



UNIVERSITY OF  
GEORGIA

CSEE 4630\_3 Bioinstrumentation

## Lab 2 - Epoc Emotive to Control Mario Kart (Brain Lab)

**Zachary Davis**

811960668

Zachdav@uga.edu

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**Category**

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Task B: Read Your EOG Signal with Epoc Emotive	5%
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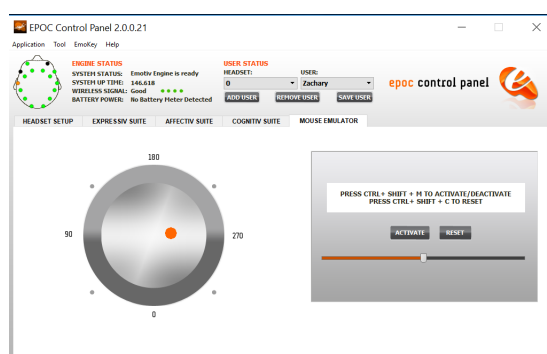
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# 1 Task A: Read Your EEG with Epoc Emotive

## 1.1 Install The Emotive Control Panel and Setup Headset

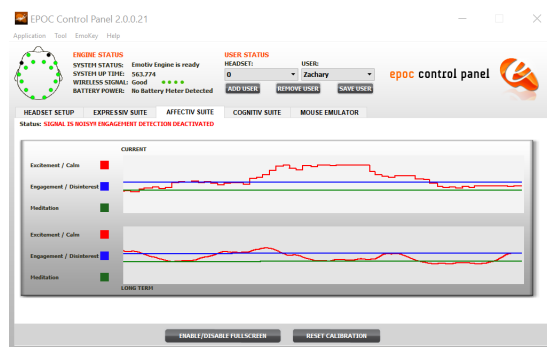
To setup the headset for use we need the control panel which uses bluetooth to read signals from the headset. The software then has two ways to map your brainwaves to keys on the keyboard. To setup the headset we saturated all 16 electrodes in a saline and later saltwater solutions to increase conductivity attached them to the headset and then used the graphic in the control panel achieve a good signal on all electrodes.

To show that the headset was connected to the panel without starting to measure the brains signal we used the built in motion sensing application to move the mouse around with head tilt. This can be seen below



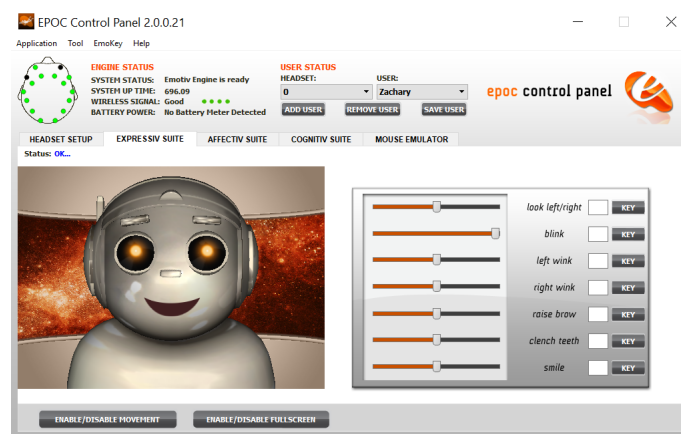
## 1.2 Demonstrate its Ability to Read EEG Signals

Now that the headset is connected and all the electrodes have a good signal I started to record my EEG signal over time. In the below graph of my EEG you can see that in the first few measurements my eyes were closed and i tried to think as little as possible and my signal is the lowest even thouching the line deamed meditation. In middle of the measurement i started doing a speed math test with simple mental math questions with a time limit and you can see my signal and excitment increases, before i finally relax again for the last measurements in the EEG. In retrospect I wish i found something more excitable for my brain as the mental math had a smaller expect then i anticipated.



## 2 Task B: Read Your EOG Signal with Epoc Emotive

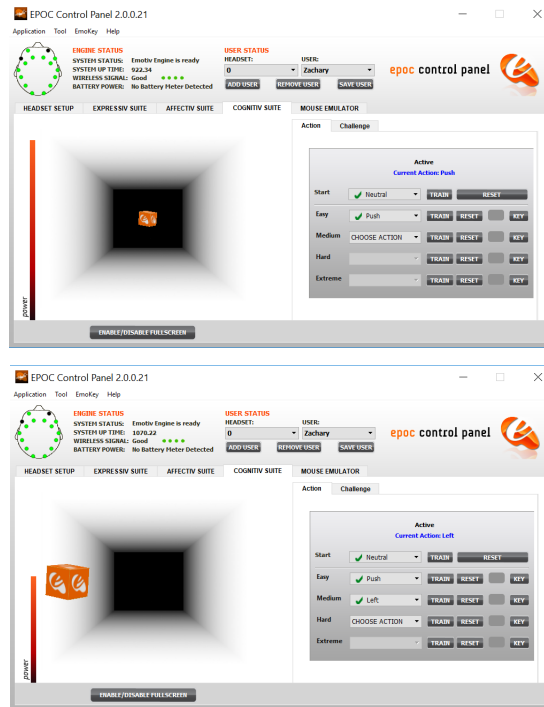
To demonstrate the ability of the headset to measure and read our EOG signals we used the expressive suite in the program. I found that after practicing for a while adjusting the sensitivity would only make the readings worse except for blink. The robot was able to emulate the blinking, winking, smiling, and etc. These actions could then be mapped to certain keys on the keyboard to type or later control and play Mario Kart. I assigned blink to "Z", wink to "A", smile to "C", and raise eyebrows to "H" and then in opening notepad after some practice i was able to correctly type my name. Below is an included picture to show as many emotions as possible. I smiled, raised my eyebrows, and blinked. Unfortunately i missed the blink in the snapshot but the rest can be seen.



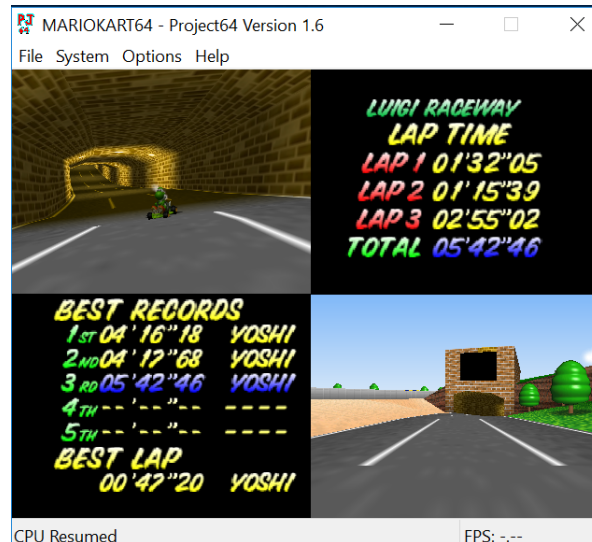
## 3 Task C: Use the Headset to Complete Laps in Mario Kart

### 3.1 Training My Brain

The next task is to control a car in Mario Kart around a couple laps using my brain to trigger certain keystrokes. To do this unlike some of my classmates i choose to use the cognitiv suite rather than the expressive suite because i felt like i could have better control. I spent a good amount of time trying to train myself. My goal was to train my brain to PUSH, LEFT and, RIGHT control the box. After struggling for a while i researched some of emotives resources for help in the hopes to have better success. Their first suggestion was to read something simple while training your neutral state. This helped a lot because to have real control you need to not only be able to start moving the box, but also stop it and if you did as i did at first and keep your eyes closed you will never realistically be able to stop moving the box in practice. Also it suggested watching objects in real life or on youtube while training to help maintain focus on the task your are trying to perform. Their final suggestion was essentially time and practice it is easy for you to exhaust your brain in training which will hurt the signal integrity so i would periodically stop training and read or watch tv to relax my brain. Below you can see me pushing the box as well as moving it to the left.



To translate this to racing in Mario Kart I mapped push to holding the "W" key, left to holding the "A" key, and right to the "D" key, which i then mapped to forward, left, and right respectively to drive the car. Thankfully in Mario Kart you do not need to brake ever. Below I have included a link to my video of me doing three hot laps of a Mario Kart track. It is worth mentioning you can see that it takes me a while to start having control of the car in the beginning of the first lap and the second lap is easily my best. But by the end of the second lap and into the third lap you can see that my brain was getting tired and failure to do what i wanted propagated into larger and larger errors. My camera setup is sub par but you are able to see me the game and keyboard. To insure that i am not using the conventional keyboard i keep my hands below the table. Below are my lap times.



Time Trial Video