

Improved AAC Device for Dogs

Introduction

- AAC stands for Augmentative and Alternate Communication.
- Pets such as Dogs can recognize words and actions that express their needs through AAC devices.
- They accomplish this feat through buttons with pre-recorded words that models the action associated.

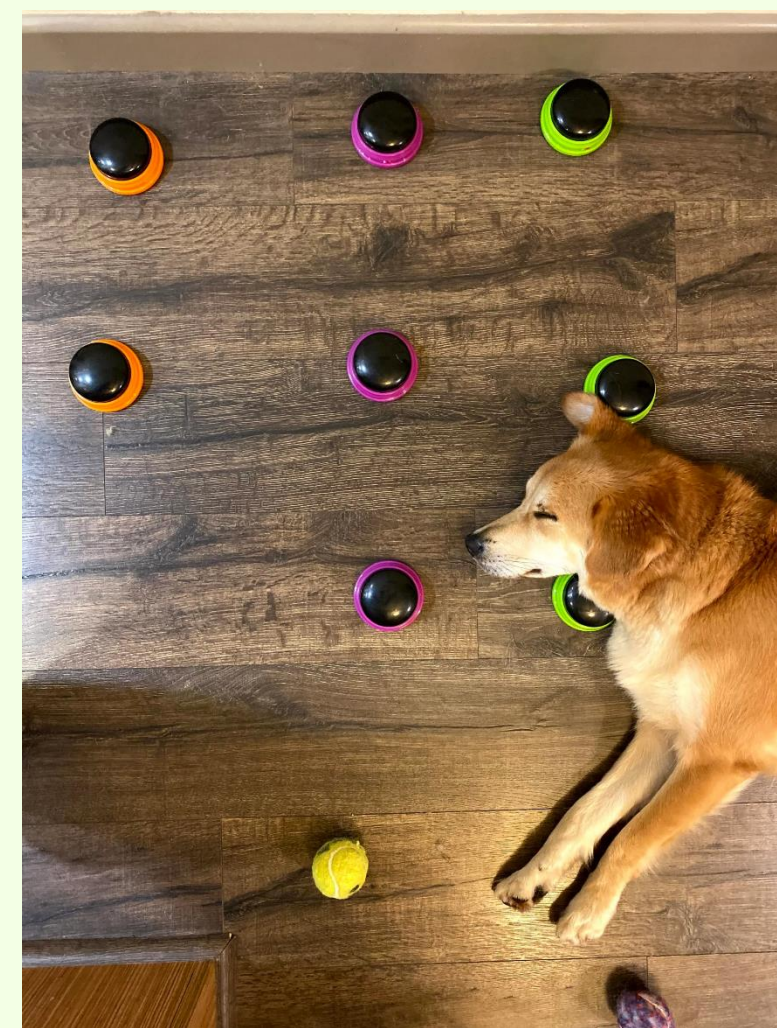


Dog sounding off the "Park" button indicating that they want to go to the park [1].

- Within 2 years, some dogs can recognize up to 45 different actions through these buttons!

Design Process

- What is there to IMPROVE?
- Current devices on the market are all single devices powered by 2 AA/AAA batteries.



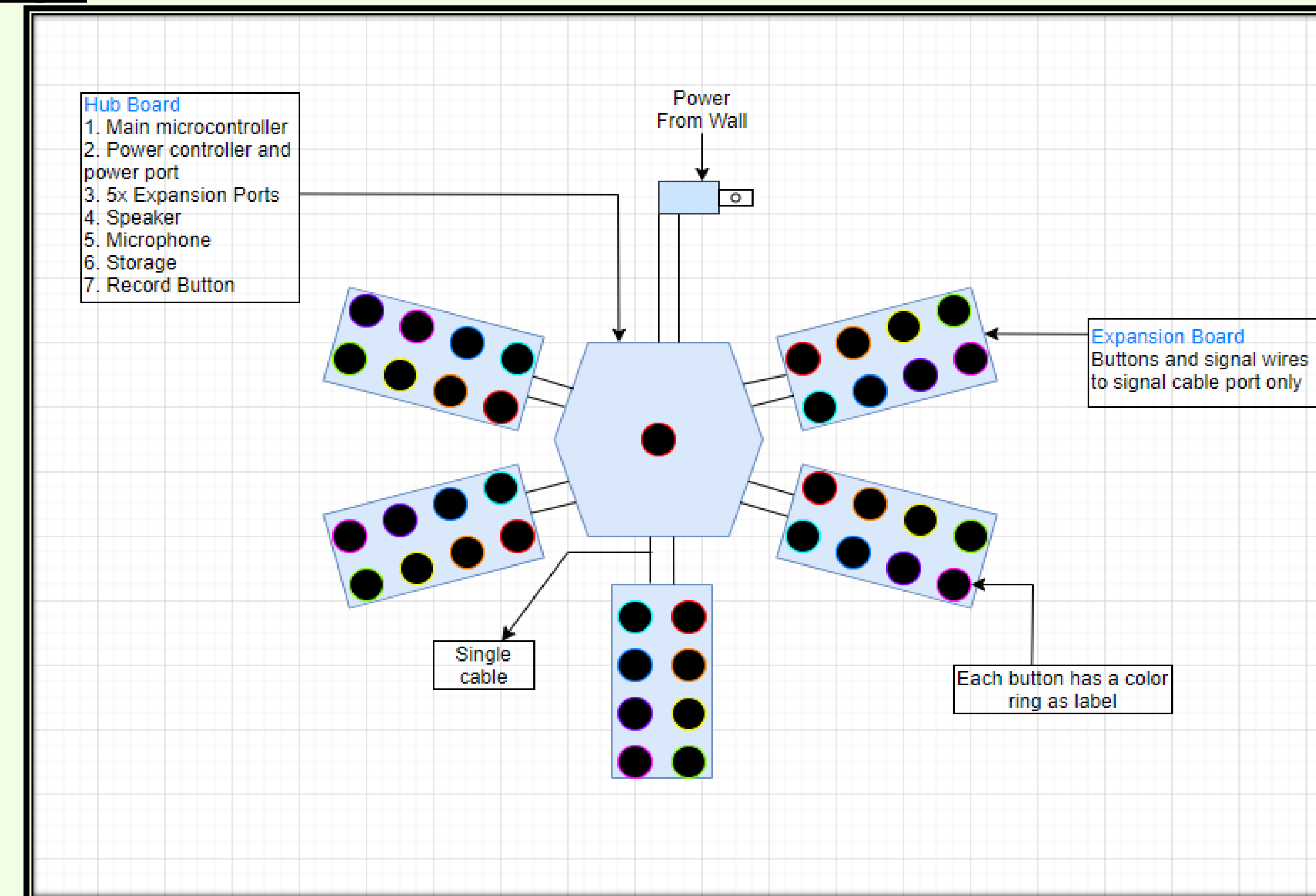
Example of single, independent battery-powered AAC devices[2].

- On average, each button costs \$10 [3] and additional costs are needed for battery replacements.

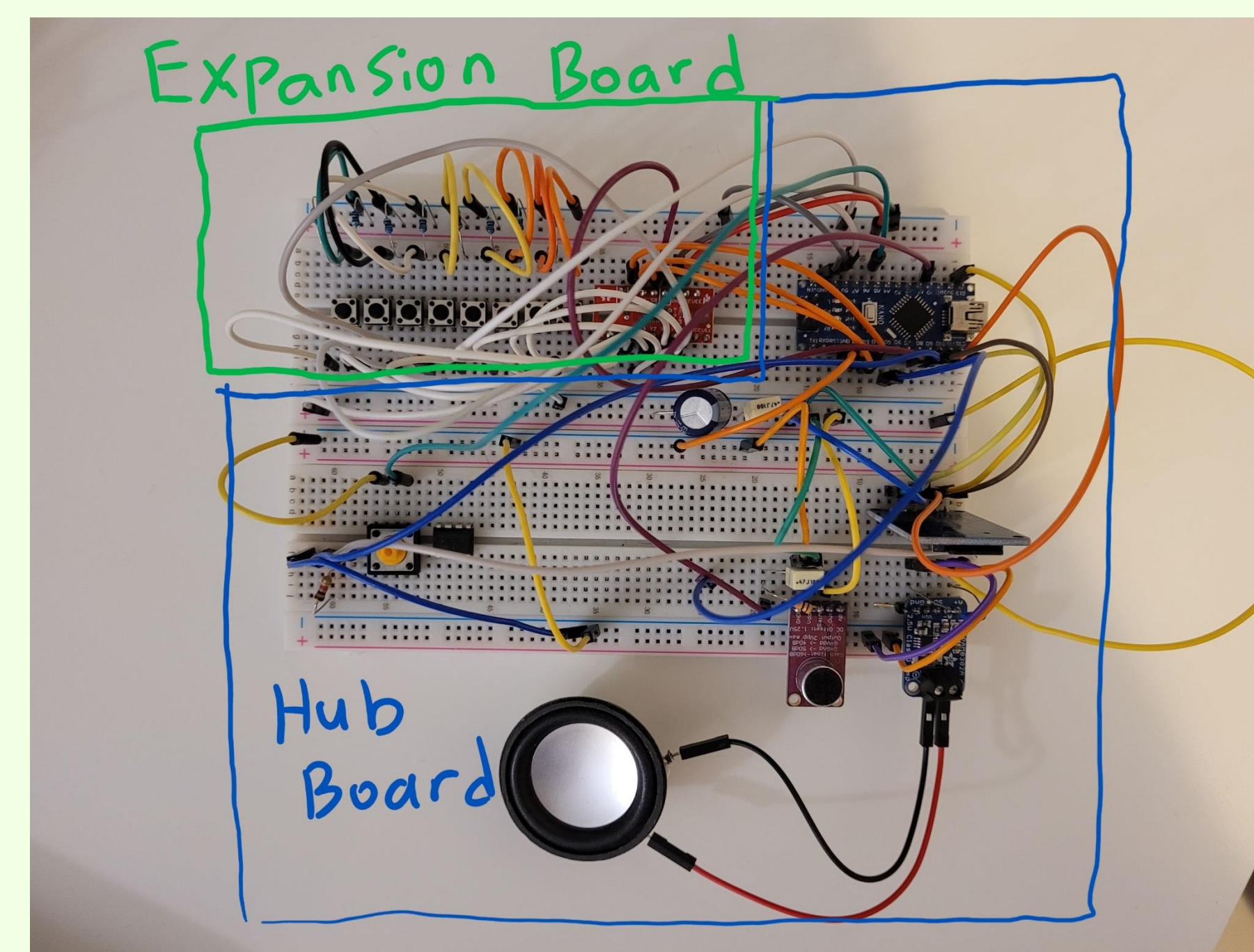
Our Team's goal is to design an improved version that:

- Eliminates the need for battery replacements by using household electricity through AC adaptors.
- Integrates multiple buttons into a separate Expansion Board.
- Makes each button correspond to different words/phrases.
- Produces a better microphone/speaker sound quality.
- Is cost-effective.

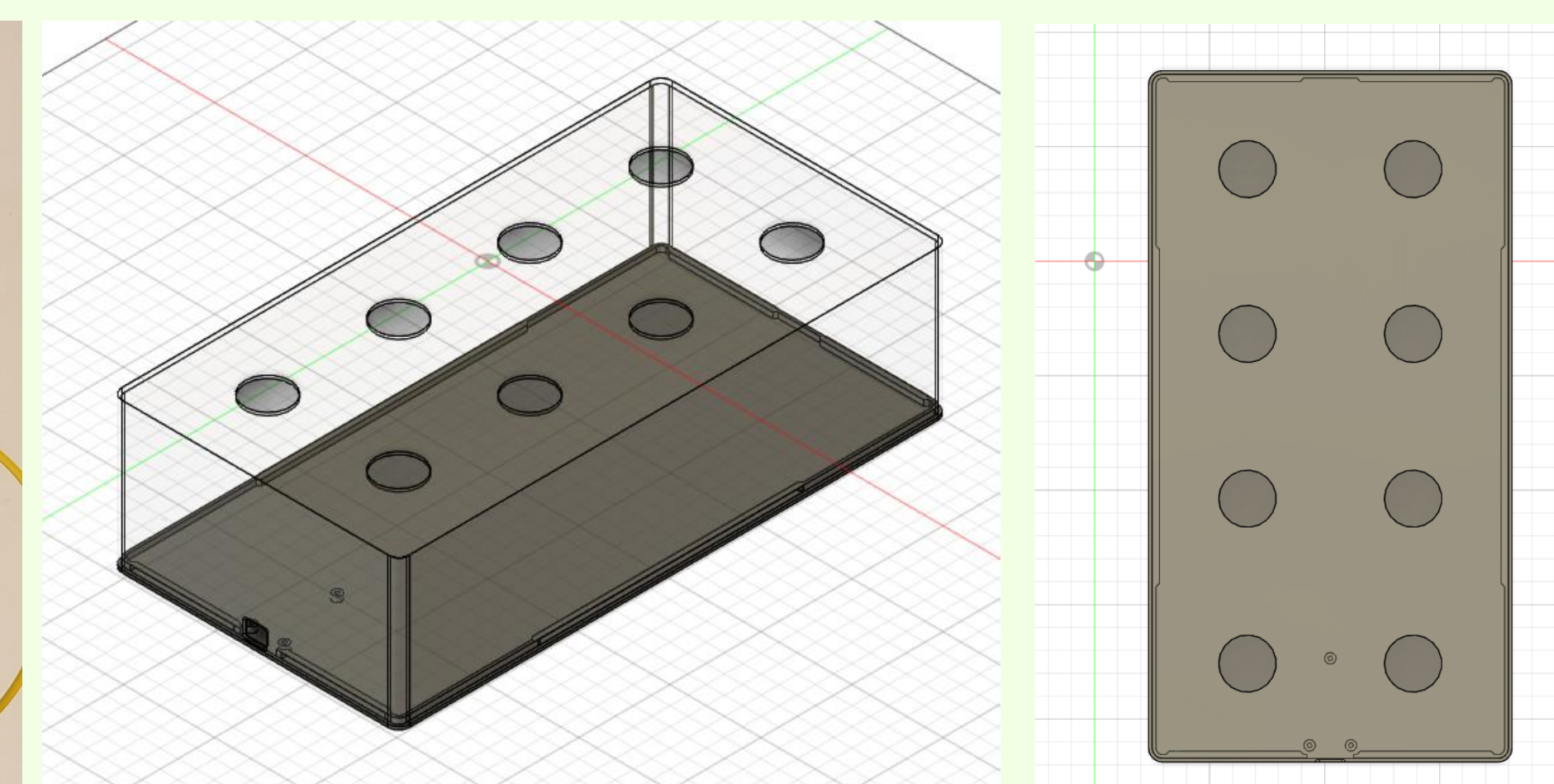
Details of Design



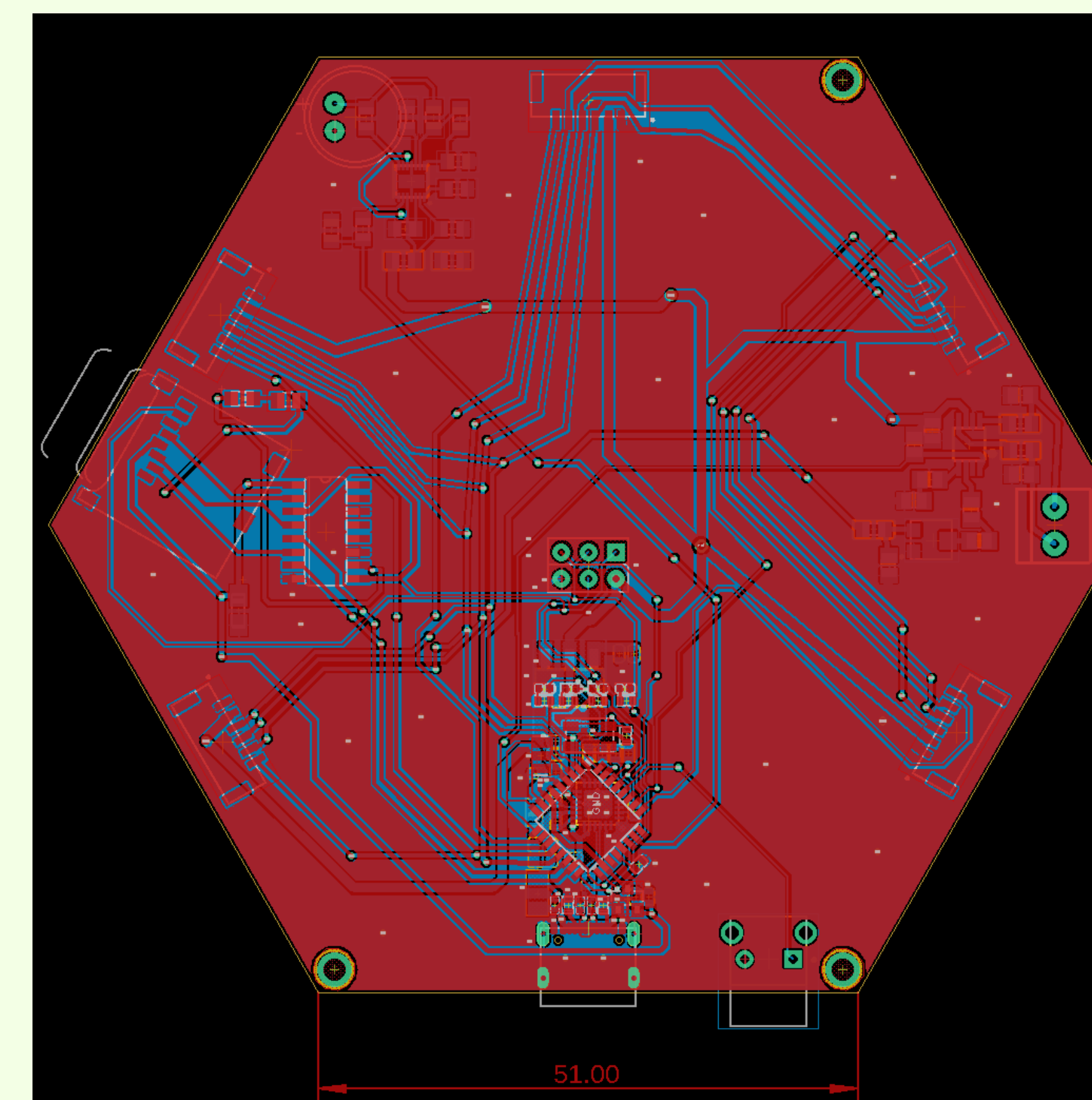
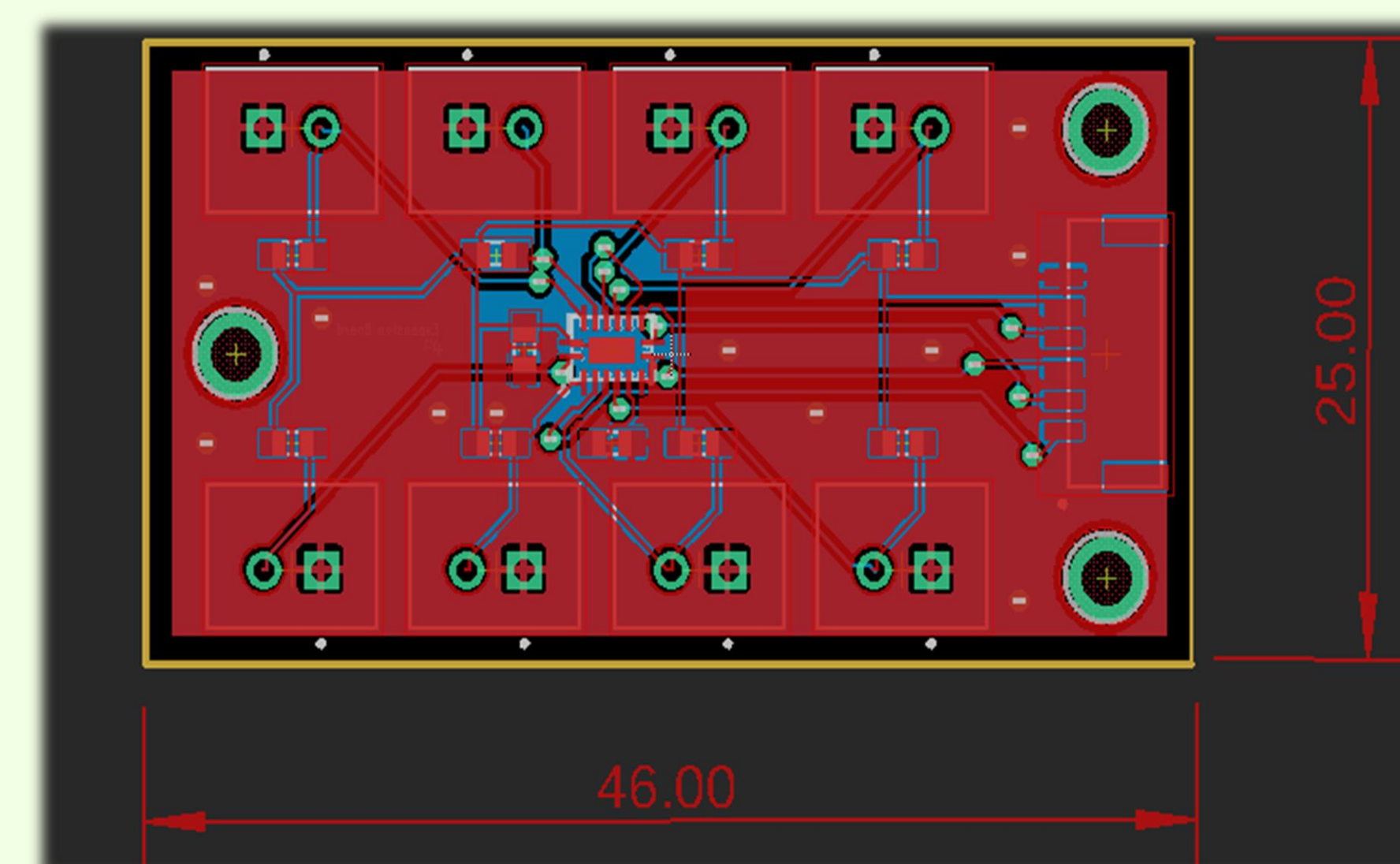
Hexagonal Hub Board in the middle that contains all major components of the device and powered through a USB-C port. Rectangular Expansion Boards contains 8 buttons each. 1 Hub Board can be paired with 5 Expansion Boards totaling 40 buttons max.



Breadboard Prototype of the device showing all components.



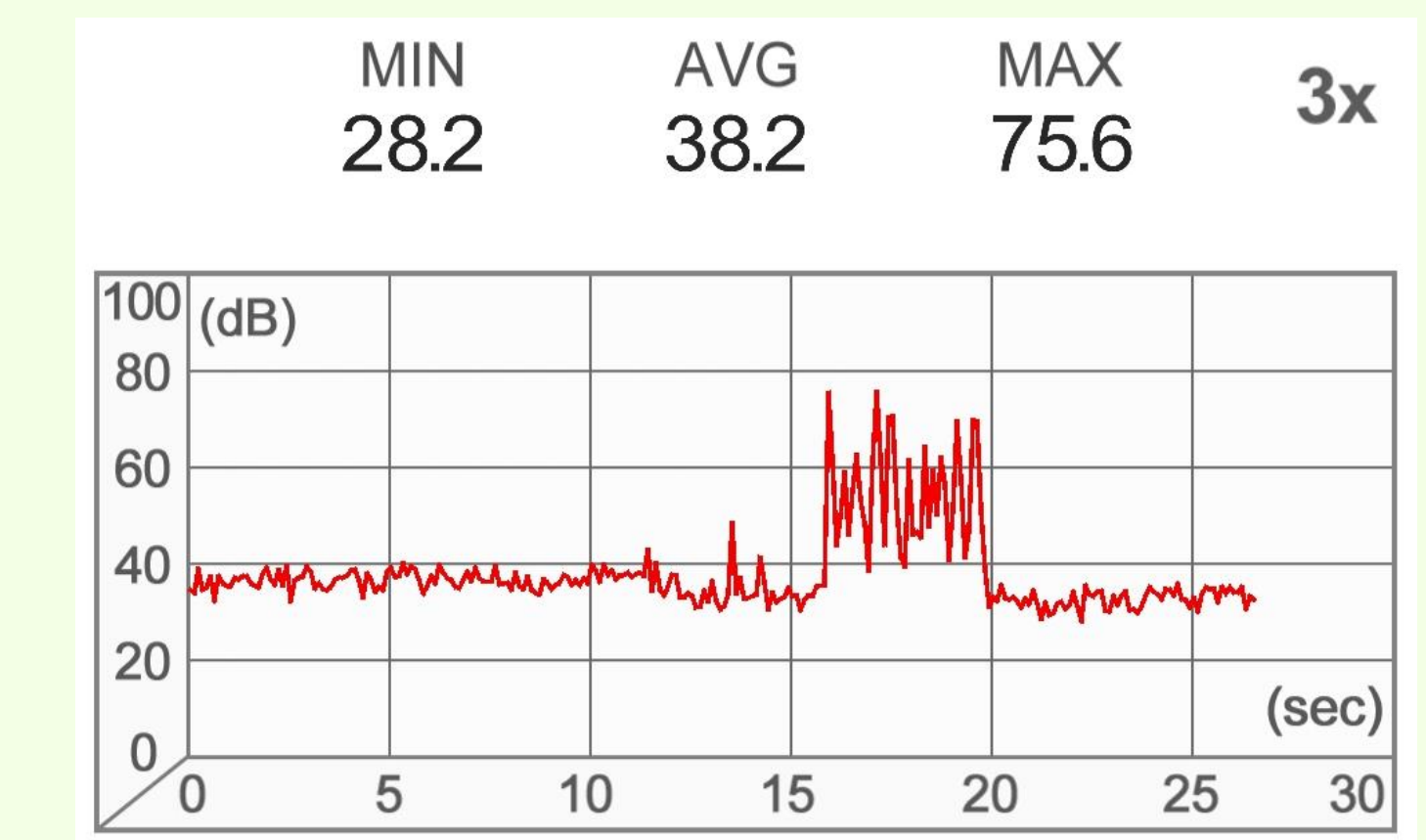
ISO Front (L) and Top view (R) of CAD design for Expansion Board.



Designed Printed Circuit Board (PCB) of Expansion Board (L) and Hub Board (R) with dimensions in mm.

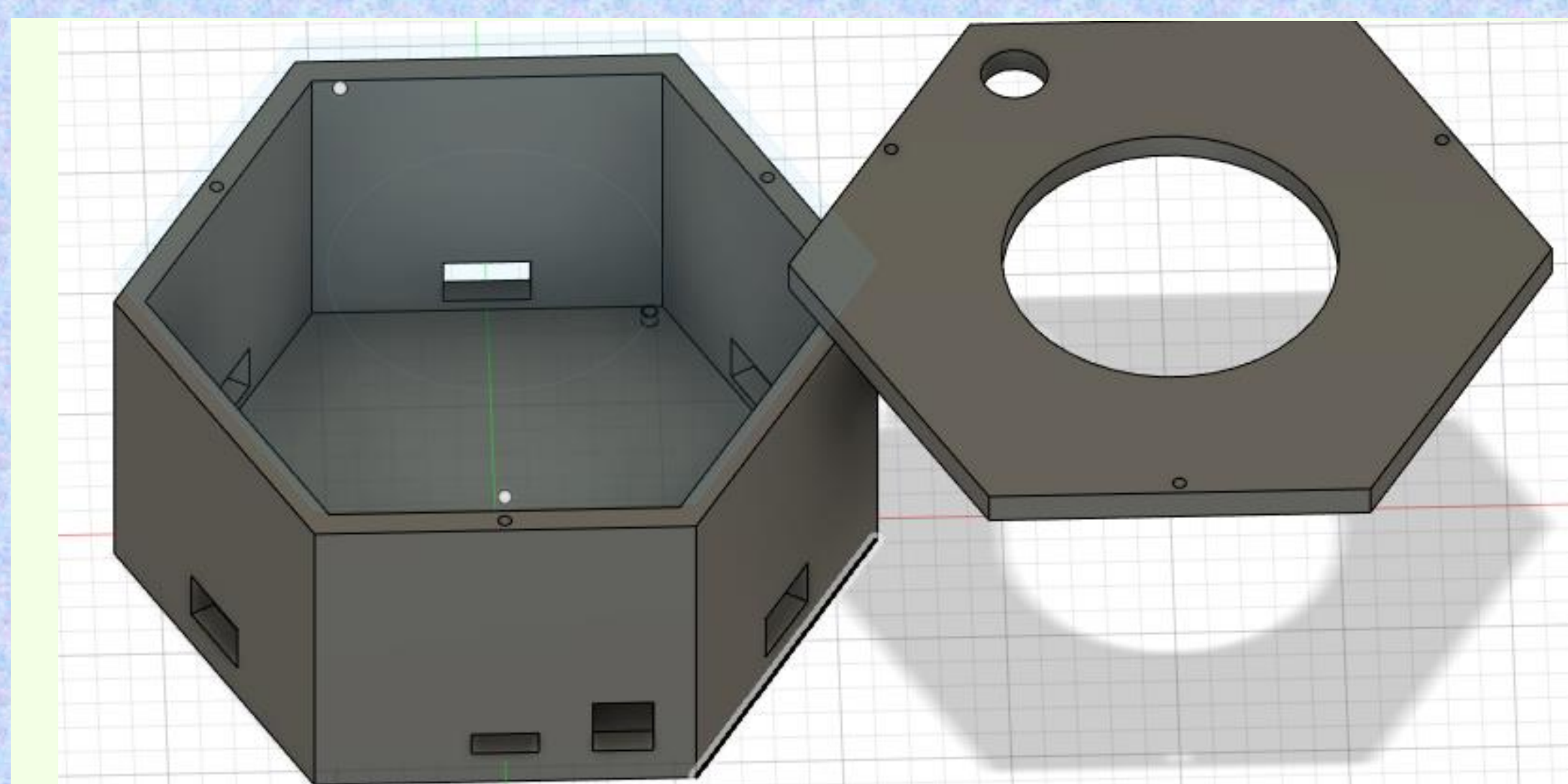
Conclusion and Recommendations

- The objective of this project was to create and design an improved AAC device compared to what is already available on the market.
- Breadboard prototype was completed, and results were outstanding.
- PCBs of the Hub and Expansion boards were designed yet to be manufactured because of missing components due to covid disruptions.



Sound level meter measured from 1m away of recorded audio being played from speaker. Content of the audio clip is "one, two, three, four, five, six, seven, eight, nine, ten"

- A future design of the Hub Board could include a potentiometer for volume control and Bluetooth/Wi-Fi chip for IoT integration.
- A 64/128MB micro-SD card is recommended for audio storage of the device.
- To improve the robustness of the product, water and dust resistance should be considered in order to get an IP (Ingress Protection) rating to prevent spills from water/food.



Front view of CAD design for Hub Board

References

- https://www.amazon.ca/Hunger-Words-Talking-Recordable-Multicolor/dp/B092DYHW2K/ref=pd_lpo_1?pd_rd_i=B092DYHW2K&psc=1 [3]
- <https://www.goodboyrufflife.com/2020/01/22/tips-on-teaching-your-dog-to-communicate-using-augmentative-and-alternative-communication-aac-system/> [2]
- <https://www.pinterest.ca/pin/790029959631502913/> [1]