BabyBot 2024: Automated Physical Therapy

BabyBot — Transforming Care Through Play

Abbi Gritt | Daniel Vandeveer | Jason Woo | Keshav Taneja | Noah Baum

Background

BabyBot started seven years ago with the goal of automating physical therapy for children with cerebral palsy. Cerebral palsy is the most common motor disability today, but early physical intervention can give children the chance to not be defined by a diagnosis. Using the ease and interactivity of modern technology, BabyBot aims to take physical therapy into the future.

Overview/Design Specs

BabyBot is built on a dual servo motor mechanism with a full 360° of rotation. This allows the bot to move in virtually any direction with a maximum roll angle of ±23°, forward pitch of 20°, and a backwards pitch of 29°. A bosu ball sits on the main chassis for the patient to lie on. Within reach is the gamebar with interactive buttons. At the bottom, we have our main electrical box that houses our Kollmorgen driver and power supply.
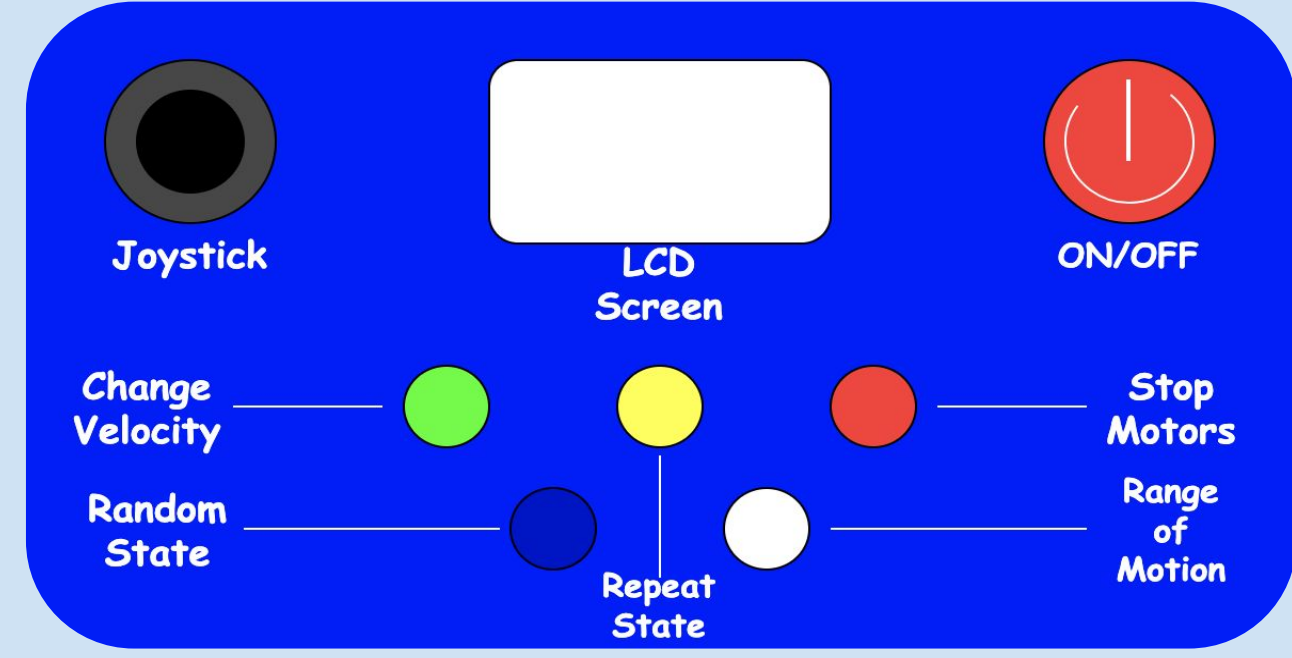
Block Diagram
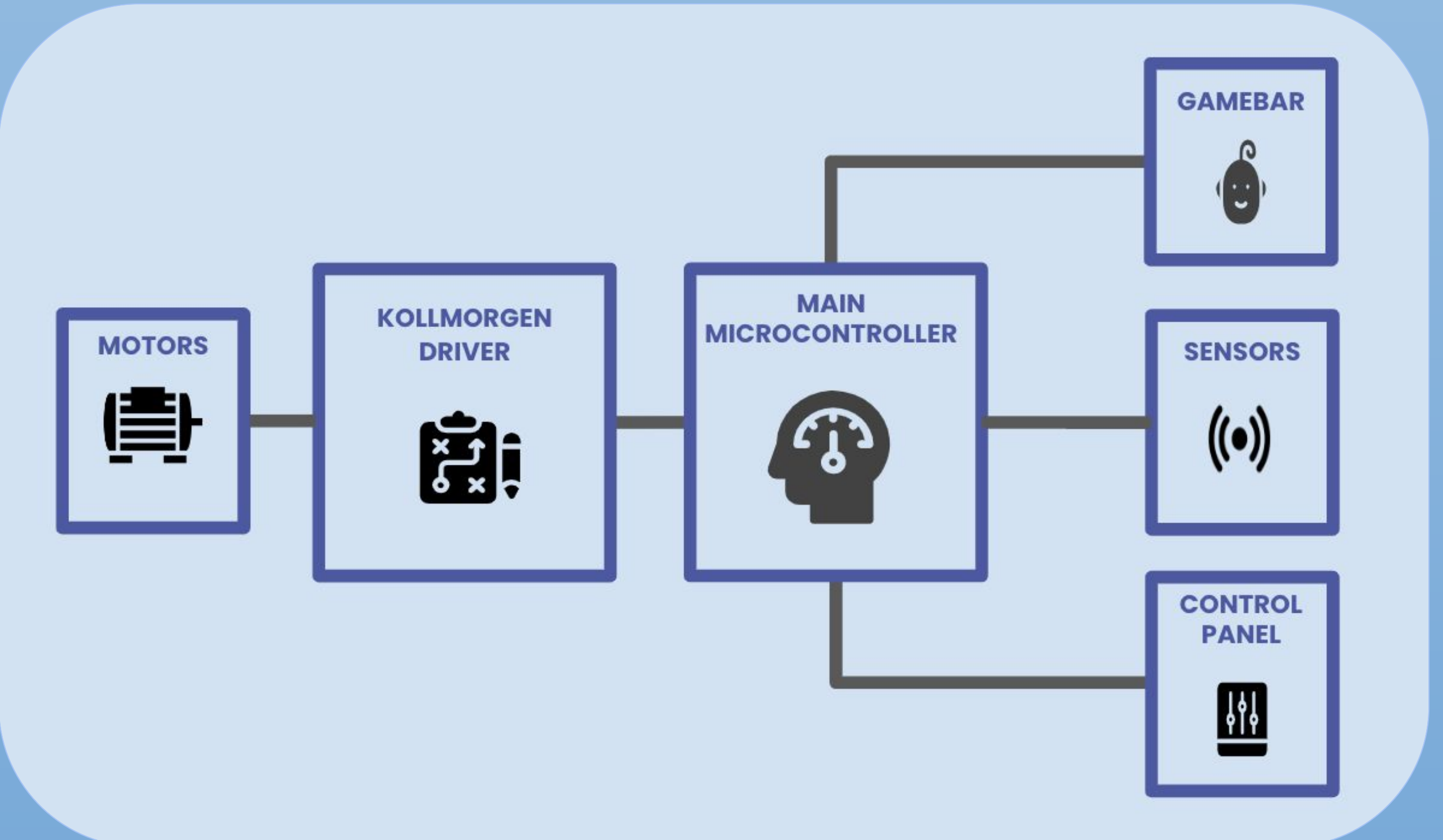
Final Design Components
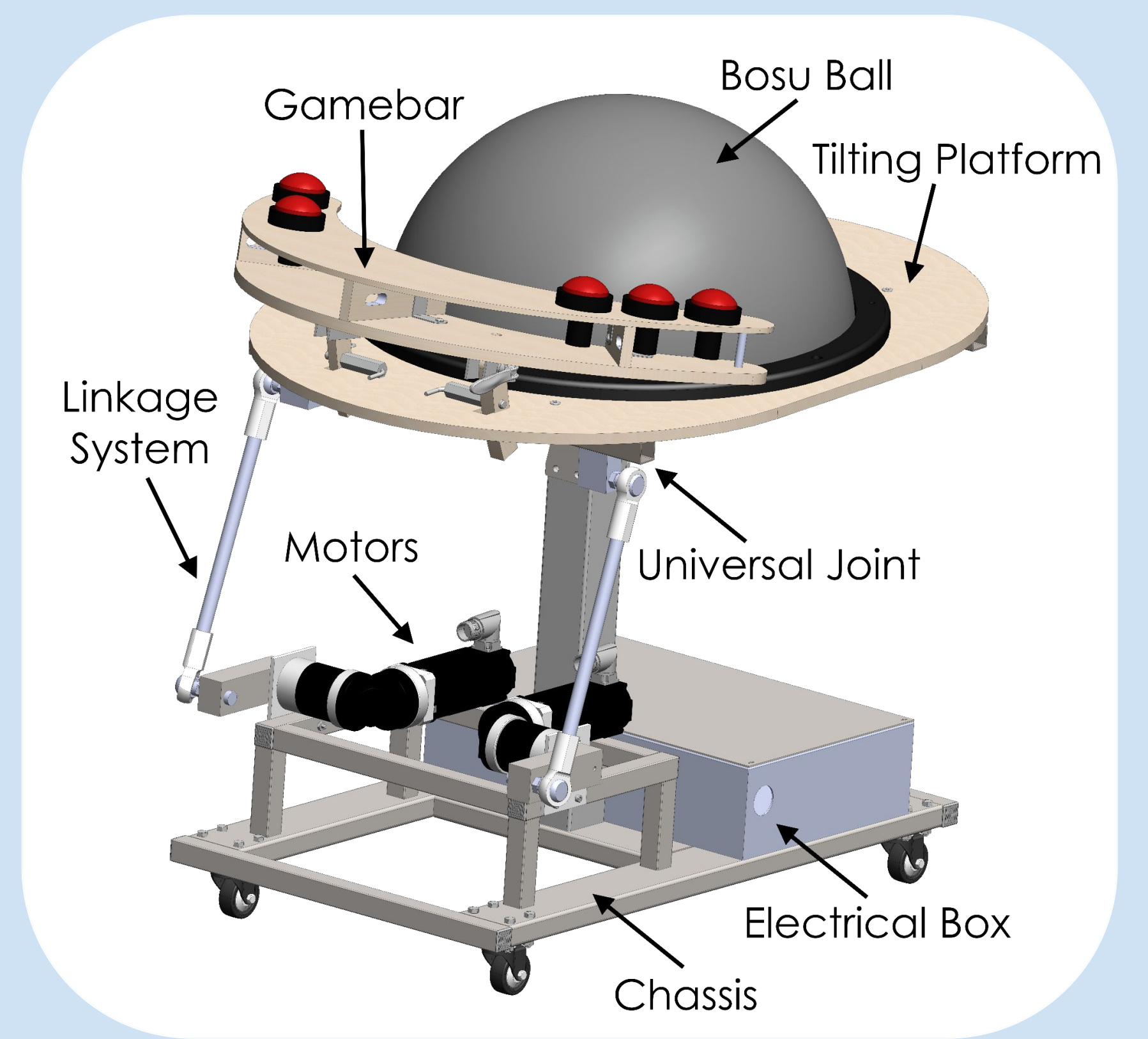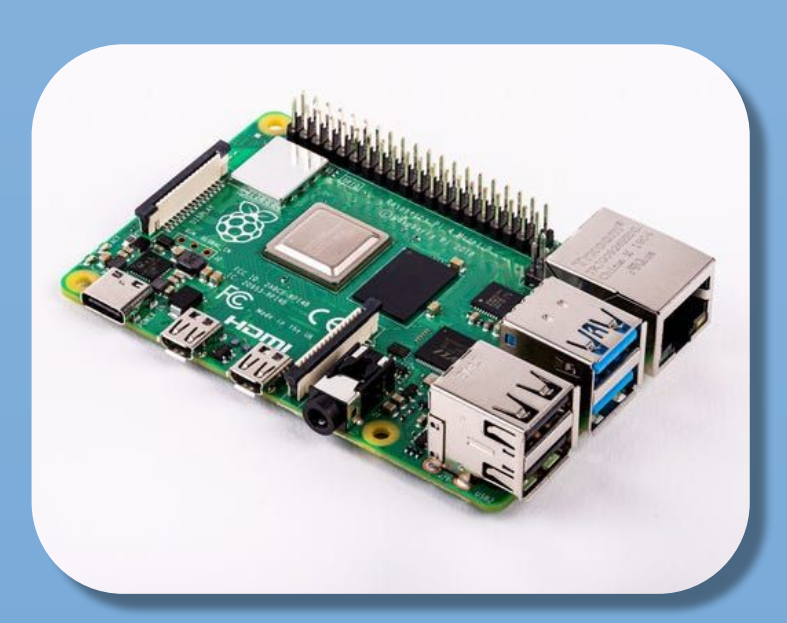

BabyBot

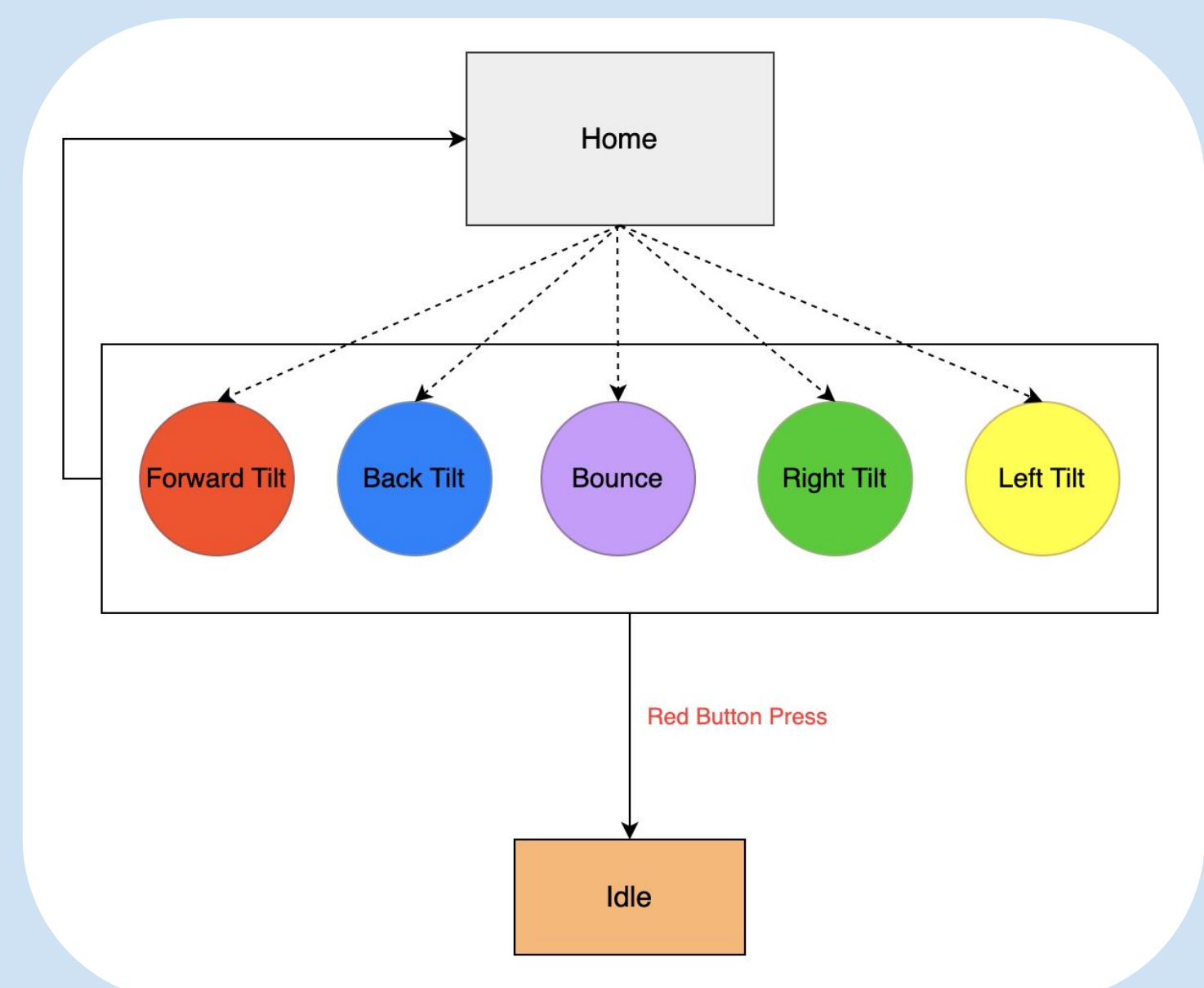**Control Panel**

Game Bar

Key Hardware Parts

Dual Kollmorgen Servo Motors
High-precision servo motors with 360 degree rotation allowing smooth and precise movements.

AKD2G Kollmorgen Driver
Directs both motors on movement, ensuring precise and accurate control.

Raspberry Pi 4
Main microprocessor of the device, handles all computation and communication between user inputs and the AKD2G.

BabyMode

BabyBot engages the users with varied movements, running them in a random order. It monitors preferences through the gamebar and can be controlled manually via the control panel.
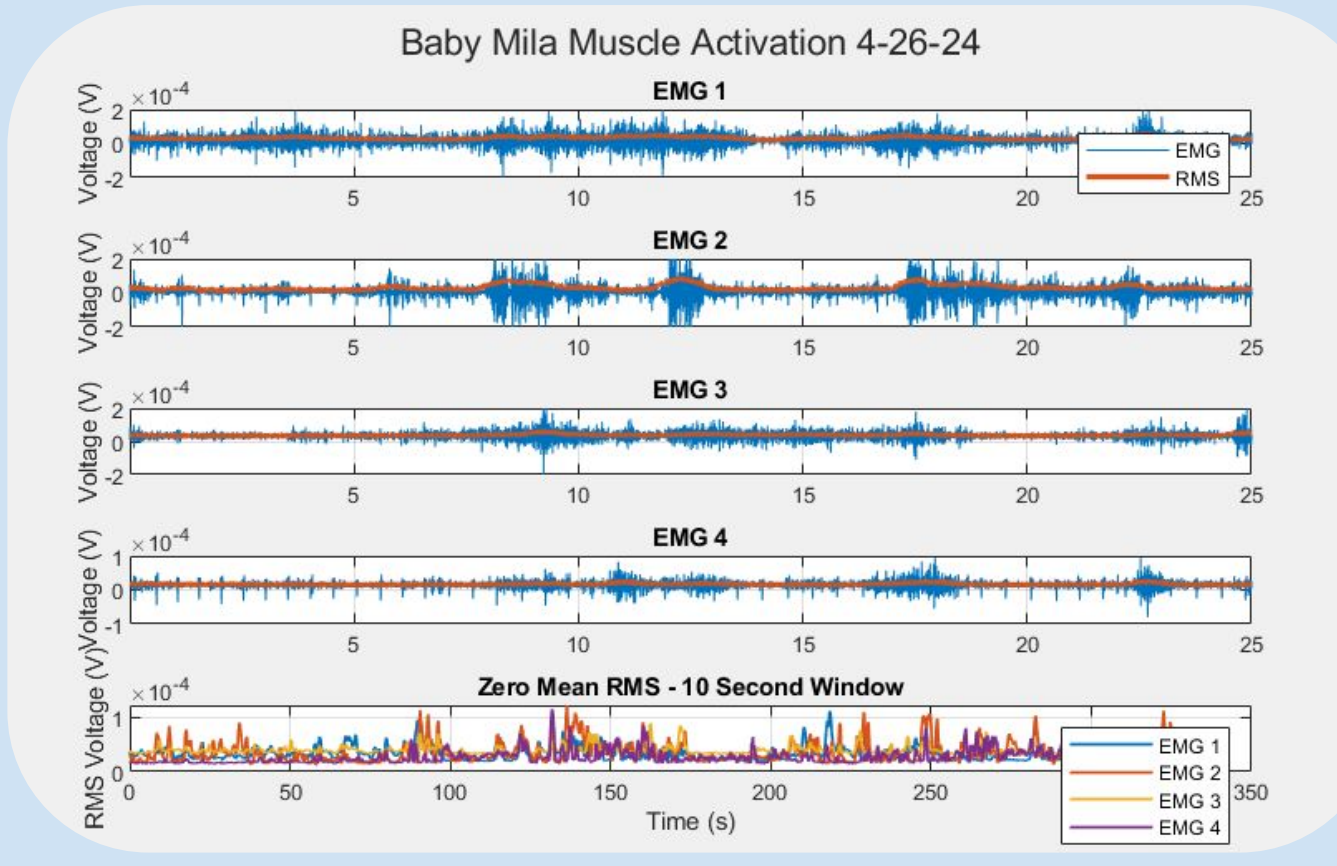
Live Testing

- Baby generally preferred a lower range of motion
- Toys/music were necessary for engagement
- Back tilt was the most uncomfortable sequence

Feedback and Data Collection

Collected position, velocity, roll, pitch, and yaw data for each of the five movements

EMG feedback response records patient's muscle contractions whilst in therapy

Lab D4H

UCSB Robotics — robotics.ece.ucsb.edu

UC SANTA BARBARA
College of Engineering