

BrainBrowser

Web-Based 3D Visualization for the MACACC Dataset and Other Surface Data

<http://brainbrowser.cbrain.mcgill.ca/>

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INTRODUCTION

MACACC (mapping anatomical correlation across cerebral cortex) was previously proposed to characterize vertex-wise correlations of any cortical morphological descriptor (cortical thickness, area and volume) across subjects¹. The correlations represent structural associations between a seed vertex and all other vertices. We have now created a database of correlation maps for all surface vertices. To allow web access to this precalculated MACACC database, we have utilized new web technologies (WebGL3 and HTML5⁴) to create a highly interactive real-time 3D interface for exploration of this database. Moreover, BrainBrowser (<http://brainbrowser.cbrain.mcgill.ca>) allows users to explore any data, functional or structural, expressed in MNI space.

METHODS

The ICBM152 MRI dataset was used for the calculation of MACACC database. So far, we have included three vertex-wise morphological descriptors: cortical thickness, area and volume. For each descriptor, we calculated its vertex-wise Pearson correlation (in total 81924 vertices and therefore 81924 × 81924 correlations) after removing age, gender and global variables across the 152 subjects, using SurfStat2. We repeated the procedure for a range of smoothing kernels (FWHM = 0-40mm at 5mm intervals).

BrainBrowser uses cutting-edge technologies such as WebGL and HTML5 which allow for the rendering and manipulation of 3D models within a web browser. These technologies are built into the latest versions of several popular browsers such as Chrome 9 and Firefox 4. Any user with access to the Internet will be able to visualize their data without any requirements for complex software installation or configuration locally.

RESULTS

For each descriptor, the statistical maps of MACACC include t-statistic, p-value with and without random field theory correction. The data is formatted as text files that were stored on a file server at the MNI. BrainBrowser is now available online for anyone who requests remote access to the MACACC data, which is fast and highly interactive. Specifically, users can select any seeding vertex of a MACACC map on the cortical surface and further specify statistical thresholds (fig 1). Users can also use BrainBrowser to view surface data from their local machine (fig 2).