BCI & AR

Combining Brain Computer Interface and Augmented Reality to Enhance Concentration and Collaboration Skills

Description

Brain computer interface (BCI) is a non-invasive technology which is currently able to process motor control brain commands into engineerable frequencies. For example, the "thought" of making a fist equates to one electrical signal, while the "thought" of opening your fist equates to another. A series of basic muscle motor control commands, generated by concentration, can be captured and assigned specific frequencies.

Augmented reality (AR) is a technology that superimposes a computer generated image on a user's view of the real world, thus providing a composite view. Magic Leap, Inc. provides goggles that allow one to see the world as they normally would, like wearing sunglasses - in addition to seeing "augmented" (computer generated) images. These images or objects can be controlled by infrared signals from one's hands, and from a BCI headset.

Magic Leap AR hardware
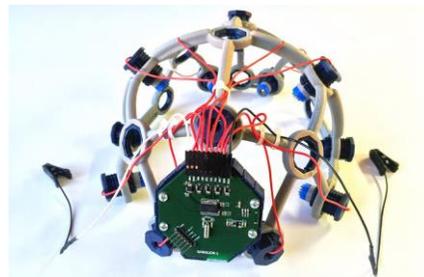
Open BCI headset

Combining these two technologies would provide a truly immersive and unique learning experience. Multiple users can be networked into a single shared experience, further enhancing the experience. Applications can be developed to enhance communication skills and promote collaboration. Sustained focus via BCI driven applications can increase concentration abilities; networked applications can open a new dimension of interaction to users. While this technology may appeal to the general public, it may be of particular interest to the autistic, or anyone experiencing behavioral or attention deficit issues.

Intended Use & Purpose

Existing BCI and AR technologies can be combined to provide one device to enhance concentration and collaboration skills. Software applications can be developed to exploit existing hardware capabilities. Examples of possible applications Dunedain is interested in exploring include the following.

Team building: Construction
Imagine a team of people working together to build a "virtual bridge", or "virtual stone wall". By sustained focus, one end of a beam is held up by one person, as if they were actually lifting it. Another person

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"grabs" the other end, lifting it off the ground. While they both concentrate on holding the beam, a third person slides supports under it. Dependency on others, playing one's own role, and sustained focus enforces a collaborative experience.

Team building: Resonance and Music
Imagine a group of players focusing on specific tones, or musical notes. One single individual's concentration would equate to a specific sound tone (frequency). A second person's focus would introduce another tone, and so on. Eventually consonant chords can be sustained - played. Further, a concert could be performed, all originating from the networked sum of each individual's focus.

Games - Soccer
A sports game can be played by sheer imagination. An augmented reality soccer ball can be "kicked" around by BCI commands, giving people the ability to play a physical sport in their minds.

Status
Dunedain is currently in discussions with Giant Astronaut (giantastronaut.com) to develop this BCI/AR learning device. We are looking at combining the hardware technologies from the following companies:

- Open BCI (openbci.com) - off the shelf BCI tech with API's
- Muse (choosemuse.com) - off the shelf BCI tech
- Magic Leap (magicleap.com) - augmented reality hardware

Current non-invasive BCI technology is able to process brain impulses related to muscle control only - not detect emotion or "pure thought". Dunedain is very interested in exploring these technologies for the longer term likelihood of using BCI as a more evolved form of communication. When the technology advances to emotion detection, applications can be written to address enhancing communication.

Budget, Resources, Timeline
There is an endless number of software applications that would apply to the merging of the two technologies of BCI and AR. Prototype applications are necessary to prove the concepts of merging the hardware and software, and user acceptance. Below are a few examples.

Project	Scope	Resources	Estimate	Duration
Team Building: Construction	Virtual construction networked as a shared experience. Many construction examples apply.	Dunedain Giant Astronaut	$300,000	6 months
Team Building: Resonance and Music	Note-by-note, user-by-user musical resonance experience. Many examples apply.	Dunedain Giant Astronaut	$300,000	6 months
Games: Soccer	BCI commands can simulate many sport movements; AR can simulate the visual aspects. Teams can play practically any sports game.	Dunedain Giant Astronaut	$300,000	6 months