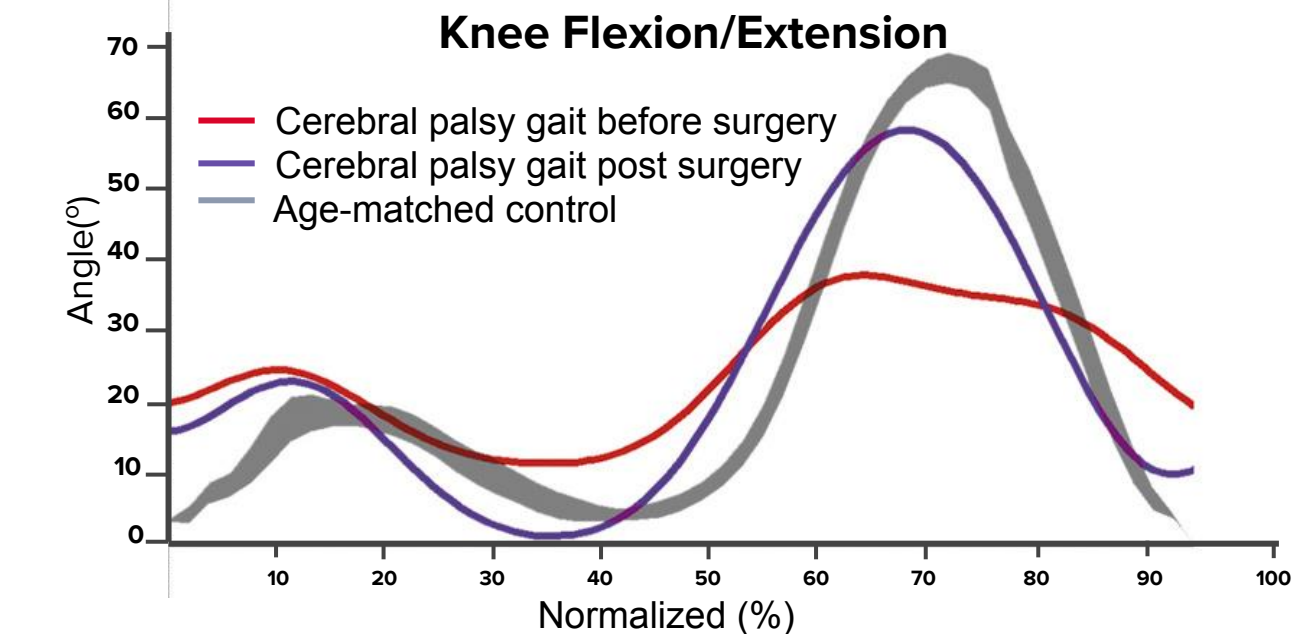
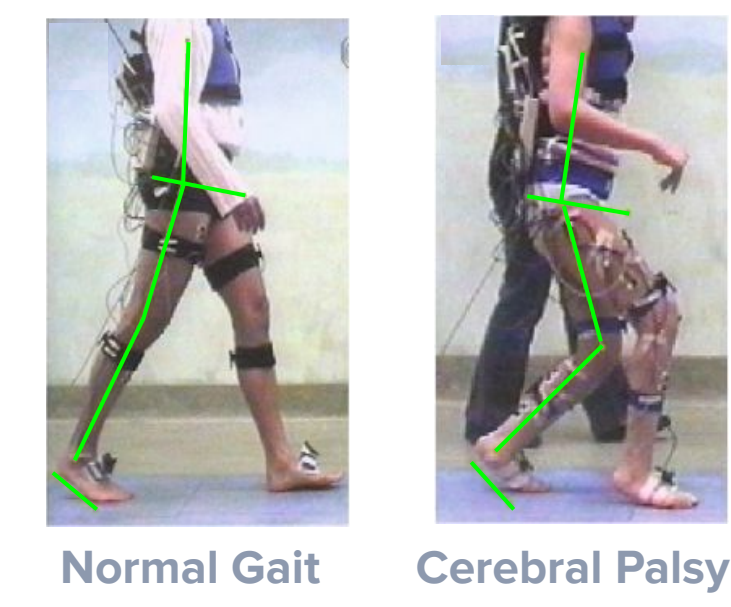


Group Two: Viswanath Gorti, Zain Kazi, Nikita Kedia, Mateo Reveiz, Janette Yacynych
 Advisors: Dr. White, Department of Bioengineering, University of Maryland and Dr. Pergami, Children's National

Motivation



Cerebral Palsy is the most frequent cause of motor disability in children and causes complex & heterogeneous **gait deviations**.

Objective

Existing treatment methods include frequent physical therapist sessions that are **time consuming** and **expensive**.

We aim to develop an **at-home** and **affordable** gait monitoring system that enables patients to make **significant improvements** and thus increase their **independence** and **quality of life**.

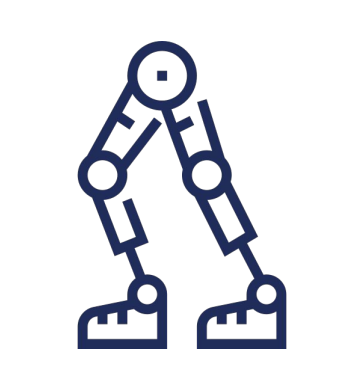
Ethical Considerations



Child safety



Physician-patient relationship



Comfort of device



Affordable to all patients

Methods and Results

Approach A: Stretch Strain Sensor

Model a **parallel plate capacitor** using conductive fabric & cured silicone dielectric

Calculate **voltage drop** of the sensor during stretch

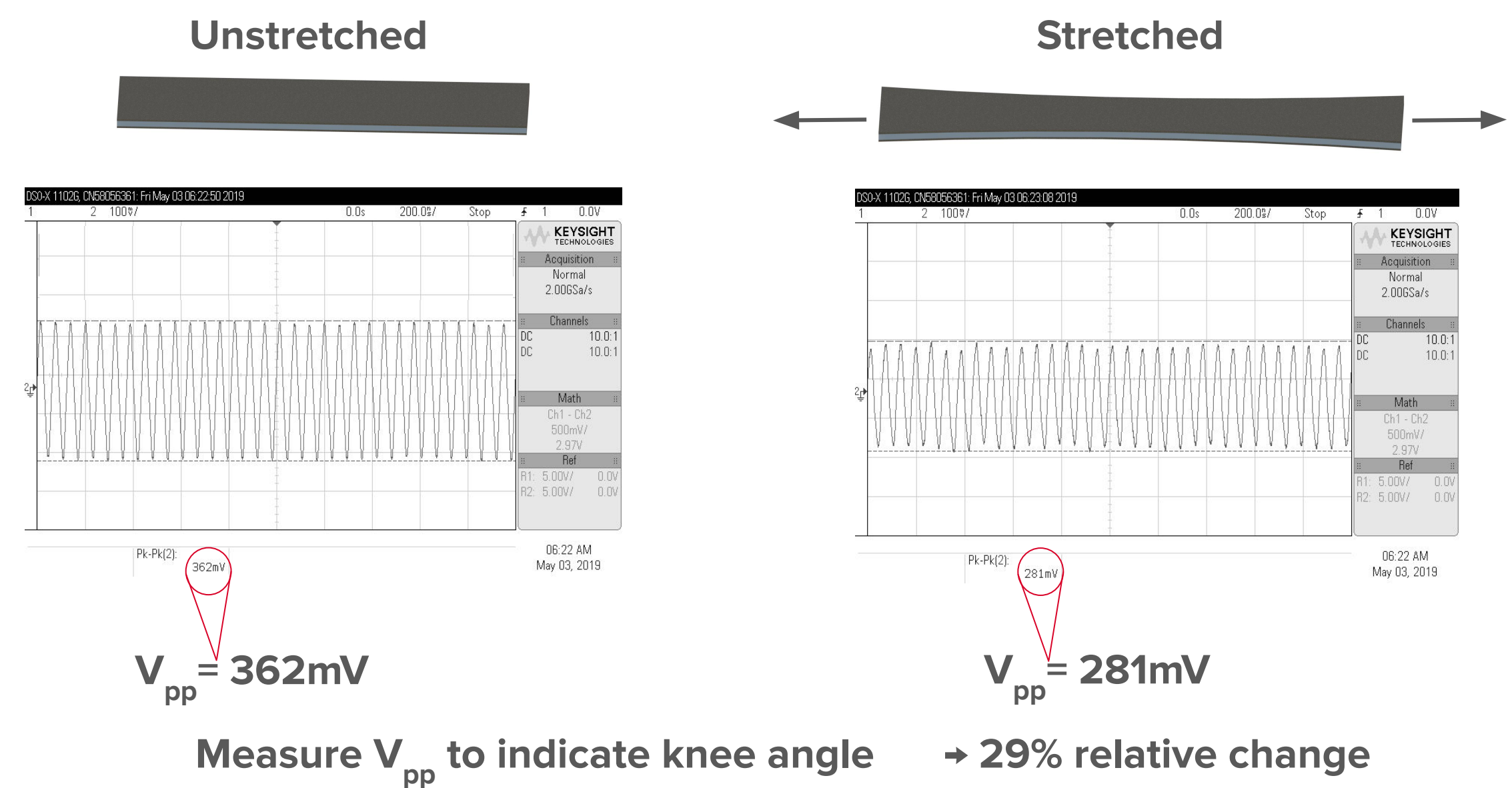
When **flexion is 0°** the recorded voltage will equal the baseline voltage



Fabrication

- Step 1:** Attach wires using iron-on decal
- Step 2:** Ecoflex™ silicone is mixed 1A:1B by weight and cured on a hot plate in a 3D printed mold made for reproducibility
- Step 3:** Use thin layer of uncured silicone to attach the conductive fabric on each side of the rubber silicone. Cut sensor to size.

Results

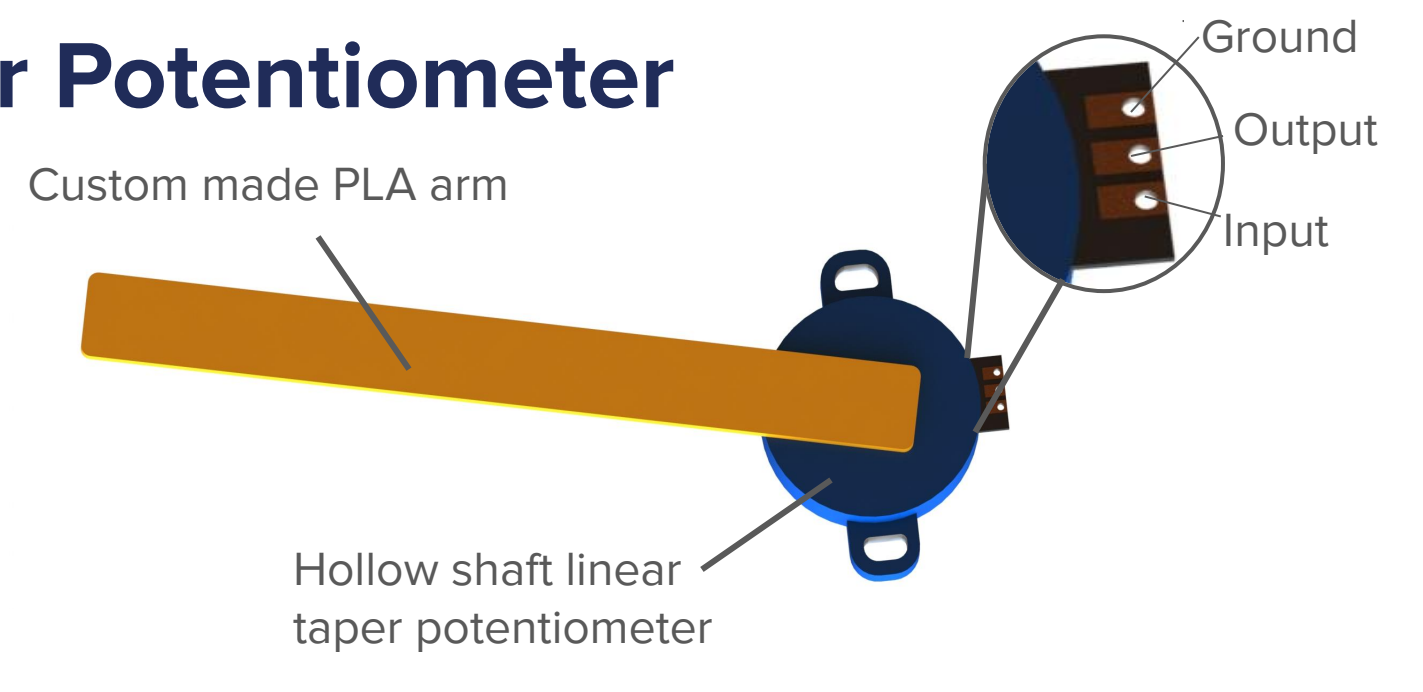


Approach B: Linear Taper Potentiometer

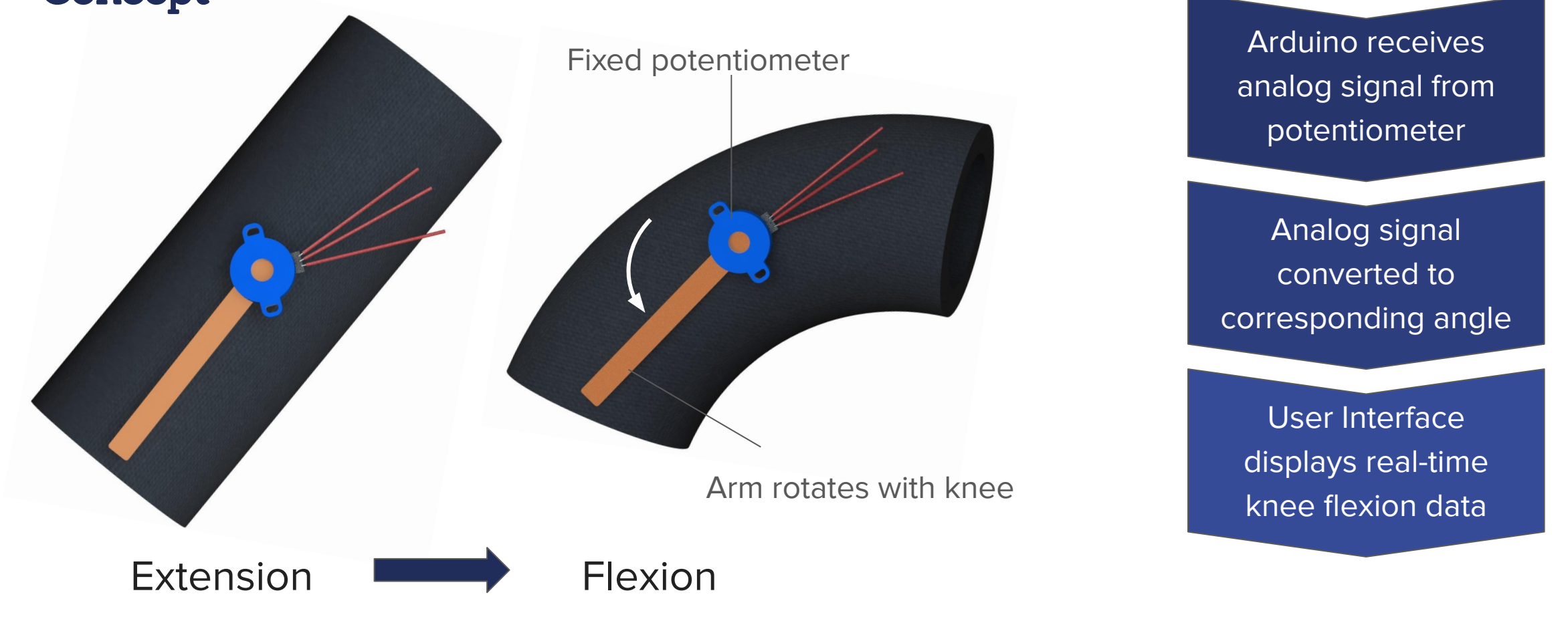
Use a **linear taper potentiometer system** to calculate knee flexion angle

Convert **analog signal** to the corresponding angle

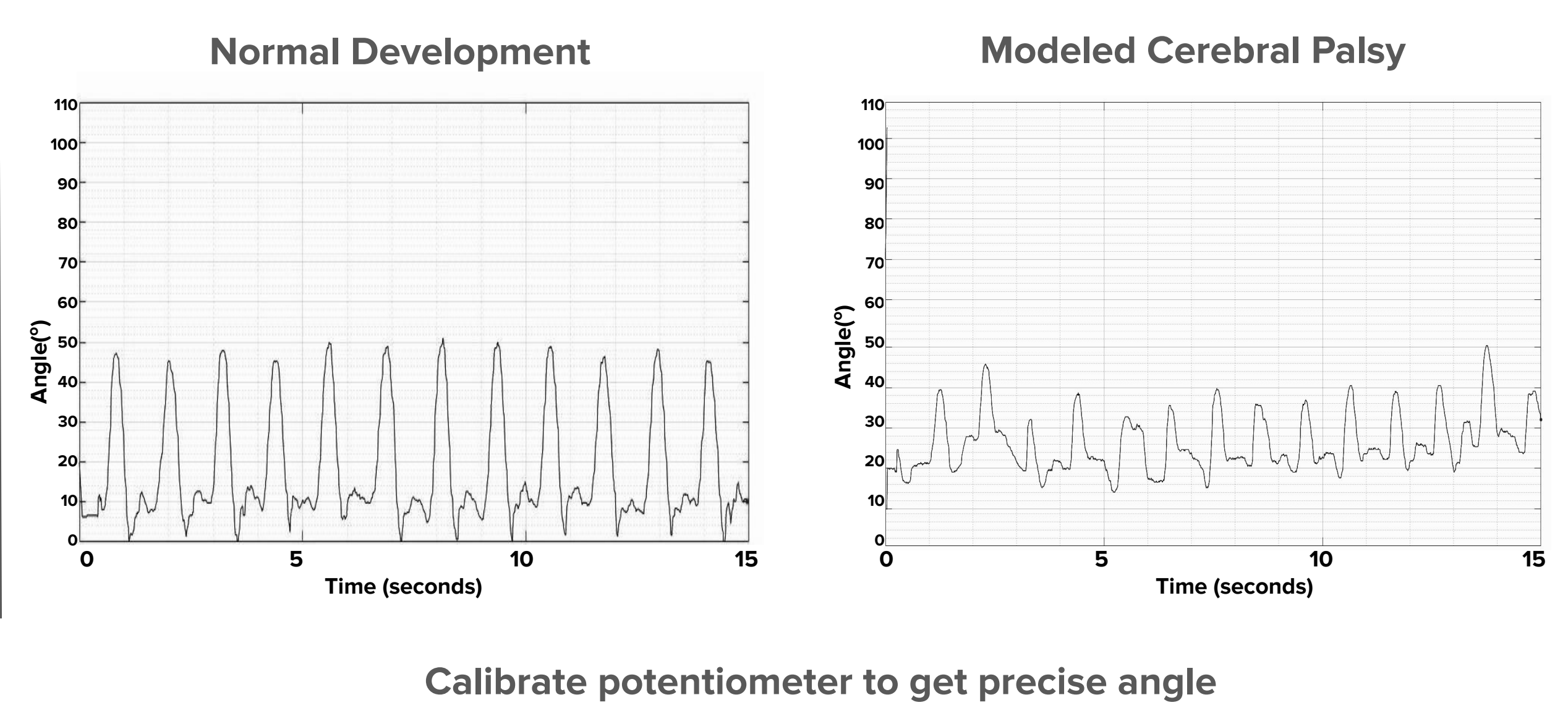
Record each gait cycle and observe if patient can hit **0° flexion** with every step



Concept

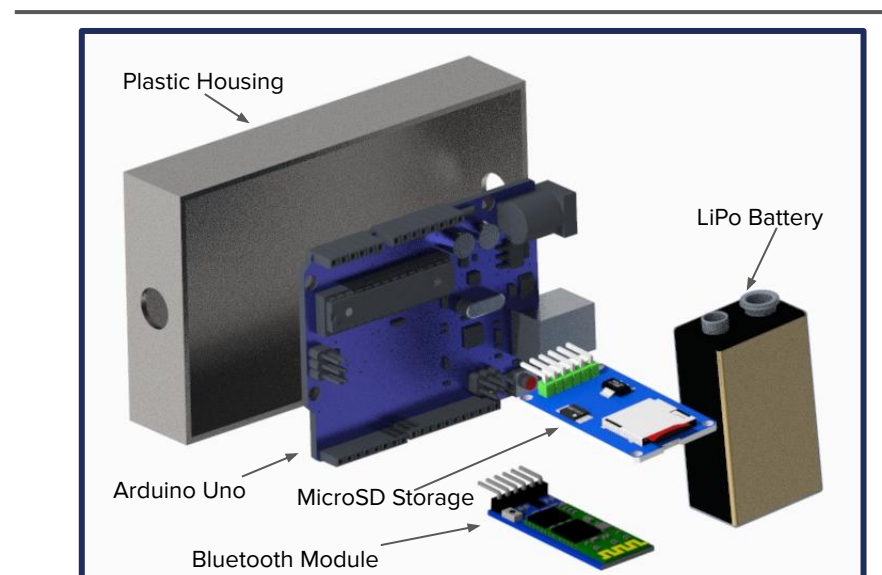
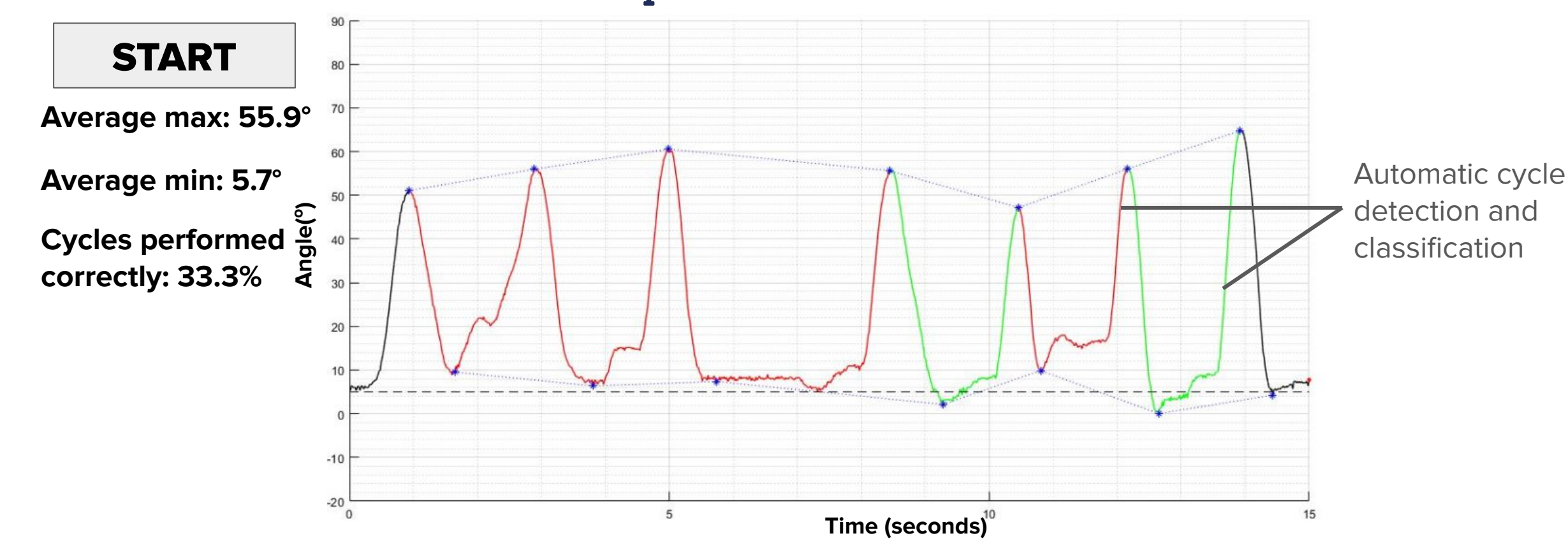


Results

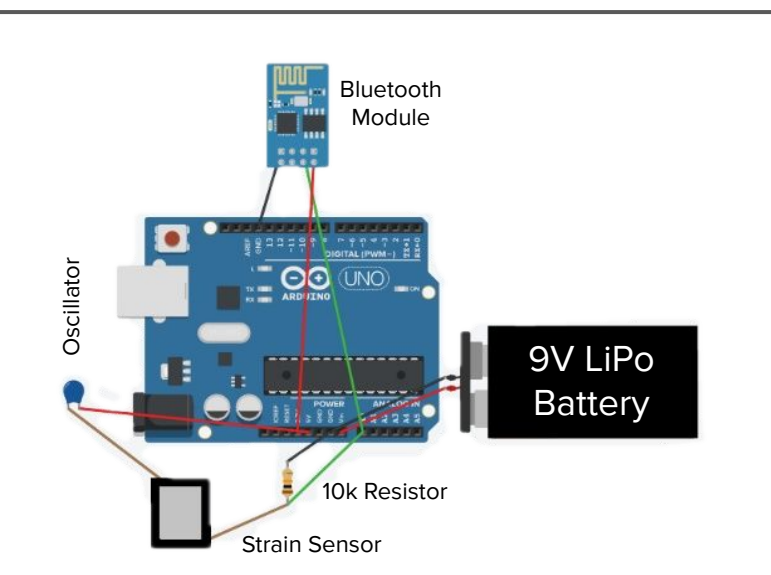


Software and Electronics

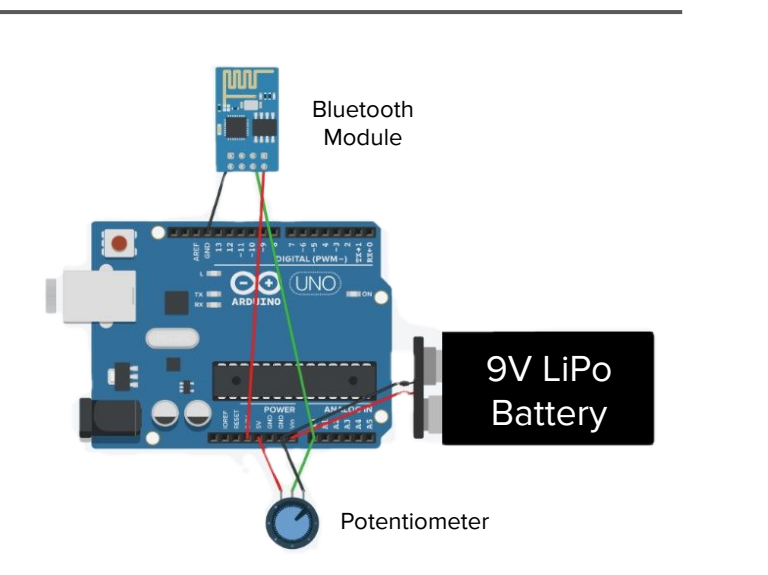
Graphical User Interface



CAD rendering of box which will house all electrical components



Circuit diagram of the strain sensor design.



Circuit diagram of the potentiometer design.

Conclusion and Future Work

Conclusion

The **potentiometer system** provides a more **precise** knee flexion angle measurement and enables real-time **feedback** and **classification** of gait cycles

Future Work

- Sleeker design** to improve comfort of device
- Pair device with **step sensor** for a more detailed analysis of gait
- Adjustability** for wider age range and broader applications