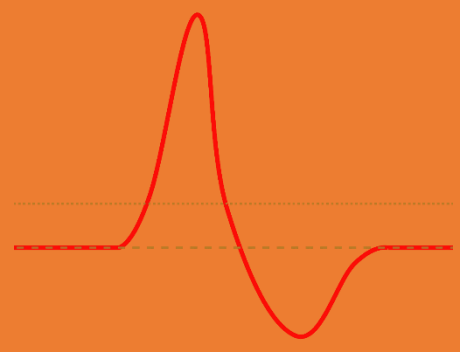
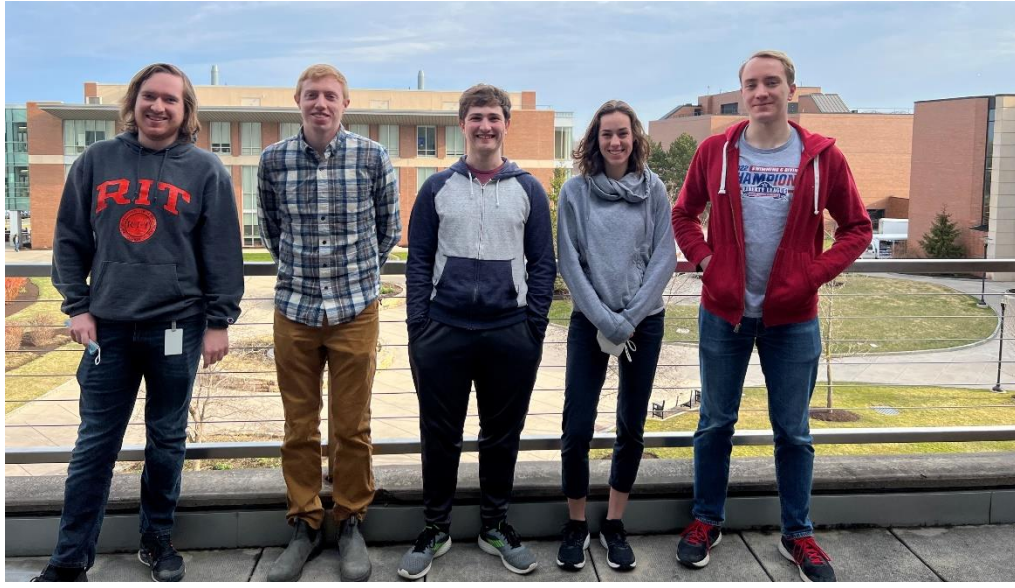




P22005: EMG Actuated Maze



The Team



From Left to Right: Matthew Pencille (Biomedical), Kyle Jerreld (Biomedical), Stephen Larson (Biomedical), Cassie Robinson (Biomedical), and Braden Feasley (Mechanical)

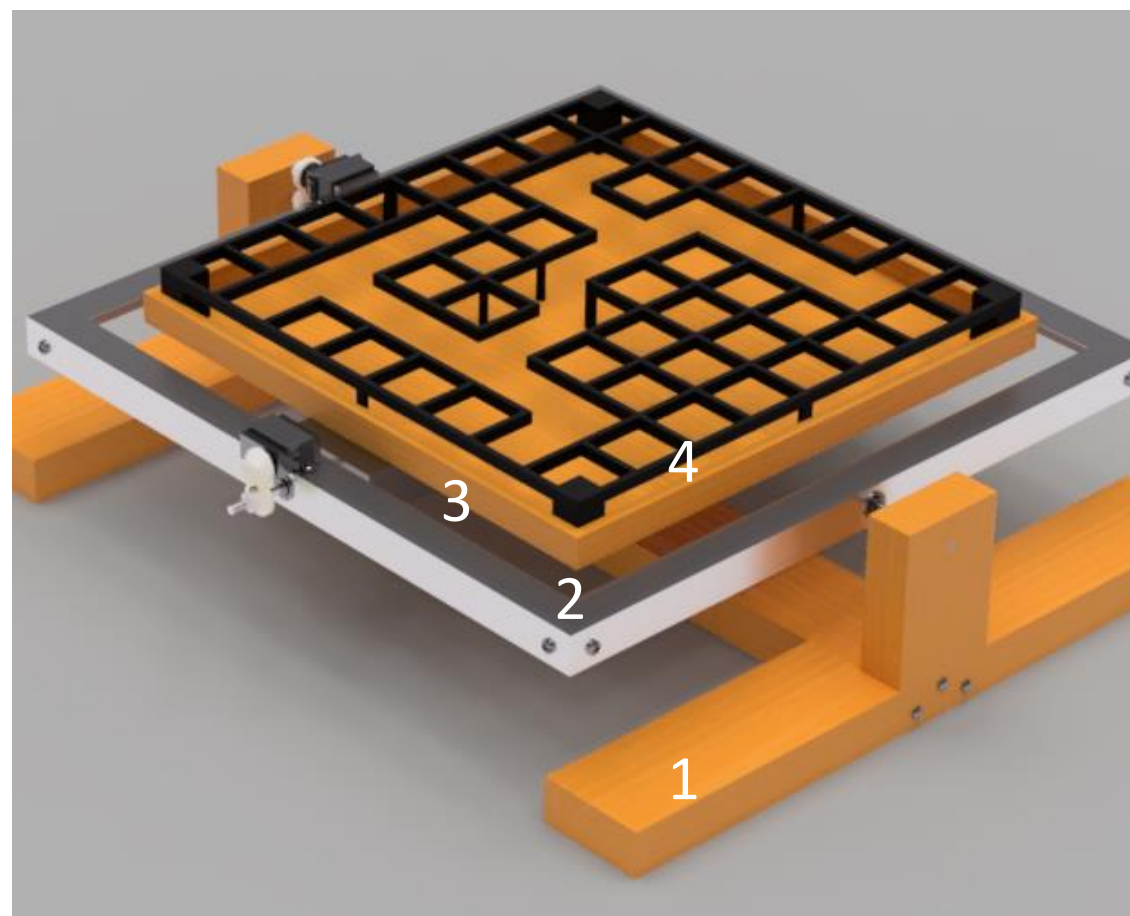
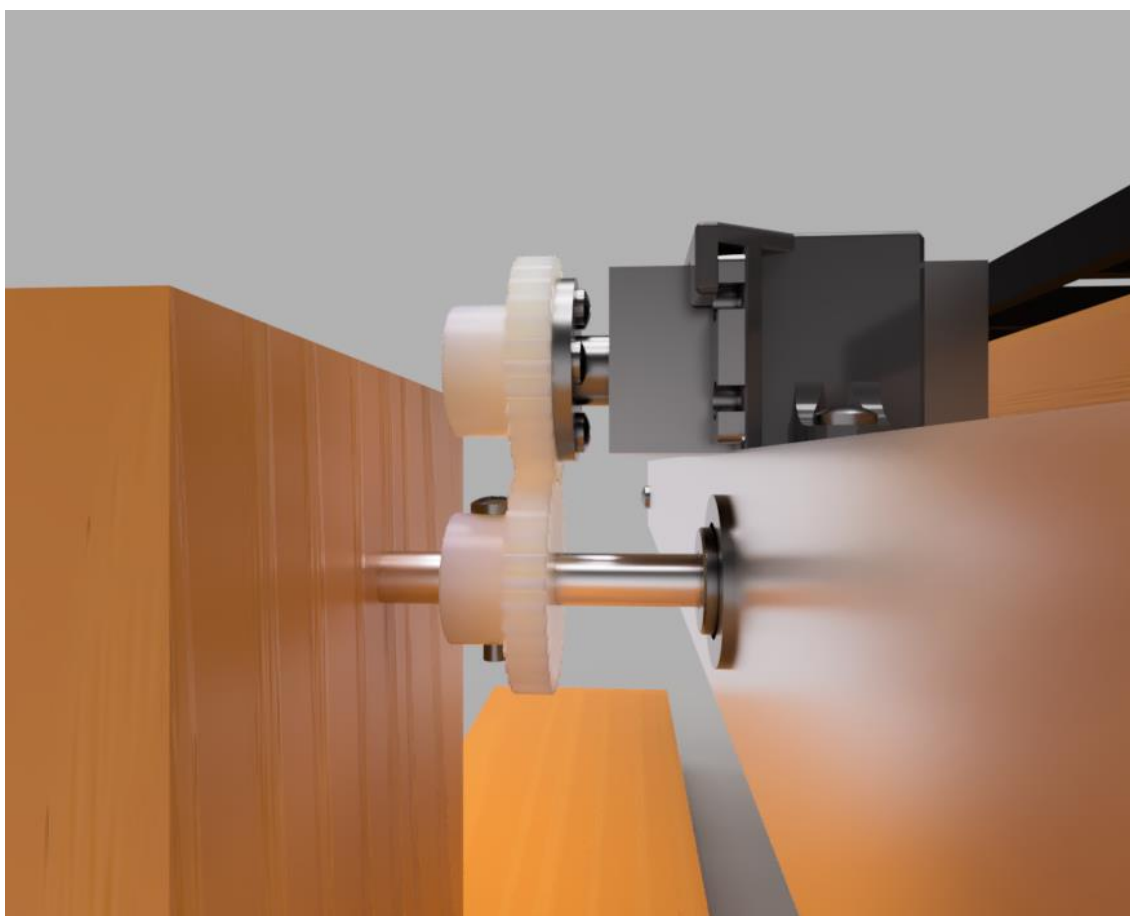
Deliverables

- Safe and accessible for all users, users only reported discomfort when removing disposable electrodes.
- Does not store user data as it could be considered HIPAA protected
- Continuously used for an entire day (8 hours)
- Easily stored for future usage
- Mechanical system is responsive, <1 second delay between user input and game board output
- Modular maze can be easily switched out for multiple game difficulties
- Can be turned over from one user to the next in <30 seconds
- Project and display are educational so that the users may learn about EMG, 93.3% of users polled reported learning something new

Project Background

The goal of this project was to create a tilting marble maze that was actuated by EMG (electromyography) inputs from the user. The game is meant to be collaborative in that there are two axis of rotation that are controlled by different users. The game also has a one player mode where one axis of rotation is fixed, and a single user controls the other axis. This project is loosely based off a previously mass distributed game, Mindflex™ which uses EEG.

Mechanical Design

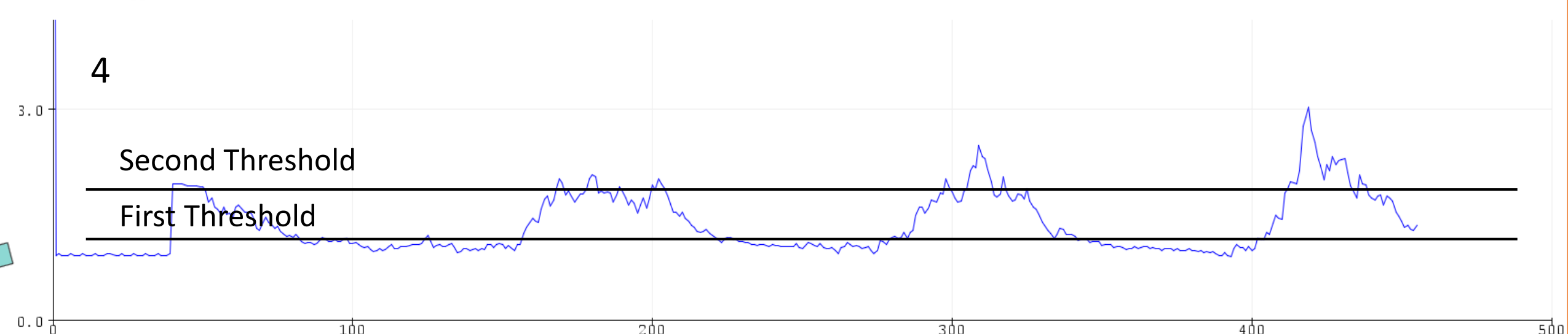
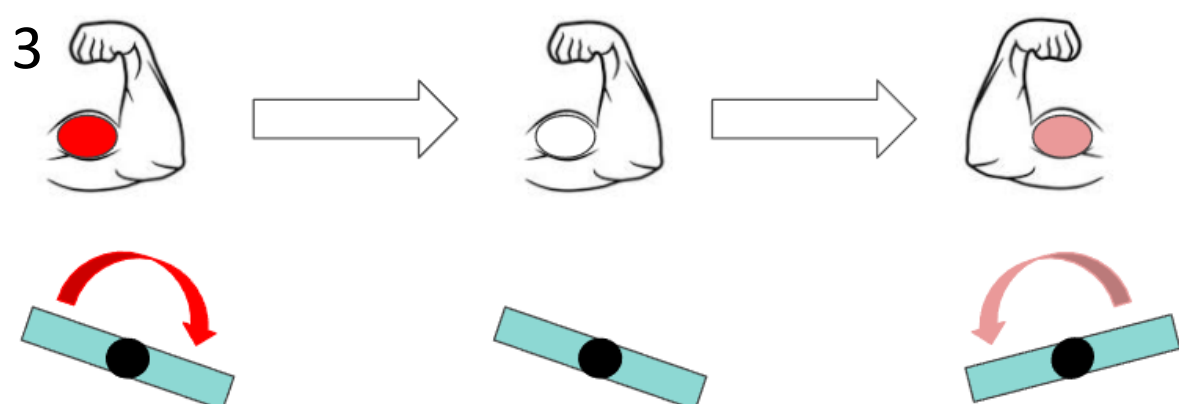
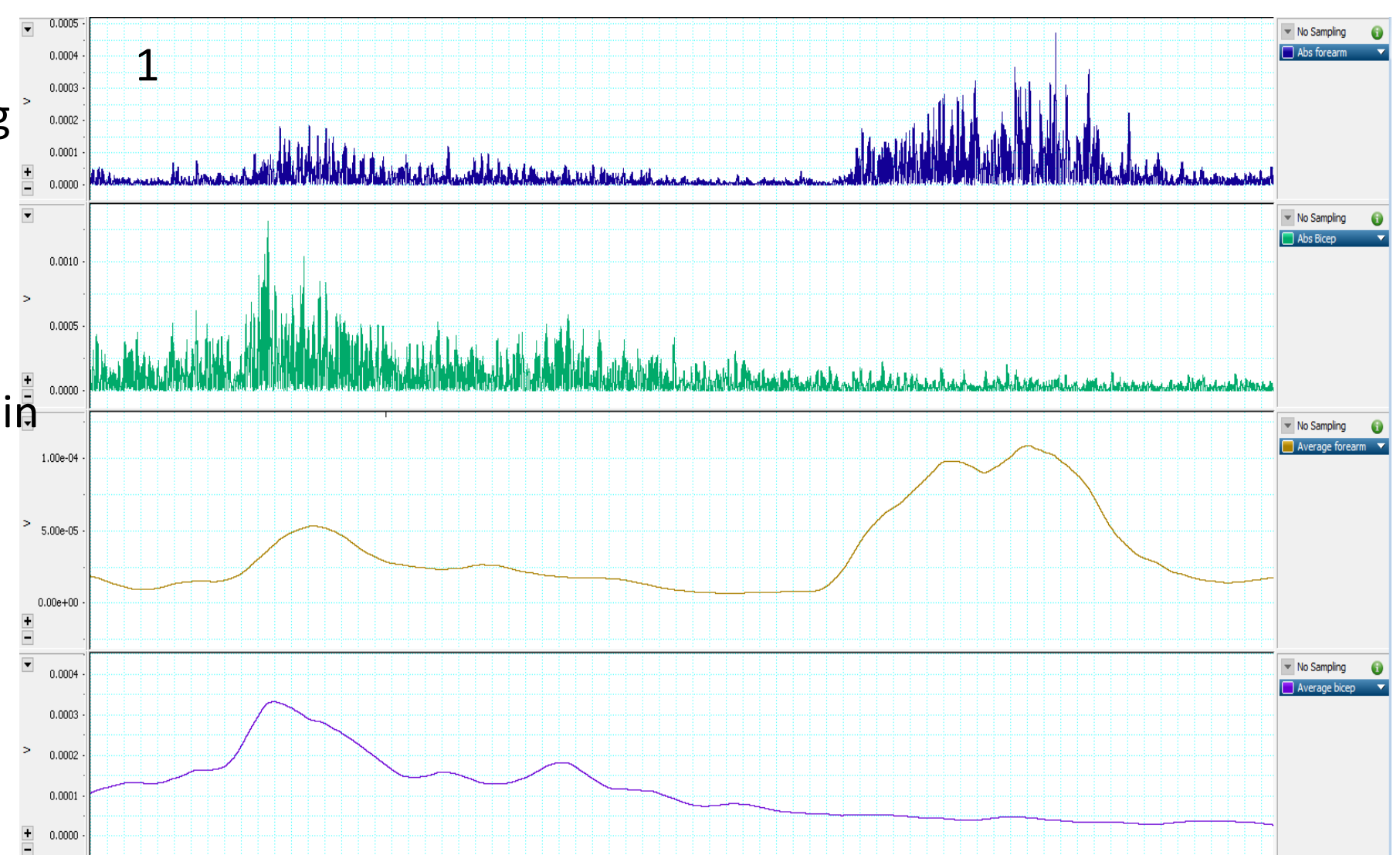


- Pololu 1501MG High-Torque Servo motor
- Shaft supports weight, servo produces torque, gears transmit it to shaft
- Four main components:
 1. Stand-Constructed from 2x4 to support the rest of the assembly
 2. Frame-Constructed from angle aluminum extrusion due to its good moment of inertia
 3. Game Board-Made from plywood and can easily accommodate multiple game boards
 4. Maze-3D printed into four quadrants which sit inside the game board and are secured by implanted magnets, can easily be switched out

EMG Signal Collection and Processing

- EMG signal collected using myoware sensors [2] and reusable silver chloride electrodes
- Sensors on two different muscle groups (left and right biceps) [3]
- The collected signals are filtered and smoothed using a moving average function [1]
 - Channel 1 and Channel 2 are raw, unprocessed signals
 - Channels 3 and 4 correspond to Channels 1 and 2, respectively but are filtered and smoothed
- Flexing left arm tilts board uniaxially left and vice versa [3]

- Max flexion signal collected at beginning and allows for thresholds for tilting speed [4]
- Myoware and electrodes contained in housing attached to spandex sleeve [2]



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