**Some notes on coordinate systems and other information**

**I am summarizing some information that I gathered regarding the different coordinate systems, FSL tools etc. It is important to verify this as many new software updates are released every few months, and conventions adopted could change.**

Radiological Ordering (LAS or left-handed system): Right side of the brain appears on the left side and left side of the brain appears on the right side of the image. X increases as you go towards left, Y increases as you go towards anterior, and Z increases as you go towards superior.

Neurological Ordering (RAS or right-handed system): Right side and left side of the brain appear on the right and left side of the image respectively.

World Coordinate System: Cartesian coordinate system in which a patient or scanner is positioned (Usually LPS system). Offset is defined as how far the subject is away from the iso-center. For example, offset = (90,-126,-72) means 90 units towards left ear, 126 units towards anterior and 72 units towards inferior. Anatomical system is also called Patient coordinate system.

Before Nifti files were in the Analyze 7.5 format and LAS was the convention. However, the convention is changed and the Nifti files follow an RAS system.

**Notes on FSL tools:** FSL works on data that is radiologically ordered. i.e., fslorient -getorient data gives you radiological (determinant of sform < 0). FSL follows an internal world coordinate system. The world coordinates are just scaled versions of the voxel coordinates (consistent with analyze format). For the FLIRT algorithm, data should be in LAS ordered and rotation is performed around (0,0).

Any data that is neurologically ordered is converted to radiological before the application of FSL tools. Some commands that can be used for the conversion are fslswapdim and fslorient.

This needs to be checked with the latest FSL tools. i.e., Is this conversion before the application of FSL tools is necessary?

FSL eyes: Display is always radiological ordered. This doesn’t tell us anything about the actual ordering of the data.

Nilearn: The default system adopted is RAS.