

# Constellations of Movement: An Interactive Application to Visualise Research in Motor Imagery Decoding

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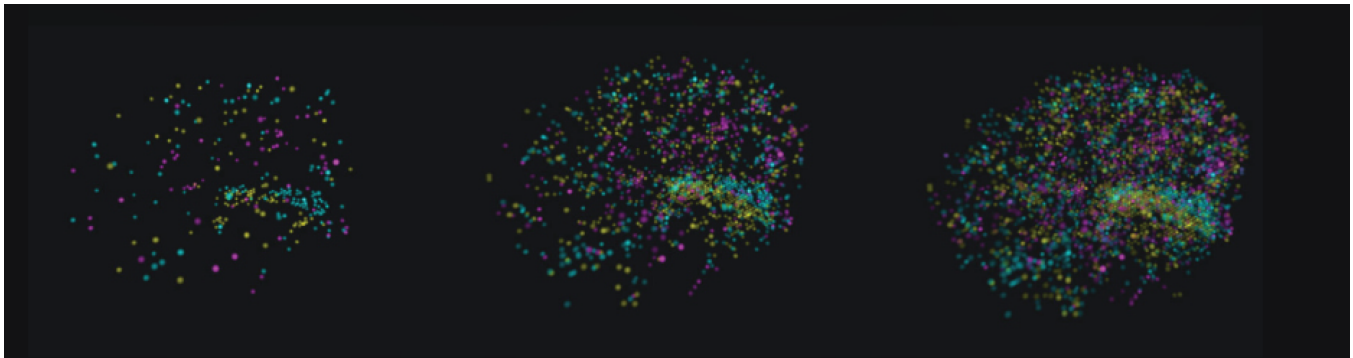


Figure 1: Mapping of Comparison Data within Unity3D.

## ABSTRACT

With advancement in research in a given field, there should be parallel development in visualisation methods to understand the data accrued. 3D visualisation and interactive visual applications can facilitate synthesis and understanding of high dimensional data. This concept has been applied within varying fields of research, though it has yet to be explored significantly in the field of functional neural mapping. This project documents the development of an interactive application for mobile and tablet devices visualising multivariate functional mapping of fMRI data within a 3D structural model of the brain. The application is developed as a proof of concept for the efficacy of interactive 3D visualisation for representing research in functional mapping, as well as the potential for Unity 3D game engine's use as a visualisation tool for the complex data involved in the research of functional neural activity.

## CCS CONCEPTS

•Computer Methodologies →Interactive Visualization;

## KEYWORDS

Interactive visualisation, functional mapping visualisation, representing functional activity, data visualization for mobile technology

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## 1 INTRODUCTION

Human cognition remains a final frontier in the field of scientific research. Because much of the brain's function cannot be determined using observational dissection, research in this area is reliant on a combination of advanced imaging technology, complex algorithms, filtering processes and statistical analysis [Goldstone and Börner 2015]. An important tool for providing insight into functional activity is the visualisation of neurological activity within the context of its anatomical structure in a process called functional mapping [Belliveau and Rosen 1991]. With the emergence of multivariate functional mapping, researchers are able to distinguish definitive patterns of activity following specific cognitive tasks. Research conducted at the Institute of Neuroscience and Psychology at the University of Glasgow is attempting to unravel the meaning behind varied patterns of activity within the Motor Cortex using Multivoxel Pattern Analysis (MVPA), a method of statistical analysis that allows the identification of specific patterns of activation resulting from a given cognitive task [Norman and Haxby 2006].

Effective representation of functional activity is a complex problem [Goldstone and Börner 2015]. However, ever-evolving tools in imaging technology have allowed further exploration into effective

