

MuseMusic: Attention Training with Brain Computer Interface (BCI) Game

Background:

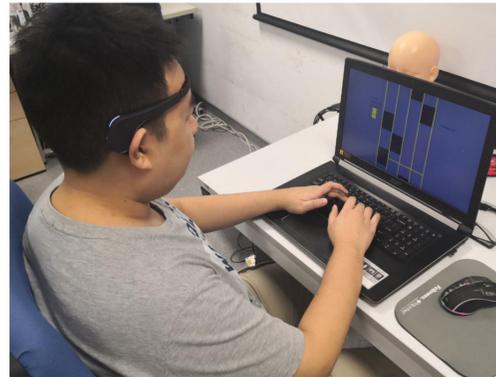
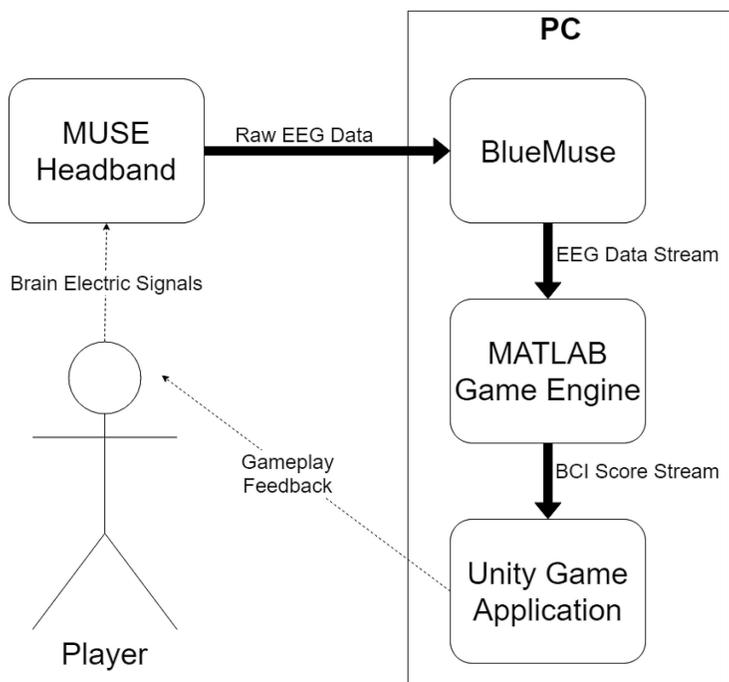
Attention is a key cognitive ability in humans. Through research, BCI has proven to be an effective treatment for improving attention in children with ADHD. Hence, there is a need for the development of more BCI tools that are effective for attention training.

Technologies Used:

Unity3D
Muse headband
MATLAB



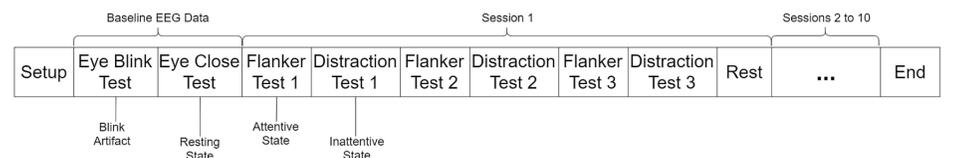
System Architecture:



Objective:

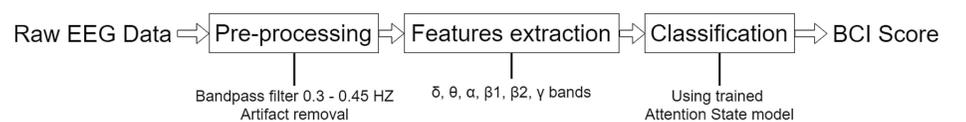
To develop a BCI game that can be used for attention training and an Attention State model that can be used for attention classification.

Attention State Model Calibration:



With experiment data collected from 50 subjects, the Attention State model is trained to classify EEG data as either 'Attentive' or 'Inattentive' and assign a probability of belonging to that class. The output is represented as a normalized BCI score. A higher BCI score means that the subject has a higher attention level.

Game Engine Processing Pipeline:



During gameplay, the game engine processes the real-time EEG data into the BCI score that is streamed to the MuseMusic game.

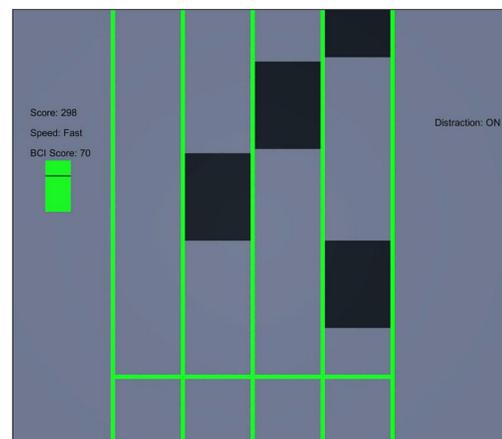
Unity Game Application:



MuseMusic is a music rhythm game. The player must press the correct key on the keyboard corresponding to the sequence of black tiles shown on screen.

The game speed is dynamically adjusted based on the player's real-time BCI Score. A higher BCI Score will result in a faster game speed.

When BCI Score is low, the game speed is very slow. The player must increase his attention level to increase the game speed.



At higher game speeds, the player will earn more points and be able to obtain a better high score.

The highest game speed will trigger distracting sounds to be played at periodic intervals, which affects the player's ability to remain attentive.

Through playing multiple sessions, the player can train his ability to remain attentive despite the presence of distracting noises.