Examining the Possibility of Three Dimensional Positional Tracking through Brain Computer Interfaces

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ABSTRACT

Current three dimensional (3D) position tracking systems require the use of optical tracking systems, global positioning systems, or other sensors such as accelerometers and gyroscopes [3]. Brain computer interfaces (BCIs) are becoming increasingly inexpensive and simpler to use [1]. Current research in motor function with BCIs have focused on using motor imagery (imagined movement) as a method of control [2]. Rather than continue using imagined movement as a source of application control, we focused on how actual motor movement can be captured and used to gather more information about the user. In this paper, we discuss our current research in a novel approach to position tracking in using for user's location in a area through displacement.

Categories and Subject Descriptors

C.0 Hardware/software interfaces

General Terms

Brain Computer Interface, position, tracking, user interface

1. INTRODUCTION

The advent of brain computer interfaces (BCIs) allows developers to extract user input from electrical signals read in from the brain. Current BCIs use motor imagery or imagined movement in users to when training users. Users must imagine moving a body part in order to train with one of several algorithms to recognize that specific signal. One of the problems with this is that the way a person imagines movement might change periodically resulting in the need for more training.

2. METHOD

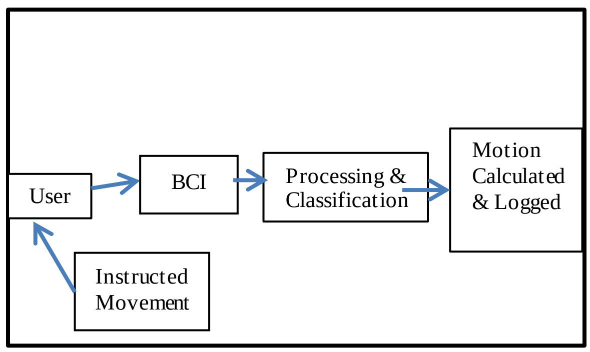

Figure 1: Process Overview for BCI Position Tracking

Our research explores using brain signals captured from actual movement as a source of application input. As noted in figure 1, we record and analyze brain signals with the use of the Emotiv Epoc headset, while instructing the user to move. We then classify the movement induced brainwave signals so that once seen again, our classifiers will be able to recognize their reappearance. After this training is completed and we are able to recognize more movements through an individual's brainwaves, we then allow the user to move freely in a space.

We attempt to determine if position of a user in an area can be determined solely through the use of BCI. With the ability to recognize movements through the use of a BCI comes the ability to track the user's location. Using displacement, we can physically measure a user's average stride length. With this length we can calculate a user's new position after analyzing how many steps/movements were recognized.

To determine accuracy we will compare our position tracking system to optical tracking solutions (such as OptiTrack) as well as motion sensors currently in existence in modern day smart phones. This will leave us with a quantifiable error frequency that will be useful in further analysis. We will examine each of the user's motions and analyze how OptiTrack, smart phone sensors, and our system compare in recording the instance of the movement as well as distance.

3. CURRENT STATUS

Our experiment is now fully designed and awaiting the Institutional Review Board's approval before we can begin.

4. IMPORTANCE

If this novel tracking method is found to be more accurate than present day tracking found in mobile devices, we will have succeeded in creating a mobile tracking system that will be able to track individual limb movement as well as overall position. This would combine the benefits of optical tracking and smartphone sensor-enabled tracking as well as being far less expensive than optical tracking solutions.

5. REFERENCES

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