Evaluating the Feasibility of Augmented Reality Brain-Machine Interfaces

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Can We?

EEG (electroencephalogram) devices can non-invasively measure small voltages from the brain. These measurements can be used to detect focus and attention.

However, EEG measurements are susceptible to noise from motion artifacts and external computing near the sensors. Using AR (Augmented Reality) technology alongside EEG has many applications, but we must ensure that the electrical noise generated by an AR headset will not obscure the EEG measurements in frequencies of interest.

Investigating Frequency Domain Noise Caused by AR Headset

When people close their eyes for a sustained period of time, we expect to observe an increase in power at ~10 Hz.

We compared the power spectral density of the EEG signal from the brain while a participant sat with their eyes closed when:
- the headset was powered on and presenting unobserved stimuli and worn by the participant [Headset Powered On],
- the headset was powered off but worn by the participant [Headset Powered Off] , and
- the headset was powered off and NOT worn by the participant [Headset Removed].

We are able to easily distinguish between eyes open and eyes closed at ~10 Hz with the headset powered on.

Detecting Event-Related Potentials in the Oddball Task

The presentation of the stimulus evokes a response in the brain, but does not evoke a response when only measuring the AR headset.

Minor differences in brain response between the standard and target stimuli.

Should We?

If it is possible to build robust EEG and AR applications, there are important questions to consider regarding the nature of the data collected and the potential use cases of this data.

Please share your thoughts below on how likely (in the next ten years, assuming that it is technically feasible) these applications are and how comfortable you are with them.

- **Drivers of non-autonomous trucks are required to wear wakefulness-monitoring devices.**
- **Students' attention levels in the classroom are monitored, and teachers have access to data for each student.**
- **Consumers using a streaming platform are required to pay attention when viewing advertising content and the platform validates that they do so.**

What are the potential applications that would make this technology worth pursuing?