EXPO
engineering ▲ design

LOW COST ELECTROENCEPHALOGRAM – SUPER BIG BRAIN EEG

Allison Ellingson, Corey Knapp, Yiting Gao, and Ostin Arters

2019

ABSTRACT

The biggest barrier facing the field of neuroscience is the lack of exposure. At the earliest, students will only have the option to explore neuroscience in an academic setting is in college. Providing low cost and DIY electroencephalograms will allow high schools and middle schools to introduce neuroscience into their curriculum.

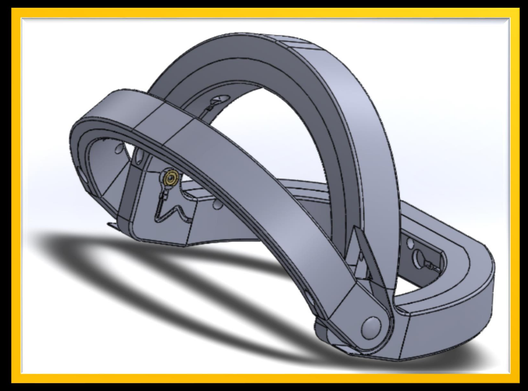
PROBLEM/GOALS

The main goals of our product were to create the following for less than $100

- Hardware that gathers raw signal and filters appropriately
- Software that determines the frequency of brain signals and shows a graphic displaying the origin within the brain
- Headset that effectively holds electrodes to any sized head and houses hardware
- Creating something easily reproducible by high school students

DESIGN

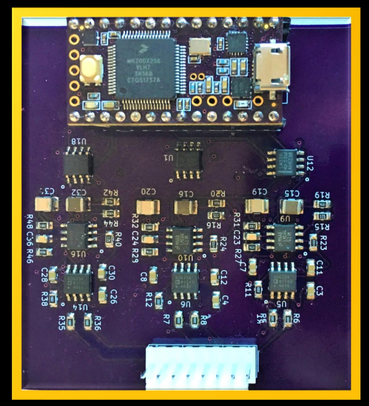
Headset

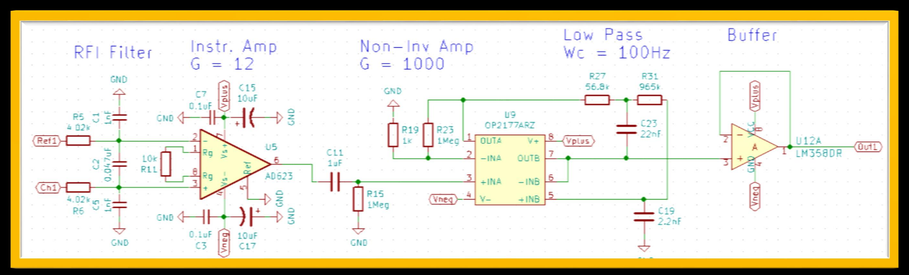


Headset is 3D printed with Nylon filament. Files for it are located in this project's bit bucket, allowing students to download the design and print it themselves at whatever 3D printer they have locally available to them. Troubleshooting advice is made available in this same location.

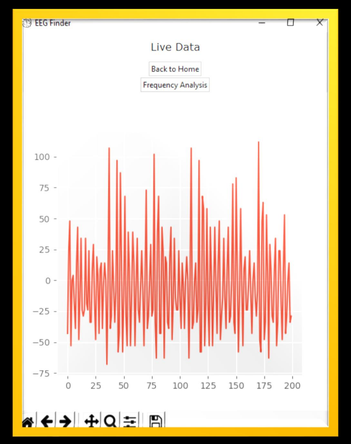
Hardware

- 6 channels
- Differential amplifier per channel
- Low pass filter to attenuate frequencies >60Hz
- Non-inverting amplifier to increase voltage
- Teensy 3.2 Microcontroller to sample input and send data to PC





Software



- Built with Python and TKinter
- Displays live filtered signals
- Plots Fast Fourier Transforms
- Switches between all 6 channels
- Open source and available online
- Easily installed and ran with an executable.

CONCLUSION

Item	Quantity	Total Cost
Electrodes	1 set of 10	$18.00
Misc. Materials	Felt, Contact Solution, USB cable	$15.00
Parts	102 different parts	$83.64
PCB	Fabricated and Assembled	$47.50
Headset Materials	Nylon Filament	$14.00
Software	Open Source	$0.00
	Total:	**$178.14**

Our design was incomplete without an RFI filter and the headset needs to be more easily reproducible. Teams in the future should focus on how to reduce costs and difficulty for 3D printing a headset and use a multiplexer to switch channels and reduce hardware costs.

Acknowledgements

A special thanks to our client and sponsor Gautam Kumar from the University of Idaho Chemical Engineering Department

University of Idaho
College of Engineering