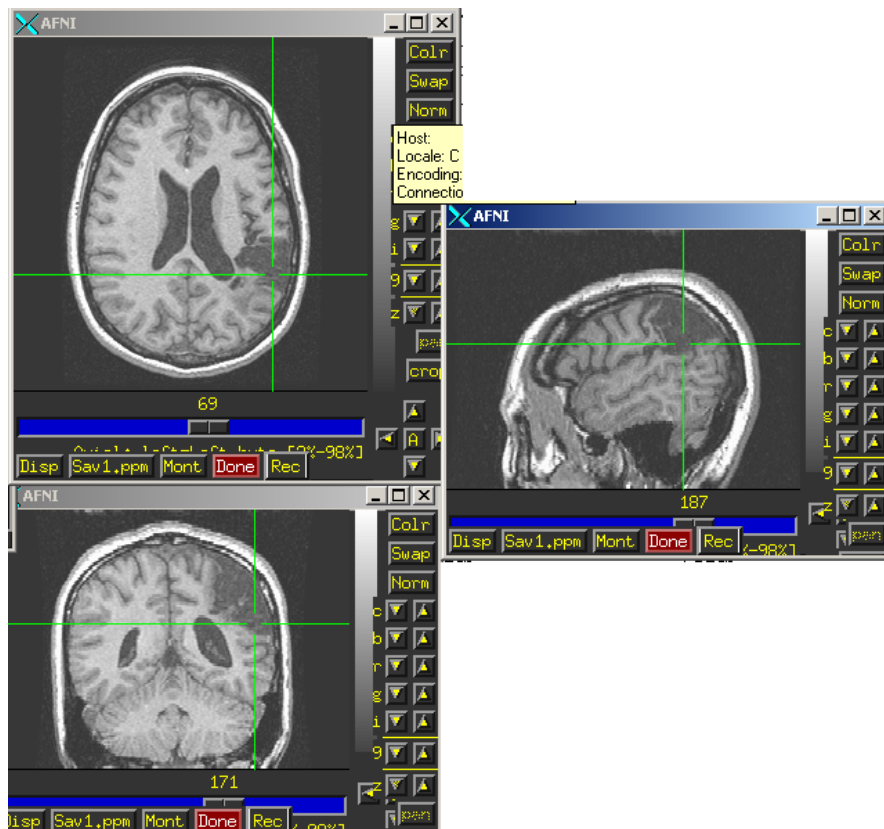
Still in Radiological convention

a) Now let us look at SPM5 viewer,

Notice that it displays the images in Neurological convention even though the image is in Radiological convention. Displaying it in Neurological convention doesn't mean that it actually is in that orientation. Hence why it can be very deceiving.

Lets add to the confusion now, and see how spm5 display's our FL1051_RPI, the one we flipped and made into NEUROLOGICAL convention.
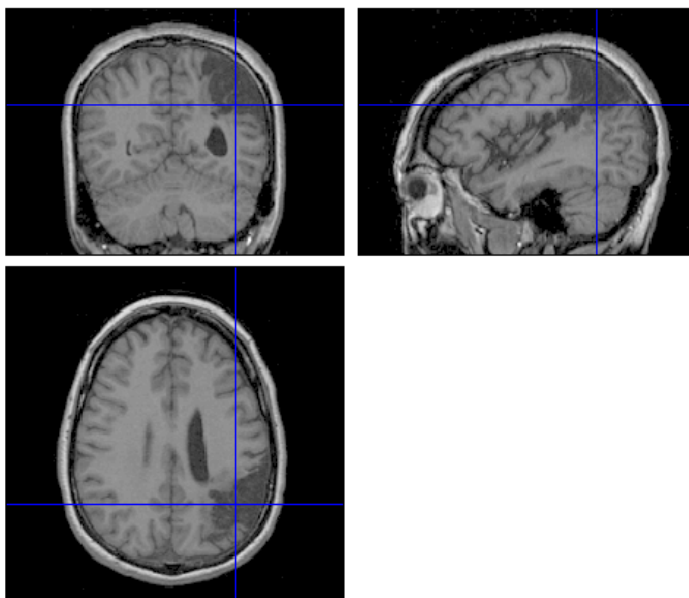
It again display's it, as if it were a Radiological image, so please don't use SPM5 to determine what orientation your image is in.

I have illustrated the dangers of what can happen, in certain scenarios, but there are many combinations of scenarios that can arise, so I do strongly recommend you take the time and verify the orientation of your images, by taking the FL1051 left lesioned brain, through exactly the same sequence of steps you did your data and from that you can determine what orientation your final product is in. It is always better to take the time at the beginning than to worry about this issue in later stages.

Many thanks to Jimmy Shen, for creating a table extending to all the software's currently being utilized at the Rotman. This table can also be accessed online http://www.rotman-baycrest.on.ca/~jimmy/UseANALYZE.htm