Boston University
Electrical & Computer Engineering
EC463 Capstone Senior Design Project

First Prototype Testing Report

EEG-based Brain-Computer Interface

Submitted to:

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by

Team 04
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Equipment & Setup Summary

For the actual setup of this procedure, we utilized all required materials needed for testing the experiment. In order to obtain proper readings of the EEG electrodes, we had to amplify our voltage output by 900x. To amplify the voltage output, we created a differential amplifier circuit using a set of resistors, a 5V power supply, and an MCP6002 operational amplifier. As an additional setup, electrode wires were connected to the voltage output of the circuit in order to obtain a potential physiological response from a test subject.

Experimentation Procedure

In order to test the performance of the EEG electrodes, we attached them to the test subject's arm using conductive paste. For a second trial, we detached them from the arm and placed them directly on the forehead to examine a potential change in results. As an additional test, we also used conductive paste for testing the EEG electrodes onto another subject's forehead.
For all the trials, we made sure to abide by all safety requirements as per lab guidelines and made sure to operate within reasonable voltage (5V).

Results

Ultimately, we were unable to obtain readings from the EEG electrodes. The oscilloscope displayed a constant zero voltage regardless of the electrode placement on our test subject. We noticed a change in the output voltage when moving the electrodes with the input voltage turned off. These readings, however, were on the scale of microvolts, a negligible difference from the base zero voltage. We were also unable to test the PCB due to these limitations.

Analysis

The small readings we were able to obtain on the oscilloscope were likely due to interference from the internal electronics of the oscilloscope, waveform generator, or power supply. Regarding the constant zero voltage readings, we anticipate inaccurate wiring, saturation of one or more components, or improper gain tuning to be the cause. We attempted to correct for the saturation and gain issues by changing the values of the resistors used in our differential amplifier. To ensure that we were not using a malfunctioning MCP6002 operational amplifier, we had also replaced it with another MCP6002. Unfortunately despite numerous circuit debugging attempts, we were not successful in witnessing accurate voltage reading measurements from the EEG electrodes. It is hoped that using our PCB design as well as more advanced circuit schematics from OpenBCI that we will obtain far more accurate and efficient patterns.