DIPFIT and model co-registration

Task 1
Co-register electrodes with model

Task 2
Autofit equivalent dipoles

Task 3
Fine fit options

Task 4
3D headplot() co-registration

Exercise...
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Exercise...
Finding dipole locations
Co-register to model

Head model (click to select)
- Spherical Four-Shell (BESA)
- Boundary Element Model (MNI)
- CTF MEG
- Custom model files

Head model file
- lab/plugins/dipfit2.2/standard_BEM/standard_vol.mat
- MR file
- lab/plugins/dipfit2.2/standard_BEM/standard_mri.mat
- Model template channel locations file
- lab/plugins/dipfit2.2/standard_BEM/elec/standard_1005.asc
- Co-register chan. locs. with head model
- Channels to omit from dipole fitting
- List

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

-π/2
Perform translation of electrode positions

Requires a shift toward back of the head AND an expansion along the X-axis
Perform translation of electrode positions

- Shift left
- Resize

Move right (mm): 0
Move front (mm): -12
Move up (mm): 0
Pitch (rad): 0
Roll (rad): -1.571
Yaw (rad): 0
Resize (x): 108
Resize (y): 99.05
Resize (z): 99.05
Align fiducials
Warp montage
Cancel
Ok
Confirm electrode transformation

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).
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
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Exercise...
Autofit equivalent dipoles
Plot dipoles
Scroll through dipoles
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Exercise...
Fine fit options in DIPFIT

- 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

Manual dipole fit -- pop_dipfit_nonlinear()

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

<table>
<thead>
<tr>
<th>Dipole</th>
<th>Fit</th>
<th>Position</th>
<th>Moment</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>✓</td>
<td>28.222 -2.401 37.331</td>
<td>2.380 475942.653 3819304.288</td>
</tr>
<tr>
<td>#2</td>
<td></td>
<td>0.000 0.000 0.000</td>
<td>0.000 0.000 0.000</td>
</tr>
</tbody>
</table>

Symmetry constrain for dipole ...

Fit dipole(s)' position & moment
Or fit only dipole(s)' moment
Plot dipole(s)

Cancel
Help
Ok
Bilateral dipoles

![Bilateral dipole images](image_url)

**Manual dipole fit -- pop_dipfit_nonlinear()**

- **Component to fit**: 6
- **Plot map**: [Check box]
- **Residual variance**: 1.23%

| Dipole | Fit | Position | Moment             | Flip (in|out) |
|--------|-----|----------|--------------------|----------|
| #1     | ✓   | -35.066 -32.492 -4.684 | 32271.382 46141.284 5880.224 | Flip (in|out) |
| #2     | ✓   | -35.066 32.492 -4.684  | 005.419 -38050.427 14094.824 | Flip (in|out) |

- **Symmetry constrain for dipole**: [Check box]
- **Fit dipole(s)' position & moment**
- **Or fit only dipole(s)' moment**
- **Plot dipole(s)**
- **Cancel**
- **Help**
- **Ok**
EEG.dipfit structure

```matlab
>> EEG.dipfit.model
ans =

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

>> EEG.dipfit.model(1)
ans =

    posxyz: [1x3 double]
    momxyz: [1x3 double]
    rv: 0.0288
    active: 1
    select: 1
```

```
X       Y       Z
[14.9791 -86.0094  47.9448]
```
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Exercise...
Plot scalp maps in 3D

**EEGLAB v6.0b**

- Channel properties
- Channel ERP image
- Channel ERPs
- ERP map series
- Sum/Compare ERPs
- Component activations (scroll)
- Component spectra and maps
- Component maps
- Component properties
- Component ERP image
- Component ERPs
- Sum/Compare comp. ERPs
- Data statistics
- Time-frequency transforms
- Average time-frequency
- Cluster dataset ICs

**Headplot() warning**

headplot() must generate a spline file the first time it is called or after changes in the channel location file. You must also co-register your channel locations with the head template.

**Ok**
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

• All
  – Load ‘stern.set’ from ‘data’ folder

• Novice
  - Plot dipoles from the GUI and scroll through components individually,
  - Try all viewing parameters

• Intermediate / Advanced
  - In the Finefit menu, try fitting a bilateral dipole, what happens to the residual variance?
  - Co-register the head model for 3D scalp map plotting. Then plot some ICs in 3D.
  - Can you gain any further insight about source projections using this display?