Brain Computer Interfaces for gaming

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ABSTRACT
Commonly used peripherals are keyboard, mouse, joystick and game controller within the gaming industry for control. However this limits users to an artificial form of input. For example it limits the time it takes for a neural command to be executed by a finger and then interpreted by hardware. A more direct method of gaining these neural commands could be done by a brain computer interface. Many researches are using these brain computer interfaces such as Emotiv headset for use in controlling applications by neural commands. These systems are being used to test out methods to gain these neural commands for wide use (McFarland & Wolpaw, 2011). This poster is an interactive demonstration of using the Emotiv headset with the EmoKey software. EmoKey is a piece of software within the Emotiv suite of tools provided. The potential of this system should be explored for use in gaming.

Categories and Subject Descriptors
H.5.2 Input devices and strategies.

General Terms
Algorithms, Measurement, Experimentation, Human Factors.

Keywords
Emotiv, Emotiv headset, EmoKey, Brain Computer Interface, Electroencephalography (EEG).

1. INTRODUCTION
The current methods for communicating with software are not as efficient as a Brain Computer Interface could be. A Brain Computer Interface would enable for someone to think of a command and the computer would do without the overhead of interacting with peripheral devices like a keyboard. This is because of the reaction time for a finger to react to a message from the brain. If a Brain Computer Interface was to be created capable of handling a multitude of commands effectively it would be possible to create much more complex actions within games.

2. Background
Back in 1924 the first brain wave was recorded by Hans Berger. He developed a means called EEG. In 2003 a system called Emotiv was developed by Tan Le, Nam Do, Allan Snyder and Neil Weste. The Emotiv headset is an implementation of the EEG sensor array.

3. Emotiv implementation
The Emotiv headset detects the brain waves of a person and then wirelessly transfers it to a computer. When the Emotiv software suite gets these signals, it processes them in an algorithm which determines what the person wants to do based on a set of training sessions the user has already done. These interpreted signals are used to activate actions. These actions are not only trained by the user but can have intensity when detected outside of training. This is visualized by using a cube. The sensors are shown with strength of the signal. Depending on the strength a color associated with the sensor will be displayed. Green is for a good strength of signal with hardly any anomalies, red for weak signal which has a lot of anomalies.

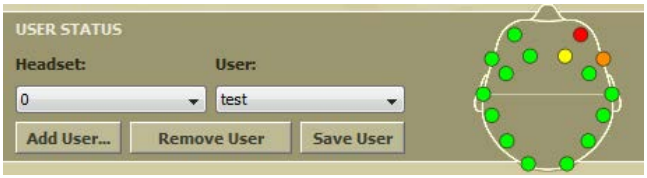

Figure 1 Emotiv suite showing signal strength

Actions can be used within API's or they can be used with pre built software like EMOKEY. EMOKEY is provided as part of the Emotiv suite. Using EMOKEY actions based on the cube, it can be used to send keyboard or mouse events to an application.

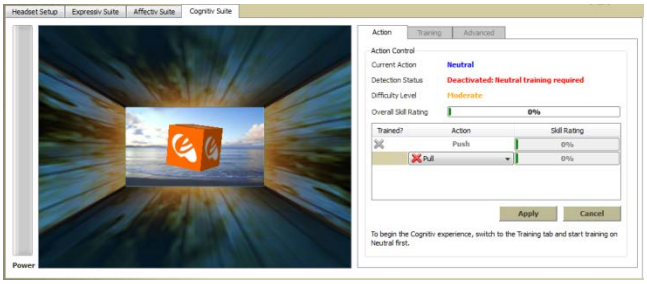

Figure 2 Emotiv cognitive suite showing actions with cube

This is applied to move an avatar within a Minecraft world.

Currently this technology has a high potential for gaming and controlling of software. However there are many limitations around the training method currently used. It required regular retraining as the human thought process changes for described actions. As the thought process changes so do the brain waves thus invalidating the existing training and causing the actions wanted to not activate correctly or at the right intensity.

Based on these technologies potential it should be researched to overcome its constraints. The author thinks this could be a replacement for core controls of games. This should enable higher response times for the user to react to events within the games world. Another way to get round any issues and for more expansive control it may be prudent to see if possible to use the person's cellular structure to communicate directly to the brain.

4. ACKNOWLEDGMENTS
The author would like to thank those who helped make this poster possible. This posters format was based on ACM's SIGCHI

This poster paper appeared at the 3rd annual conference of Computing and Information Technology Research and Education New Zealand (CITRENZ2012) incorporating the *25th Annual Conference of the National Advisory Committee on Computing Qualifications*, Christchurch, New Zealand, October 8-10, 2012. Mike Lopez and Michael Verhaart, (Eds).

template. The author would also like to thank Emotiv Systems for developing the Emotiv headset and software for use with gaming. Without them this poster could not present their work.

5. REFERENCES

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