We propose a method for automatic anatomical labeling of stereotactic coordinates by bootstrapping using the already labeled coordinates in the literature (as encoded in the BrainMap™ database) and give a measure for how probable the label is. Furthermore, we are able to generate probabilistic based volumes of interest.

**Introduction**

Areas of activation in functional neuroimaging is often communicated in the form of 3-dimensional Talairach coordinates or anatomical names. It is important to build models that can translate between the two representations, e.g., for meta-analyses or in neuroinformatics applications.

Automatic translation of Talairach coordinates to anatomical labels is, e.g., implemented in the Talairach Daemon [8] that is based on a digitization of the Talairach Atlas [10] and probabilistic atlases [3]. Other tools that correlate spatial and textual information are the Computational Brain Atlas [11] and the Electronic Brain Atlas [9].

The assignment of a label to a stereotactic coordinate is not straightforward due to variations in anatomy, functional activation and noise in the data [2], e.g., for small structures there might be little overlap between different anatomical scans [7]. Our method uses fuzzy/probabilistic assignment based on "commonsense" in the scientific literature.

**Example volume**

We construct static Web HTML files with one volume for each label which contain a Cover Cute visualization (both images and 3D VML files), a list the locations with links to BrainMap™, and a list the related volumes.

**Example labeling**

A location from [3, table 1, entry 1] labeled "R, Inferior temporal gyrus" (50, -64, -12). HAST, with Brett's non-linear transformation [2] from MNI to Talairach space: MNI -> (Brett) Talairach: (60, -62.5, -7). Below is the location labeled with the Talairach Daemon and by the author of [5].

<table>
<thead>
<tr>
<th>Labeler</th>
<th>Label</th>
<th>TD</th>
<th>SubGyr</th>
<th>White Matter</th>
<th>Temporal Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author</td>
<td>Inferior temp. gyrus</td>
<td>TD</td>
<td>OpcitolLobe 7.0</td>
<td>White Matter</td>
<td>TemporalLobe 7.25</td>
</tr>
</tbody>
</table>

Some of the labels show a marked right or left dominance (apart from obvious labels such as "left" and "right"), e.g., "motor" locations are predominantly found in the left hemisphere, probably because the right hand is often applied in the functions being measured experiment.

We can use an asymmetry measure by counting the number of locations in the left and right hemisphere and use a test in the binomial distribution. This measure is available as HTML pages and an index page is generated with a sorted list of asymmetry measures.

Volumes that are produced in the BrainMap database and with voxel size and field of view taken from the data (SPM99). All locations are transformed with Brett's non-linear transformation [2] and the locations are devoted by mirroring in the z-coordinate to account for the asymmetry. These volumes can potentially be used as marks in region of interest analysis.

**Conclusion and further issues**

We obtain labeled coordinates from the BrainMap™ database [4, http://www-brainmap.org] and the associated anatomical label ('Lobar Anatomy') for each location.

Density volumes as used for labeling as well as the Talairach Daemon [8] that is based on a digitization of the Talairach Atlas [10] and probabilistic atlases [3]. Other tools that correlate spatial and textual information are the Computational Brain Atlas [11] and the Electronic Brain Atlas [9].

The assignment of a label to a stereotactic coordinate is not straightforward due to variations in anatomy, functional activation and noise in the data [2], e.g., for small structures there might be little overlap between different anatomical scans [7]. Our method uses fuzzy/probabilistic assignment based on "commonsense" in the scientific literature.

**References**