BCI-TVR: Brain computer interface training with virtual reality

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Introduction

- Brain computer interfaces and their users are often trained in very calm environments
- This environment does not simulate the real world environments that the BCI users will operate in
- When BCI trained on data produced in a calm environment is used in real world settings, the performance of the machine learning classifier degrades

Our Aims

- Use virtual reality to simulate a real world environment
- We hypothesise that this will improve the generalisability of the classifier i.e. better performance across different environments
- Deploy the system on a BCI controlled wheelchair

EEG VR headset

Figure 1: EEG VR headset combination

Control through Motor Imagery

- We can detect changes in the EEG power spectrum when we imagine movement of the hands and feet

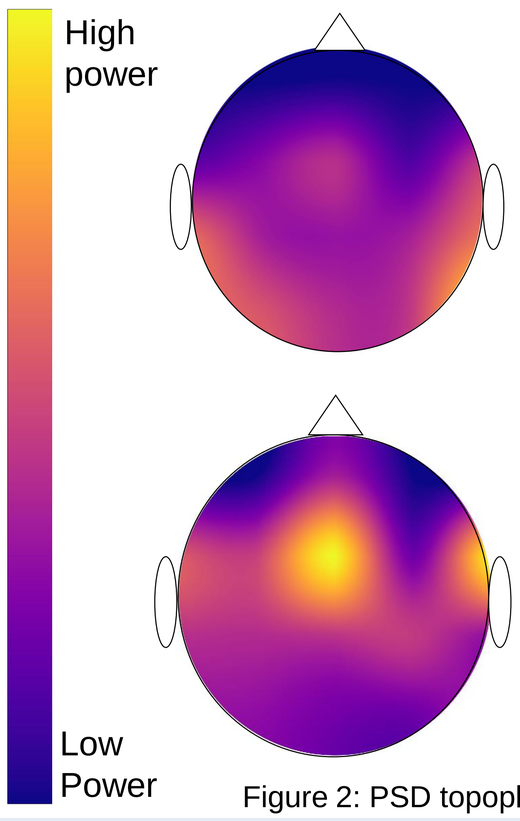

Figure 2: PSD topoplot of MI instructions

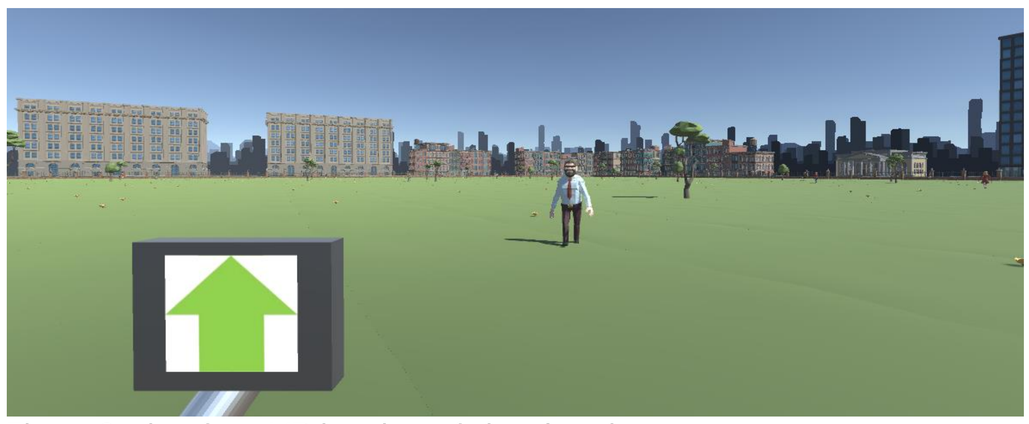

Figure 3: view from VR headset of virtual environment

Figure 4: User using a prototype simulation

EEG Electrodes

- 16 electrodes placed in 10-20 positions:
- 512Hz sampling rate

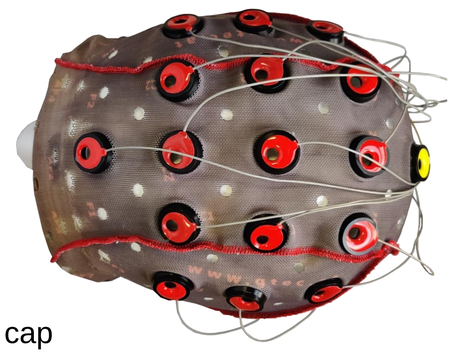

Figure 5: Birds eye view of EEG cap

Shared control

- Our Wheelchair makes use of a system known as shared control, where the assistive device that the BCI controls also has an influence on the final action taken
- The wheelchair is equipped with an array of ultrasonic sensors

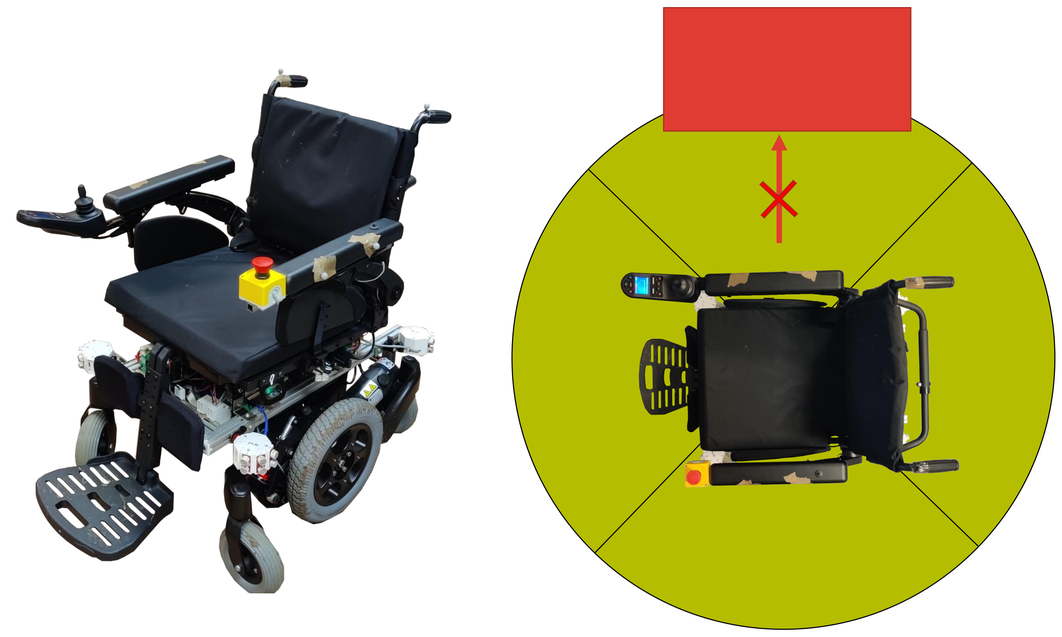

Figure 6: shared control wheelchair

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