3D Visualization and Tracking of Brain fMRI Scans

Nada Elmasry

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1 Problem Statement

1.1 Problem

The project aims to implement a user-friendly platform for visualizing 3D fMRI scans. The program's primary goal is to enable users to visualize brain fMRI scans and track the activity of a selected brain region throughout an fMRI scan, facilitating a better understanding of how specific brain regions' activities change over time and in relation to other brain areas.

1.2 Inputs and Outputs

The application will take NIFTI or DICOM format files of a patient scan as input. Subsequently, it will generate a 3D reconstruction of the input along with associated 2D slices in the sagittal, axial, and coronal planes. In addition to viewing the 3D Volume, users can select a 2D slice and choose the axis for viewing. For tracking a specific region's activity, users can select the region through an application option, allowing the program to mark the region and track its activity over time.

1.3 Stakeholders

Stakeholders include but are not limited to researchers, professors, doctors, radiologists, medical professionals, and students studying the brain and associated diseases and conditions.

1.4 Environment

The project will be developed as a cloud-deployed web application, providing users with a self-contained, cross-platform solution.

2 Goals

1. 3D reconstruction of fMRI scans.
2. Implement 2D slice views (sagittal, axial, coronal) for fMRI scans.
3. Segment and track the activity of a selected brain region.
4. Develop a user-friendly web application.

3 Stretch Goals

Implementation of multi-thread processing or GPU processing to enhance computational speed and reduce loading times when initially loading a scan, contributing to an optimized user experience.