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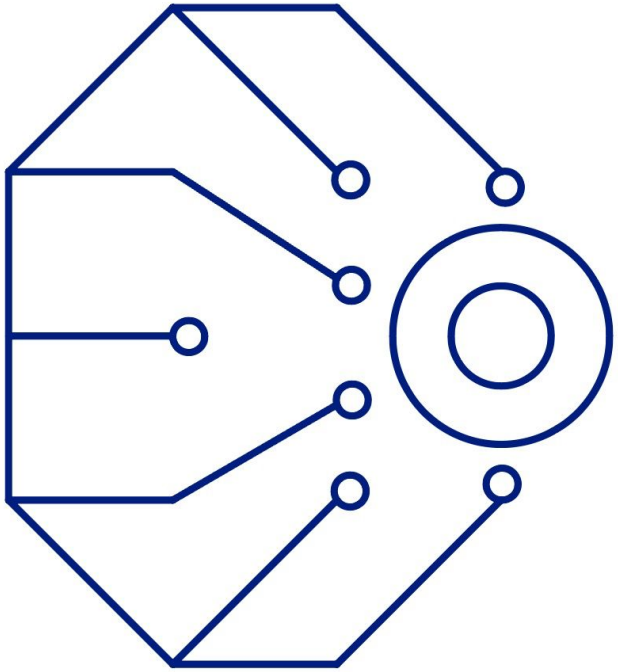

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Non-Invasive Brain Computer Interface for Real-Time Robot Control

Team 9
Adam Shaikh, Andrés Marquez, Gabriela Porto Machado, Mete Gumusayak, Bobby Bona

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Introduction

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How can we enable users to control technology effortlessly and intuitively using only their brains?

The challenge:

Current external device control methods (ex: joysticks, remotes) can be restrictive for individuals with mobility impairments or those seeking new ways of interaction.

Deliverables Summary:

A non-invasive brain-computer interface (BCI) that translates brainwave patterns into real-time commands for controlling a robotic toy.

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Summary of Completed Work

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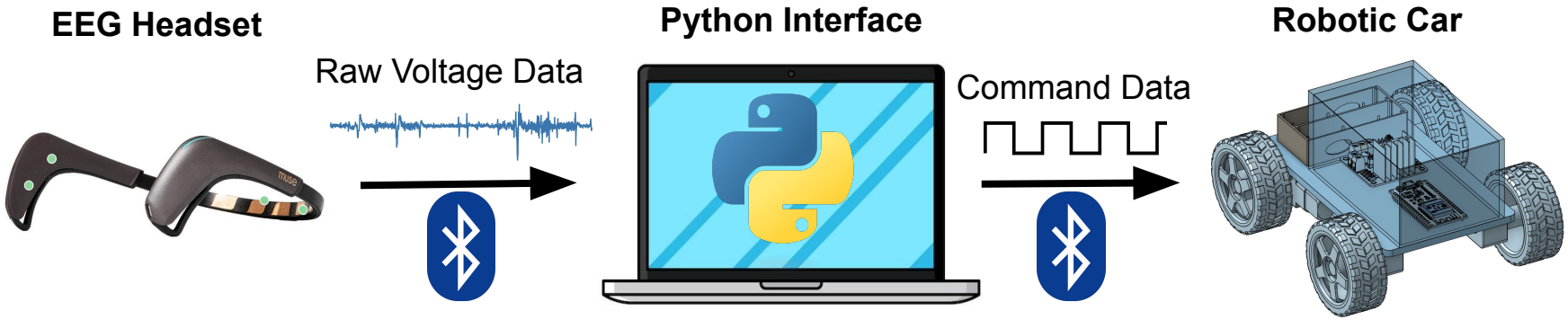

New Headset Adaptation

Switch EEG Headsets: from Neurosky Mindwave to Muse 2

Incorporation of Left and Right Control

Using Left vs. Right eye blink classification

RC Car Hardware

Incorporation of new mechanical and electrical components to the robotic toy

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Updated EEG Headset

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Neurosky Mindwave

Original

✅ Cost (130$)

❌ Single Electrode

❌ Unreliable connection

❌ Required full separate application to receive data

Muse 2

Current

❌ Cost (250$)

✅ Multiple Electrodes

✅ Connects to all computers

✅ Only requires python package to receive data

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Updated EEG Headset

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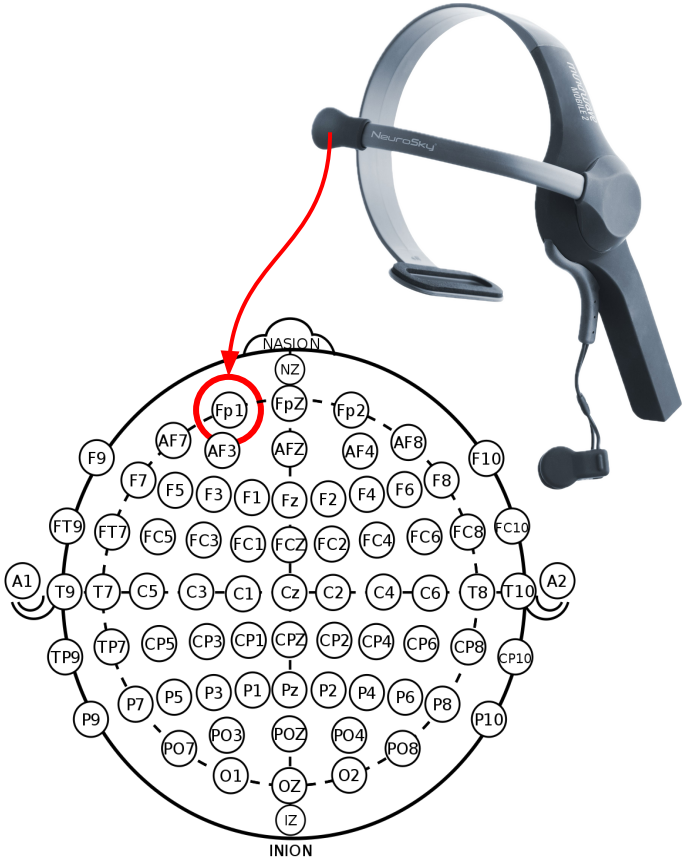
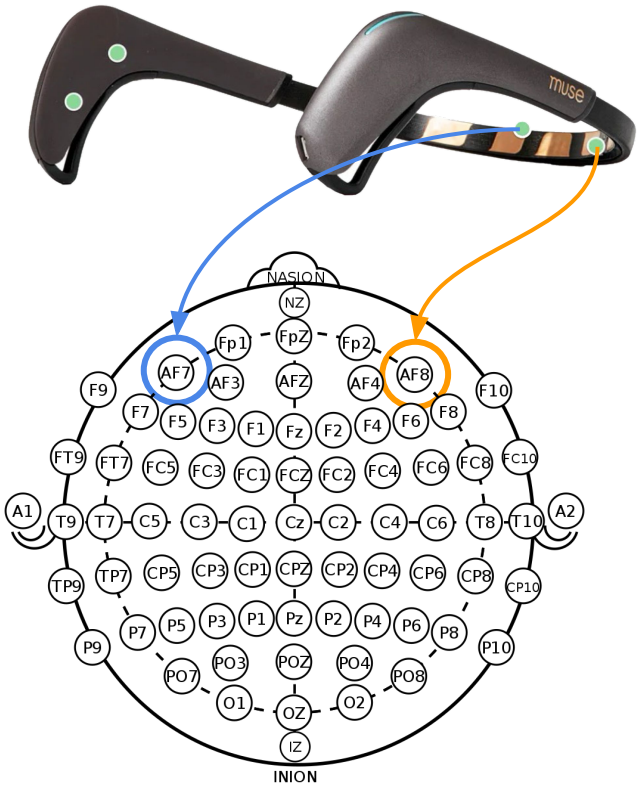
Neurosky Mindwave

Original



Muse 2

Current



Updated Signal Processing Pipeline

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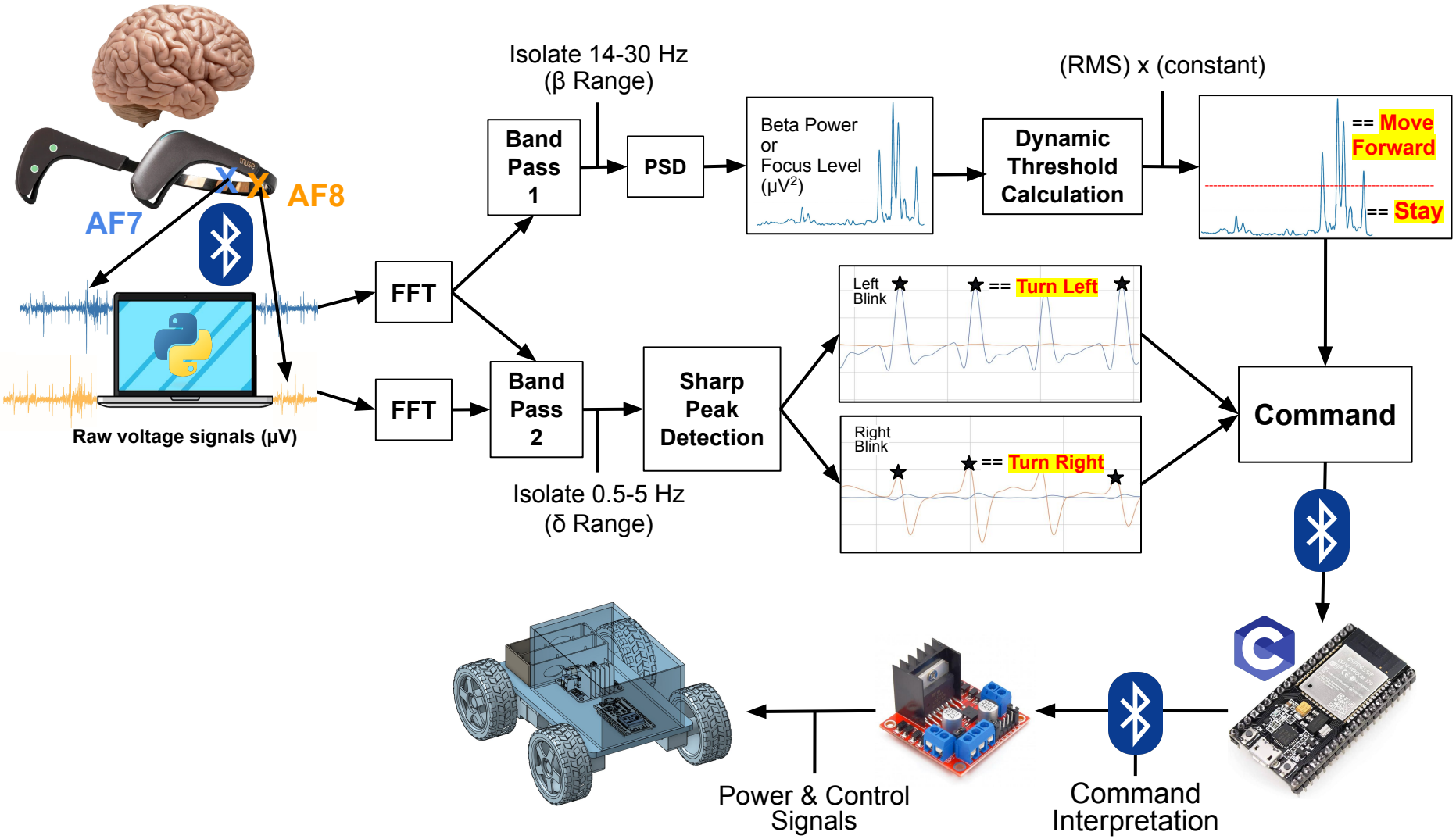

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Updated Signal Processing Pipeline

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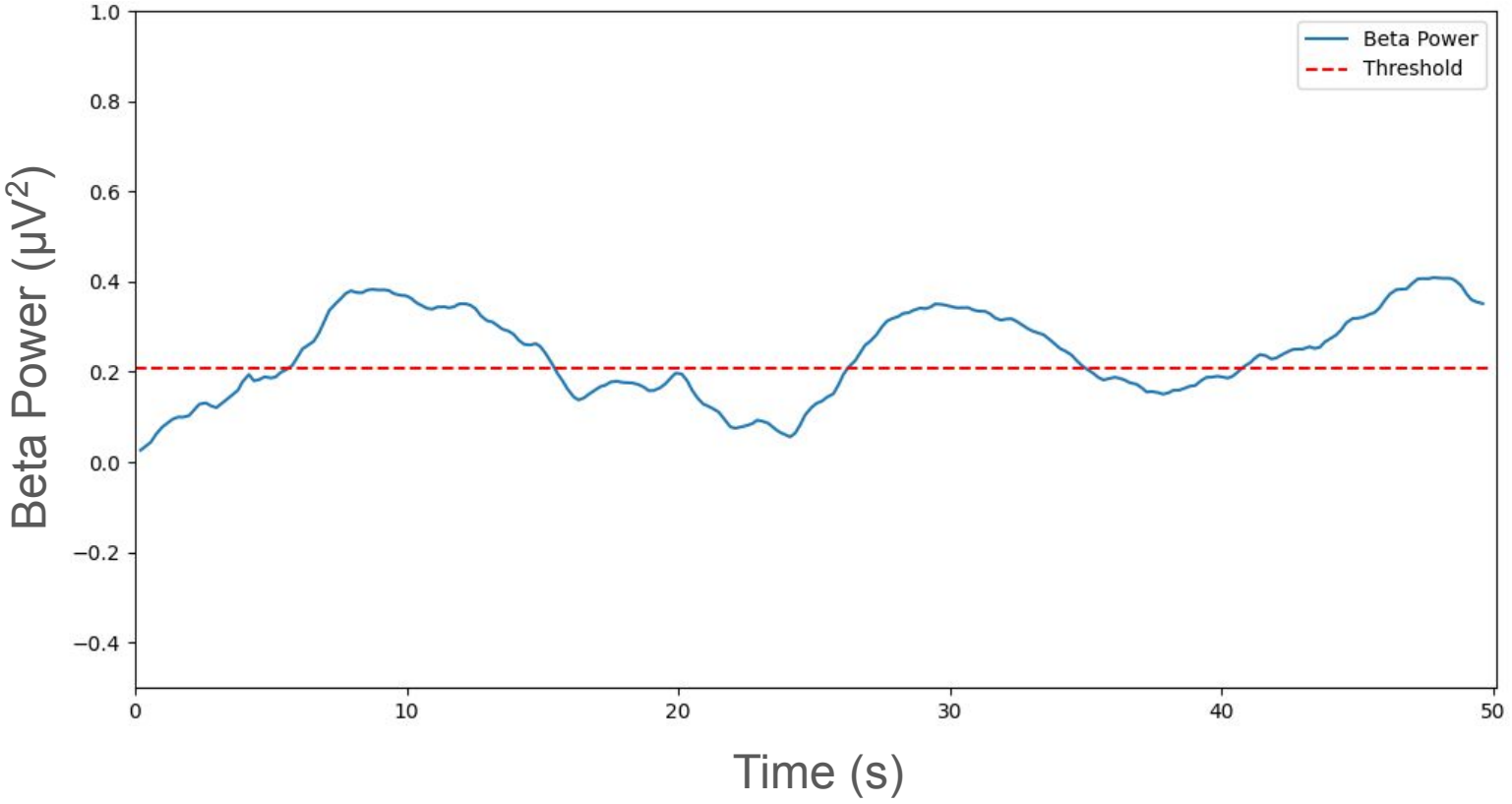
Results: Muse 2 Concentration Measurements



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Updated Signal Processing Pipeline

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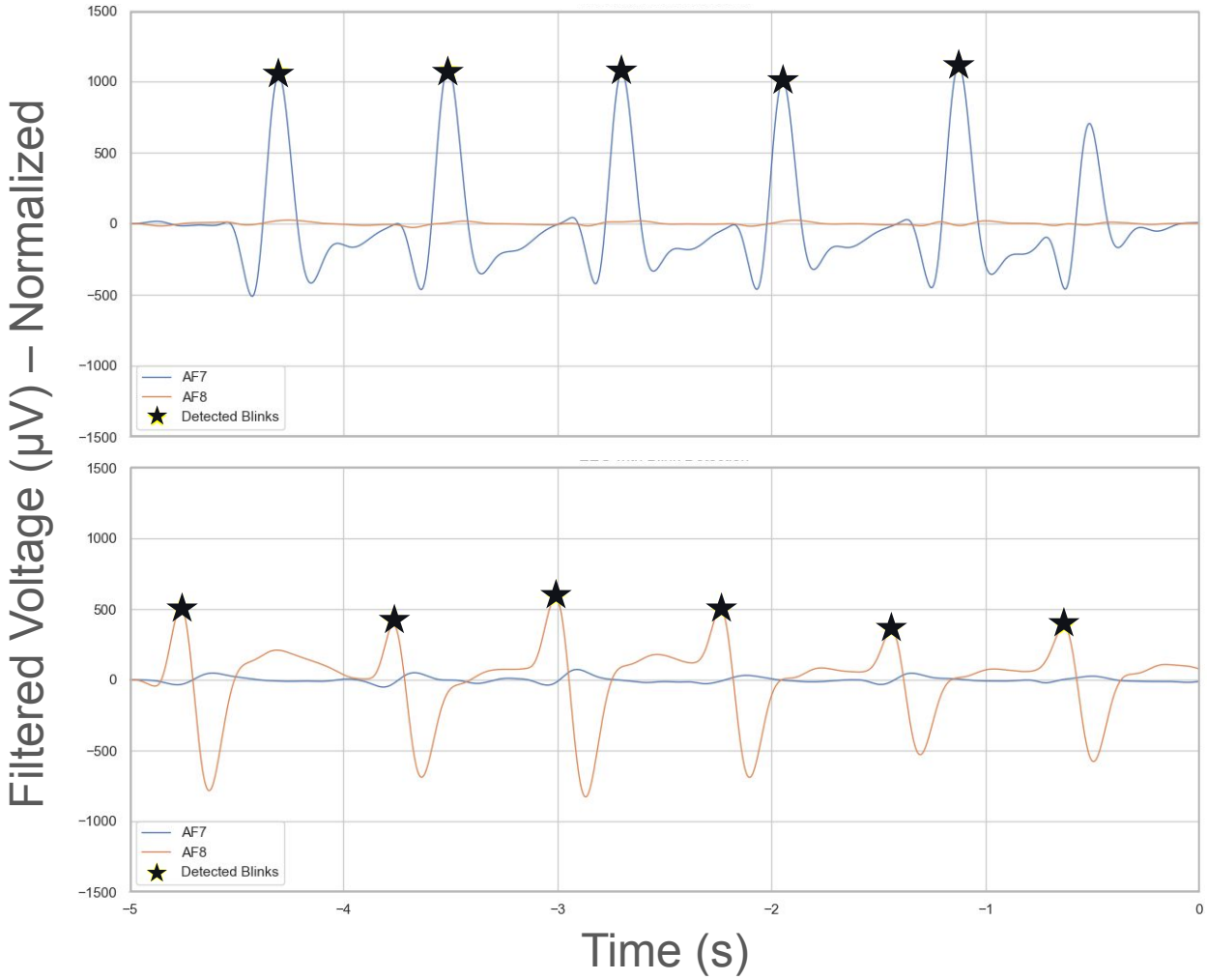
Results: Muse 2 Blinking Measurements



Updated RC Car Hardware

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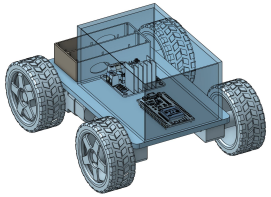
Mechanical

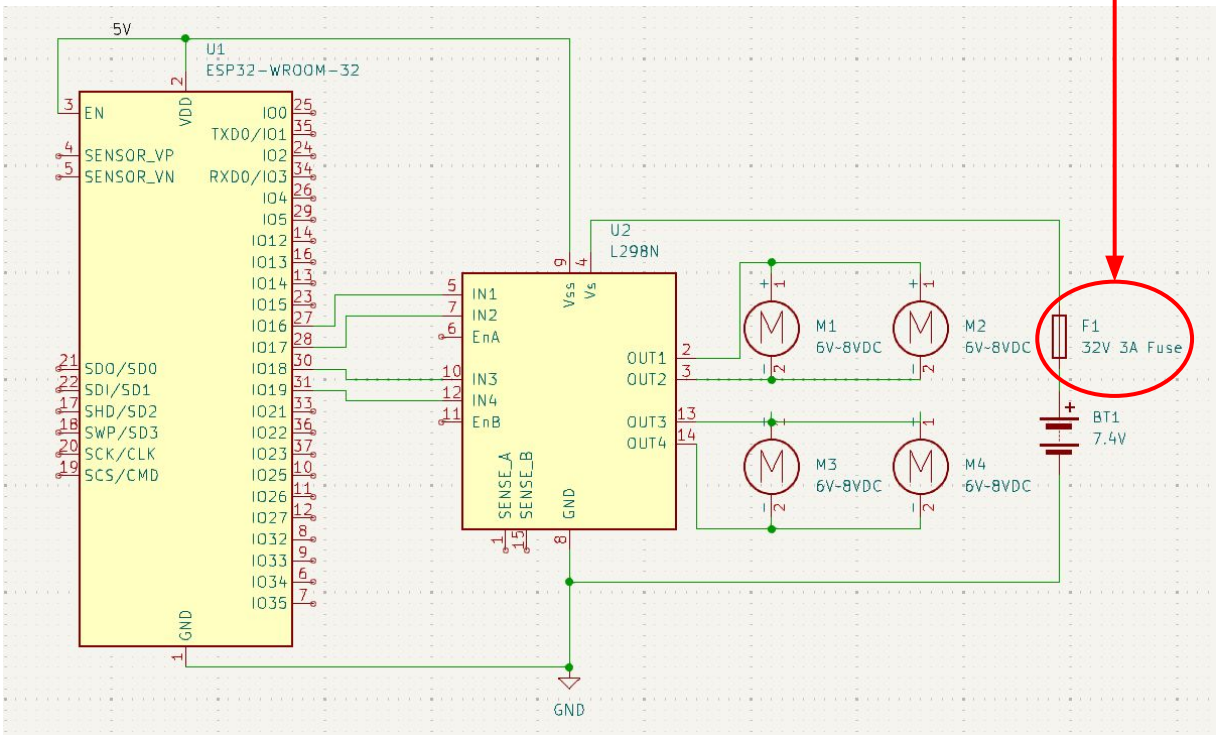
New electrical component housing – Acrylic chassis

New Hinges and Improved Fasteners – Custom Aluminum hinges



Electrical

Inline 32V 3A Fuse



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Milestones – Work for Final Prototype

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Further Improve Robustness of Blinking Detection

Currently extremely sensitive to forehead placement, varying the shape of filtered blinking signal

RC Car Hardware

Aesthetics, precision movement and steering. Priority on creating a *unique* appearance; improve wire placement.

User-Friendly Software/GUI

Minimal setup process, simplified parameter readouts and display

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Gantt Chart

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