Coreg_v2

Coreg - the purpose of this program is to align digitized points (ELP) with the estimated surface of the head (AFNI .BRIK and .HEAD), transform those points into Talairach space, and output the transformed locations in an ASCII file (.tol) to be used with Opt3d.

Input Files

1) .elp file \data\fff\reg\xxxnnn.elp
2) .mtg file \data\fff\reg\ (there are several options for this, see #8 below)
3) .tai file \data\fff\reg\nnnac_mmddyy
4) +acpc.BRIK \data\fff\mri\Snnn_mmddyy+acpc.HEAD
5) scalp file (optional) \data\fff\mri\Snnn_mmddyy_scalp.zip (an output file from coreg—doesn't exist on 1st pass)

fff = folder name (study code)
xxx = filename prefix (sometimes this is the same as the folder name, but sometimes it is not)
nnn = subj number
mmddyy = date

Output Files

1. Scalp file – segmented scalp data (a.k.a., mudman)
    a. \data\fff\mri\Snnn_mmddyy_scalp.zip (matlab file)
2. TOL (Tailairach Optode Location) file – digitized .elp points after MR alignment and Talairach transformation (used by opt3d)
    a. \data\fff\reg\xxxnnn.tol
    b. It's an ASCII file: optode location label and x, y, and z coordinates
3. .brk file in acpc space – coregistered elp points in AC-PC space (to be viewed in AFNI after conversion)
    a. all digitized points: \data\fff\mri\Snnn_mmddyy_fffelp+acpc.brk
    b. **OR** montage points only: \data\mri\Snnn_mmddyy_fffelp_no_dum_pnts+acpc.brk
4. .brk file in Talairach space – coregistered elp points (montage points only) in Talairach space (to be viewed in AFNI after conversion)
    a. Montage points only: \data\mri\

Directory paths

Coreg_v2 – We usually keep this in: C:\analysis\matlab\

mri and reg folders

The default path is "C:\data\", but you will have the option to change this path. You will need to have these subfolders (mri and reg) in an experiment folder (fff).

Compatibility

This version of matlab has only been tested using Matlab Version 7.10.0.499 (R2010a) – 64-bit

Coreg_v2

In matlab, set your current folder to Coreg_v2 and type 'coreg' at the command prompt (this will initiate a series of prompts)

1. Is your data path c:\data\? (y/n)
   a. This is the default path for the experiment folder that has the mri and reg subfolders
   b. If your experiment folder is in this path, type 'y'.
   c. If not, type the new path with a trailing backslash
2. Enter experiment folder name:
   a. This is the folder with a 3 letter code that contains the subfolders mri and reg
3. Enter filename prefix:
   a. This refers to the characters that appear before the subject number in the file names in the reg folder
   b. This was added for those few studies where the first few characters of your filename serve as a block identifier or trial type (like study and test blocks for 1 experiment)
4. Enter subject #:
   a. Obvious, I think.
5. Enter MRI date:
   a. This refers to the date on the .BRIK and .HEAD files in the mri folder
6. Select mtg file type:
   1 - One mtg file per experiment (ex: ar.mtg) -all subjects are run with the same montage
   2 - One mtg file per subject (ex: ar743.mtg) -subjects have unique montages
   3 - One 'good' mtg file per experiment (ex: ar_good.mtg) -like #1, but used the "select channels" option in p_pod
   4 - One 'good' mtg file per subject (ex: ar743_good.mtg) -like #2, but used the "select channels" option in p_pod
   a. This will depend on your experiment.
   b. Note: as of 11-04-10, coreg is configured to handle montage files that follow the 5 or 6 column array format.
7. It will now list which files that it found. Check to make sure it found everything except the SCALP file. If there are files missing, you will need to find them and restart coreg.
8. Enter up to 5 thresholds, range .02 to .2, multiple values in []s, default is 0.05:
   a. These are the initial thresholds for segmenting the scalp surface. We usually start with 3 or 4 thresholds (in brackets) centered somewhere around .05.
   b. For example, you might type [.04 .05 .06 .07]
   c. The higher the number you choose, the more the surface is going to be cut off (it will go deeper into the head). The lower the number, the more extra junk you will have outside the head.
9. After some time (time will increase with the number of thresholds), images of the scalp surface will appear in a new figure. We affectionately call these "mudmen". Rotating these guys is rather tricky, but basically, you can place your mouse on one of the images and drag it slightly in the direction you want to turn. It is SLOW (at least on our machines), and rather difficult to get it to move in the direction you want, but keep trying and you will eventually get the hang of it.
   a. You want to find the threshold that provides the smoothest surface without getting extra blobs on the outside (noise) and not digging too far into the surface (resulting in what looks like holes).
   b. Nose wrap can be a problem. In those cases, try to find a threshold that provides the most separation between the posterior surface and the nose. In severe cases, you may have discard digitized points from the .elp file or figure out a way to mask the MR.
10. After viewing the mudmen, go back to the coreg matlab prompts…
11. Enter Desired Threshold (or Press Enter if all undesirable):
    a. If you are **not** satisfied with the thresholds or would like to try additional ones, just press ENTER and it will take you back to the prompt at Step 11.
    OR
    b. If you have decided on the best threshold, just type that number at this prompt
12. View Scalp? (y/n)
    a. Type 'y' and ENTER to view the mudman again, or type 'n' to go on

13. Save Scalp? (y/n)
    a. Type 'y' and ENTER to save a zipped up file of the mudman parameters to the mri folder
    b. I have no idea why you would not want to save this step…if the subject were to return for a different experiment, you can use a saved mudman to align a different montage.
14. Force all optodes to lie on the scalp?
    1 - No Force
    2 – Closes point force
    3 – Radial projection force
    a. For now we use Type '2'
15. Write out optode brik to view in AFNI (Create FIM file)? (y/n)
    a. Type "y" and ENTER to save a .brk file of the digitized points in ac-pc space (highly recommended)
16. Remove dummy ELP points from FIM file (if they exist)? (y/n)
    a. If you have digitized the whole helmet, selecting "y" here will create a .brk file with ONLY the locations used in your montage (i.e., it uses the .mtg file info to select which locations to include in the .brk)
    b. For checking the successfulness of the coreg procedure, we recommend you select "n" here so you can better see how well the points fit the surface of the head.
    c. For creating images that describe the montage (e.g., for publications), select "y"
17. Compute bananas? (y/n)
    a. Selecting "y" here will generate a .brk file that has the green bananas (estimated paths of light)

****

Checking the coregistration in AFNI

- Convert the RBTfm overlay .brk to an AFNI .BRIK and .HEAD, by running a matlab script called brk2brik.m.
    - You may need to edit this program depending on your directory paths (currently, it only prompts for subject number and date, I think…the paths are hard coded and it has to be run from the folder with the .brk file).
- In AFNI, you will want to plot the +acpc.BRIK with the new RBTfm+acpc.BRIK as an overlay. We usually plot these using the plug-in Render (new). Make sure to check the "see overlay" button and the colors will be nicer if you check the "pos" button at the bottom of the color bar.
    - Sources will be red
    - Detectors will be yellow
    - Other digitized points will be light blue (except fiducials, which are red and green, I think)