Introduction:

The acpcdetect program is a module of the Automatic Registration Toolbox (ART). The program takes a 3D T1-weighted structural MRI of the human brain as input. It automatically detects the mid-sagittal plane (MSP) using the method described in [1]. It then detects the AC and PC intersection points on the MSP using the method described in [2]. Finally, it detects 8 additional landmarks[[1]](#footnote-1) (the so-called Orion landmarks) on the MSP using the method described in [3]. This information is used to tilt-correct the input volume into a standard orientation. In this orientation: (1) the MSP is precisely aligned with the central plane of the FOV; (2) the anterior-posterior (AP) axis is on the MSP and aligned with the AC-PC line; (3) the inferior-superior (IS) axis is on the MSP and perpendicular to the AC-PC line; (4) the left-right (LR) axis is perpendicular to the MSP; and (5) the FOV center is approximately the mid-point between the AC and the PC on the MSP. The FOV center can alternatively be placed on the AC point using the -center-AC option.

Required argument:

-i (-input) <*input-image*>.nii: 3D T1-weighted structural MRI in ‘n+1’ NIFTI1 format of type short or unsigned short

Optional arguments:

-v (-verbose): enables verbose mode

-center-AC: places the FOV center at AC.

-output-orient <orientation code>: specifies the orientation of the output image

-nx <*integer*>: number of voxels in i direction (fastest varying index) of the output image

-ny <*integer*>: number of voxels in j direction (2nd fastest varying index) of the output image

-nz <*integer*>: number of voxels in k direction (slowest varying index) of the output image

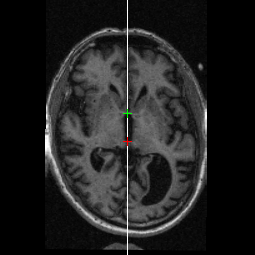
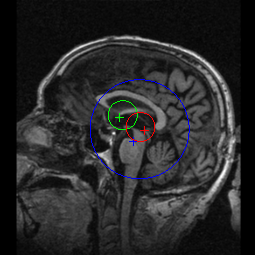
-dx <*float*>: voxel size (mm) in i direction (fastest varying index) of the output image

-dy <*float*>: voxel size (mm) in j direction (2nd fastest varying index) of the output image

-dz <*float*>: voxel size (mm) in k direction (slowest varying index) of the output image

-o (-output) <*output-image*>.nii: output image names (default: <input-image>\_<orientation code>.nii

Example 1: In this example, we apply the acpcdetect program to the v1.nii image in $ARTHOME/example1 with no other options except–v to put the program in verbose mode. With this option, the program prints the name of the inputted image, its orientation (in this case ASL: Anterior-Superior-Left) and the size of the matrix (256x256x128) and voxels size (1x1x1.25 mm3) of the input volume. It also prints the name, orientation, matrix and voxel size of the computed output volume. Since no other option specified at the command line, the output volume will have the same matrix and voxel size and orientation (ASL) as the input volume. The name of the output volume will by default be: <input image name>\_<output orientation>.nii, which in this example is v1\_ASL.nii. The output volume will be written in the same directory as the input volume.

$ acpcdetect -i $ARTHOME/example1/v1.nii -v

Input image: /Users/ardekb01/babak\_lib/example1/v1.nii

Input image orientation: ASL

Input image matrix size: 256 x 256 x 128

Input image voxel size: 1.0000 x 1.0000 x 1.2500

Output image: /Users/ardekb01/babak\_lib/example1/v1\_ASL.nii

Output image matrix size: 256 x 256 x 128

Output image voxel size: 1.0000 x 1.0000 x 1.2500

Output image orientation: ASL

Output transformation matrix: /Users/ardekb01/babak\_lib/example1/v1.mrx

Output transformation matrix (FSL format): /Users/ardekb01/babak\_lib/example1/v1\_FSL.mat

Example 2:

$ acpcdetect -i $ARTHOME/example1/v1.nii –v --output-orient LAI

Input image: /Users/ardekb01/babak\_lib/example1/v1.nii

Input image orientation: ASL

Input image matrix size: 256 x 256 x 128

Input image voxel size: 1.0000 x 1.0000 x 1.2500

Output image: /Users/ardekb01/babak\_lib/example1/v1\_LAI.nii

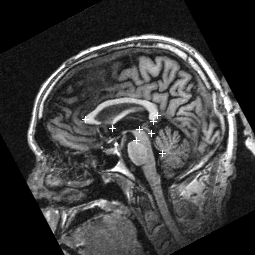
Output image matrix size: 128 x 256 x 256

Output image voxel size: 1.2500 x 1.0000 x 1.0000

Output image orientation: LAI

Output transformation matrix: /Users/ardekb01/babak\_lib/example1/v1.mrx

Output transformation matrix (FSL format): /Users/ardekb01/babak\_lib/example1/v1\_FSL.mat



1. Actually, one of the 8 Orion landmarks happens to be very close to the AC. [↑](#footnote-ref-1)