DIPFIT and model co-registration

1. Co-register electrodes with model
2. Autofit, plot dipoles, fine fit
3. 3D headplot co-registration
Finding dipole locations using DIPFIT in EEGLAB
Co-register to model

Note: For EEG, check that the channel locations are on the surface of the head model
(To do this: ‘Set head radius’ to about 85 in the channel editor).
Co-register to model, cont'd
Perform translation of electrode positions

\[-\pi/2\]
Perform translation of electrode positions

Requires a shift toward back of the head
AND
an expansion along the X-axis

shift backward
Perform translation of electrode positions

- Shift left
- Resize
Confirm electrode transformation

Note: For EEG, check that the channel locations are on the surface of the head model.
(To do this: ‘Set head radius’ to about 8.5 in the channel editor.)
Alternatively, warp to standard montage

Check to see that electrodes are correctly matched

stats toolbox required for warping
Check coregistration with model
>> EEG.dipfit
ans =

  hdmfile: [1x76 char]
  mrifile: [1x71 char]
  chanfile: [1x83 char]
  chansel: [1x33 double]
  coordformat: 'spherical'
  model: [1x33 struct]
  current: 32
  vol: [1x1 struct]

  coord_transform: [0 0 -1.570796 100 76 90.87264 1 1 1]

From head model transformations
DIPFIT and model co-registration

1. Co-register electrodes with model
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Autofit equivalent dipoles
Plot dipoles
Scroll through dipoles
Fine fit options in DIPFIT

EEGLAB v6.0b

File  Edit  Tools  Plot  Study  Datasets  Help

#1: (0)

Change sampling rate
Filter the data
Re-reference
Reject continuous data by eye

Extract epochs
Remove baseline

Run ICA
Remove components

Automatic epoch rejection
Reject data epochs
Reject data using ICA
Locate dipoles using BESA

Locate dipoles using DIPFIT 2.x
Laplacian

FMRIB Tools
Grand average datasets
Locate dipoles using LORETA
PCA plugin

Head model and settings
Coarse fit (grid scan)
Fine fit (iterative)
Autofit (coarse fit, fine fit & plot)
Plot component dipoles
Fine fit menu

Component to fit: 6
Plot map
Residual variance = 3.21%

Dipole
#1
Fit
Position
28.222 2.401 37.331
Moment
2.380 475942.653 3819304.288

#2
Symmetry constrain for dipole...

Fit dipole(s)' position & moment
Or fit only dipole(s)' moment
Plot dipole(s)
Cancel
Help
Ok
Bilateral dipoles

Component to fit: 6
Plot map
Residual variance = 1.23%

| dipole | fit | position         | moment                        | Flip (in|cut) |
|--------|-----|------------------|-------------------------------|---------|
| #1     |     | -35.066 -32.492 -4.684 | 32271.382 46141.284 5880.224 |         |
| #2     | ✔  | -35.066 32.492 -4.684  | 505.419 -38050.427 14094.824 |         |

Symmetry constrain for dipole ...
Fit dipola(s)/ position & moment
Or fit only dipola(s)' moment
Plot dipola(s)
Cancel
Help
Ok
```matlab
>> EEG.dipfit.model
ans =

1x33 struct array with fields:
    posxyz
    momxyz
    rv
    active
    select

>> EEG.dipfit.model(1)
ans =
    X         Y         Z
 [14.9791  -86.0094  47.9448]

    posxyz: [1x3 double]
    momxyz: [1x3 double]
        rv: 0.0288
    active: 1
    select: 1
```
DIPFIT and model co-registration

1. Co-register electrodes with model

2. Demonstration

3. 3D headplot co-registration
Plot scalp maps in 3D
Headplot co-registration

Go through co-registration in the same way as with dipfit co-registration
Confirm headplot co-registration
Spline file in EEG structure

2D scalp map for IC 12

3D scalp map for IC 12
Exercise

- **Novice / Intermediate**
  - Load ‘stern125.set’
  - Practice co-registering electrodes with BEM model (choose 'Erase' because this dataset has co-registration done already)
  - Autofit IC dipoles
  - Fine fit dipoles
  - Plot dipoles from the GUI; scroll through components individually
  - Co-register the head model for 3D scalp map plotting. Then plot some ICs in 3D

- **Advanced**
  - In the Finefit menu, try fitting a bilateral dipole, what happens to the residual variance?
  - Try plotting a subset of dipoles in 'summary mode'
  - Try purposely misaligning electrodes with model, how far off are the resulting dipoles from the original locations?