NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Computer Science and Engineering
College of Engineering

Artificial Intelligence Based Analysis and Game Control using Brain Signals

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Objectives

The project involves developing the entire pipeline of the signal extraction, processing, classification, game development and interfacing. A low cost, low electrode count EEG capturing device, known as the InterAxon Muse 2, is used as the choice of hardware for this project. This project also aims to evaluate the feasibility of using the said device as the EEG capturing choice. This project has two main points to evaluate; the first is to compare and contrast the separability of attentive and relax states, and the second is to evaluate whether the model is transferable onto a game which will be created using Unity3D.

Experimentation

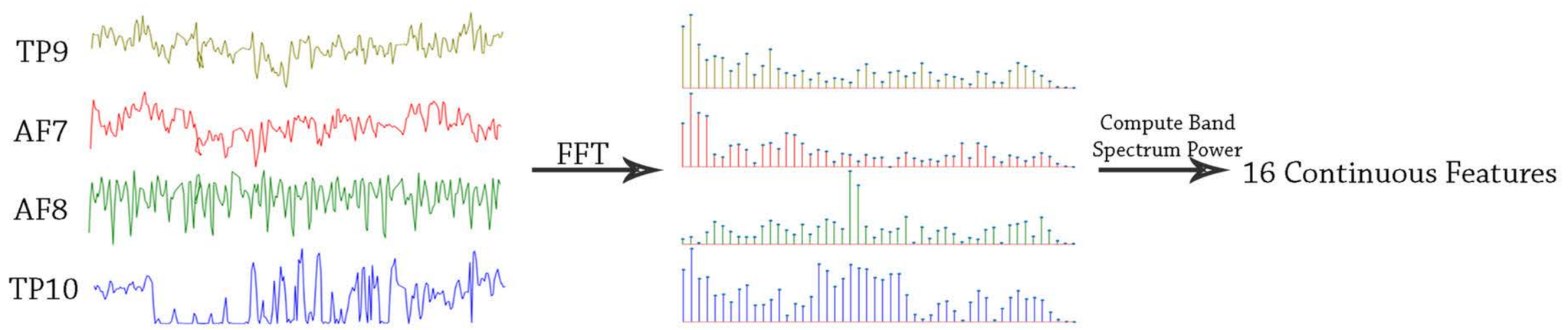
Subjects are presented with two different sets of stimuli (i.e. Flankers task and majority task) with varying experiment length. Whilst being presented with stimuli, EEG activity is recorded.

Majority Task

Flanker Task

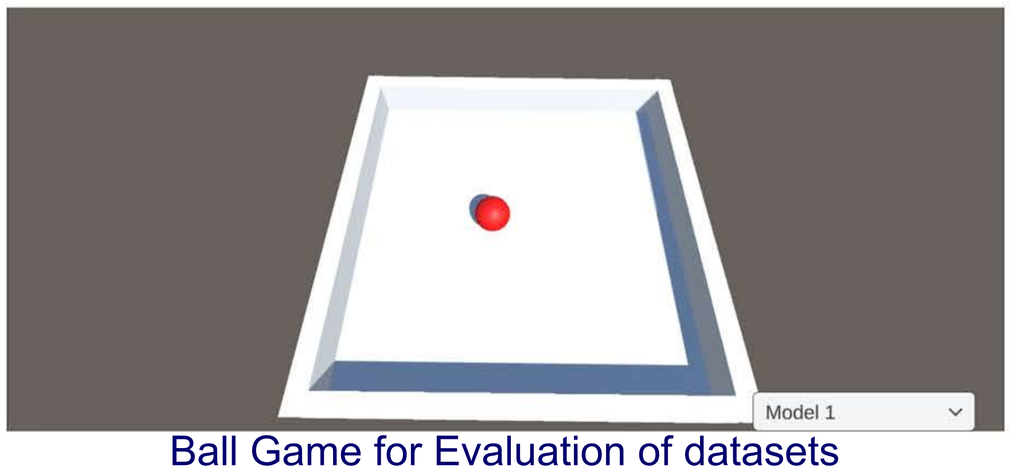
Data Extraction

The Muse 2 headband contains 4 channels, namely TP9, AF7, AF8 and TP10. Fast Fourier Transform(FFT) is applied to each channel and the band spectrum power is computed to obtain 4 continuous value from each channel, which effectively produces 16 continuous features.



Evaluation

The data collected is then used to train an Support Vector Machine(SVM) and Neural Network model. Results have shown that the Majority task dataset has a higher accuracy across 10 test subjects. Besides that, the Neural Network model mostly yields better accuracy than SVMs. These models trained are also used to be evaluated on a simple ball game created using Unity3D.



Ball Game for Evaluation of datasets