Care-Mate: Wheelchair Pressure Distribution Mapping System

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Background & Introduction

- **2.7 million** Americans used a wheelchair in some capacity in 2015[1]
- **60%** of people who are wheelchair bound due to a spinal cord injury will suffer from pressure ulcers[2]

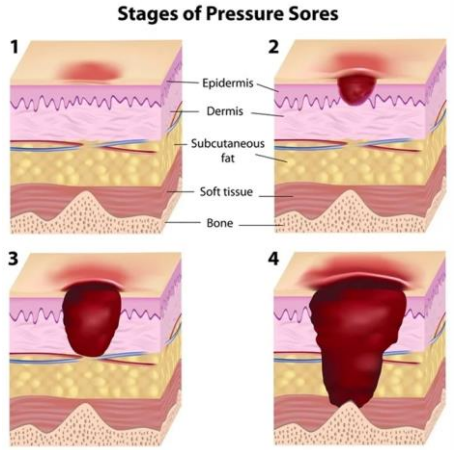
Problem and Objective

Patients that are bound to wheelchairs suffer from restricted blood flow.

- This leads to the formation of pressure Ulcers
- These Ulcers reduce quality of life and increase the chance of infection

Prevent the formation of pressure ulcers in disabled patients

Design and build an application that will read and display pressure sensor information

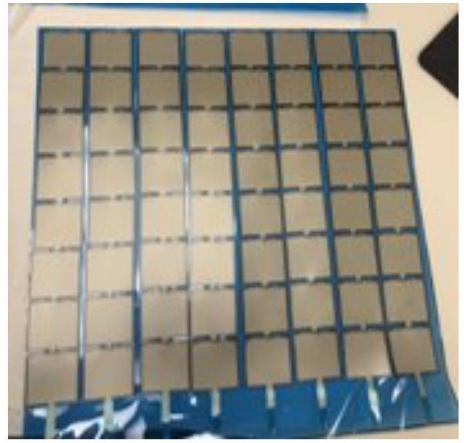


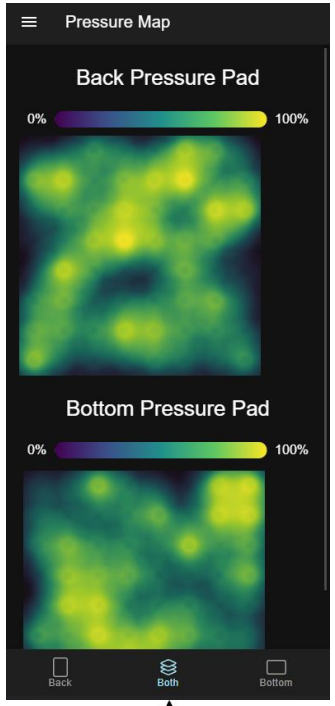
Xsensor ForSite SS mat

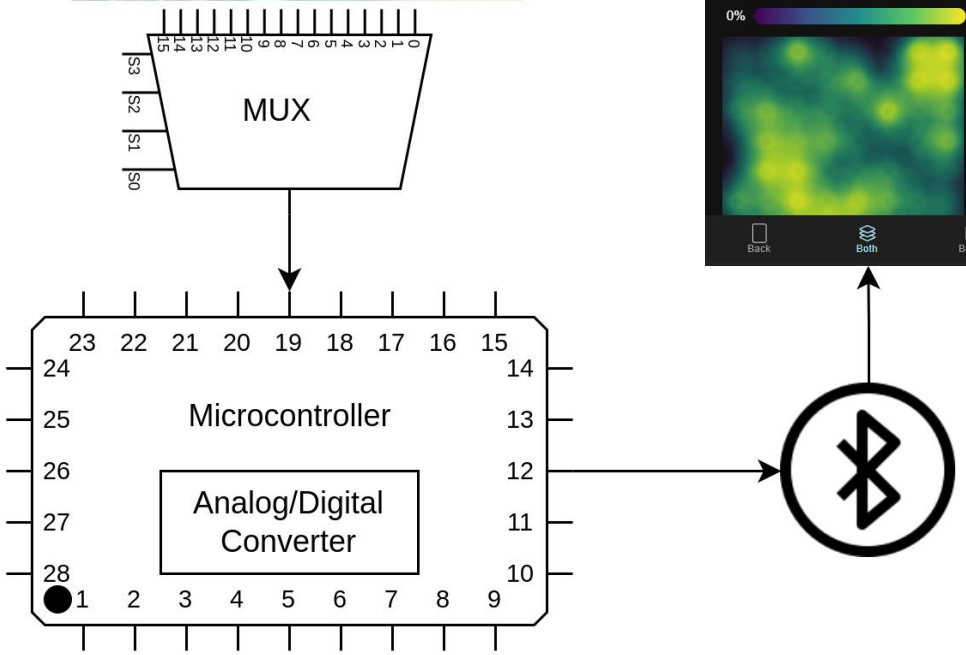
Hardware

Datapath

- Microcontroller selects MUX input to read raw sensor data
- Data converted through A/D converter one at a time
- Data serially transmitted to phone through HC-06 Bluetooth module







Testing

Software

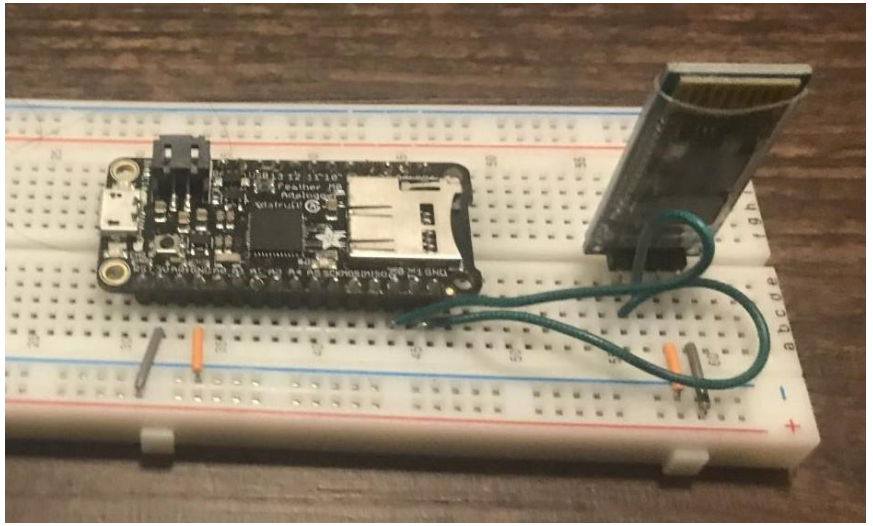
- Mock data composed of 8 – bit binary characters
- Arduino with Bluetooth Module

Hardware

- LEDs for Multiplexer select switches
- Bluetooth terminal receiving sensor data

Integration testing

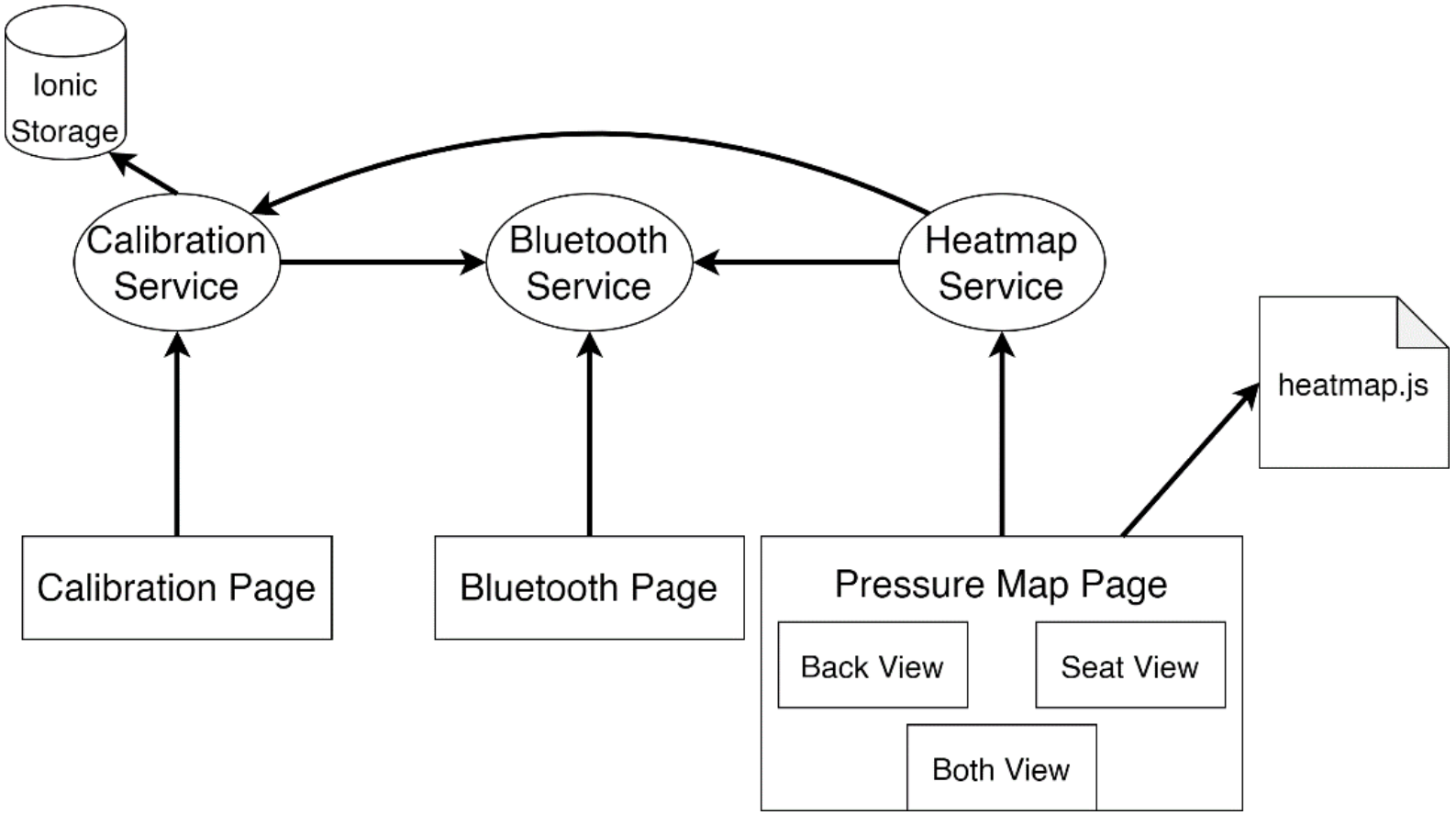
- Sent live data to app to test end-to-end communication



Arduino with HC – 06

Backend Design

- Callback-based event system allows us to update views whenever new data is received
- Three custom services
  - HeatmapService
  - CalibrationService
  - BluetoothService
- Views implemented as Ionic pages. Some pages require sub-pages to function

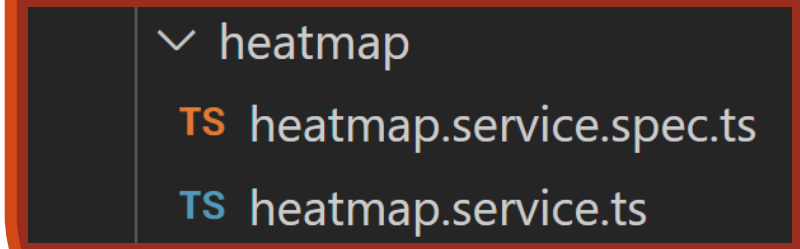


Code Layout – Series of Nested Modules

Services

.service.ts
Provide class/method signatures; Implement logic for the service

.service.spec.ts
Provide unit tests



Pages

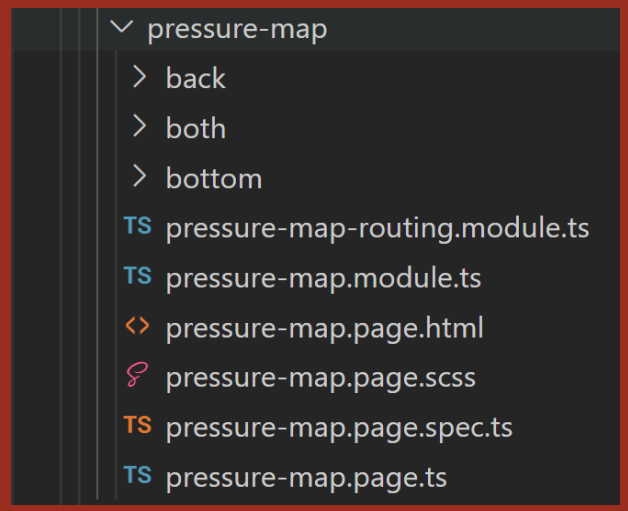
.page.ts
Provide view logic for the page

.page.html
Provide HTML skeleton for page; allows custom tags

.page.scss
Provide CSS styling for the component

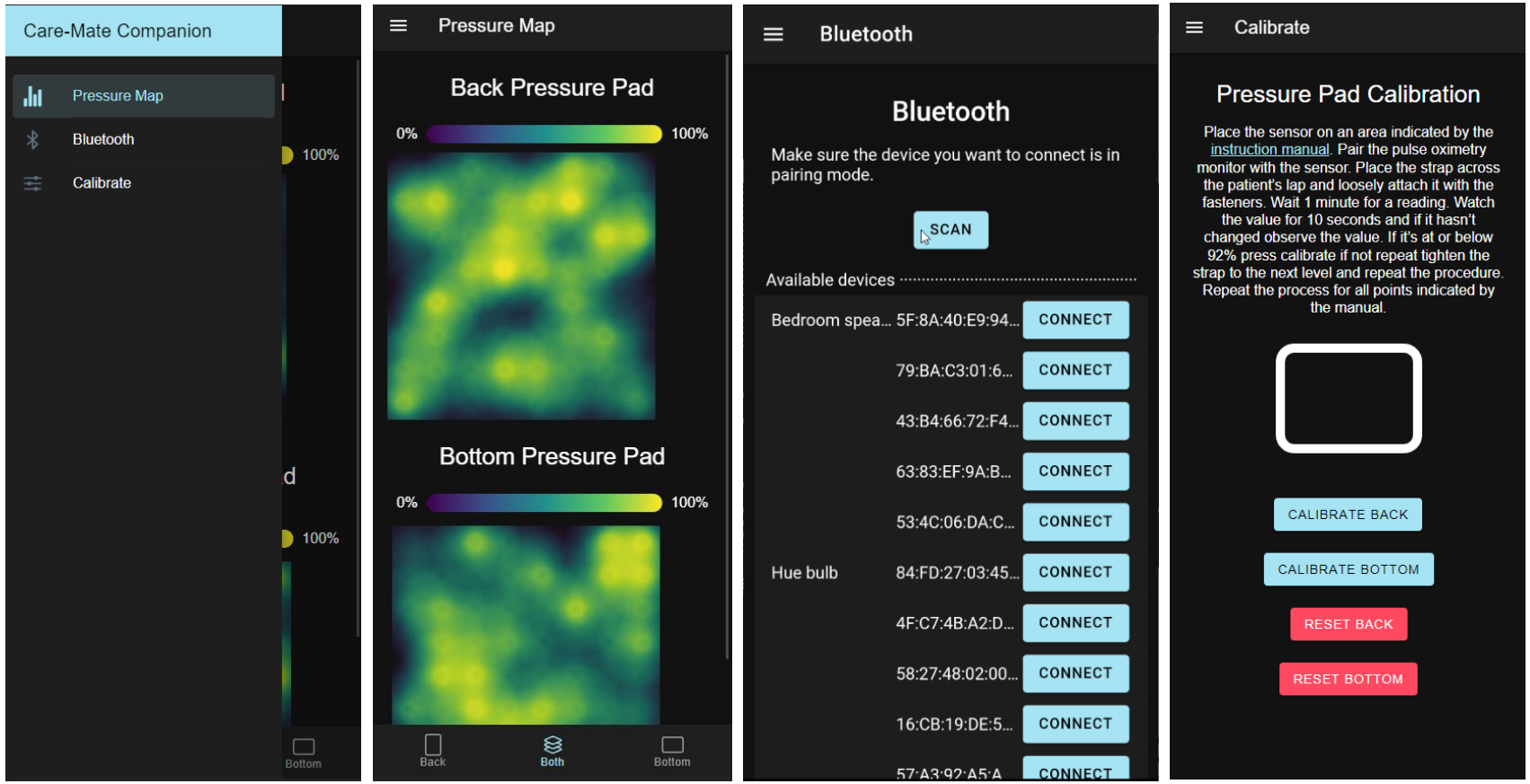
subdirectories
Additional modules used by this one

.module.ts
Declare imported classes; provide routes for pages



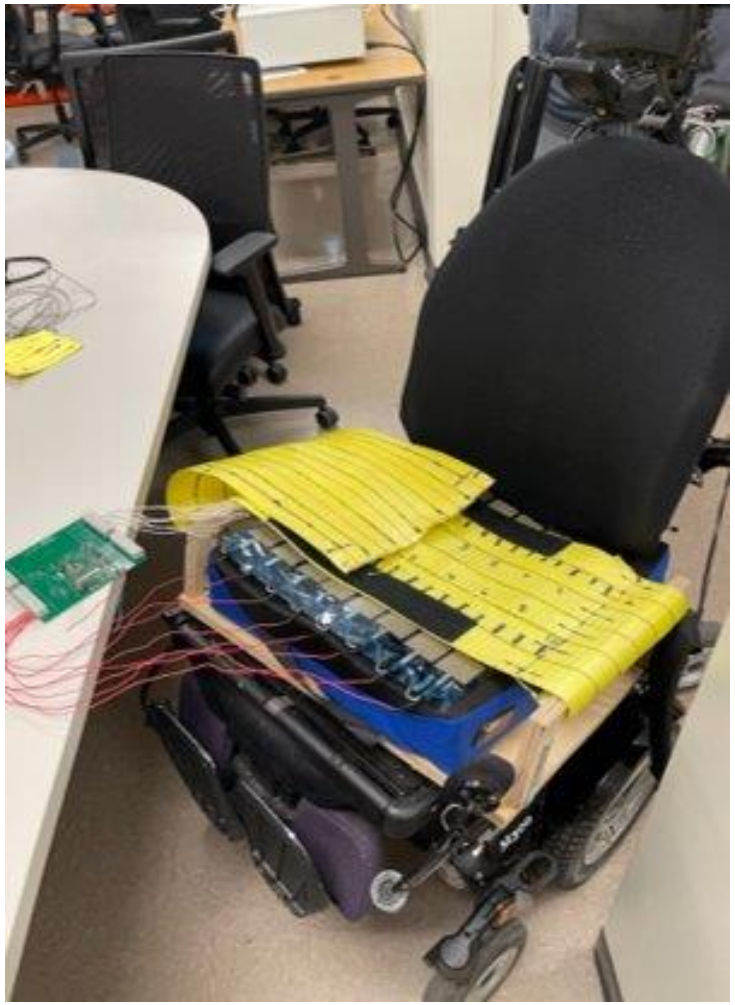
Frontend Design

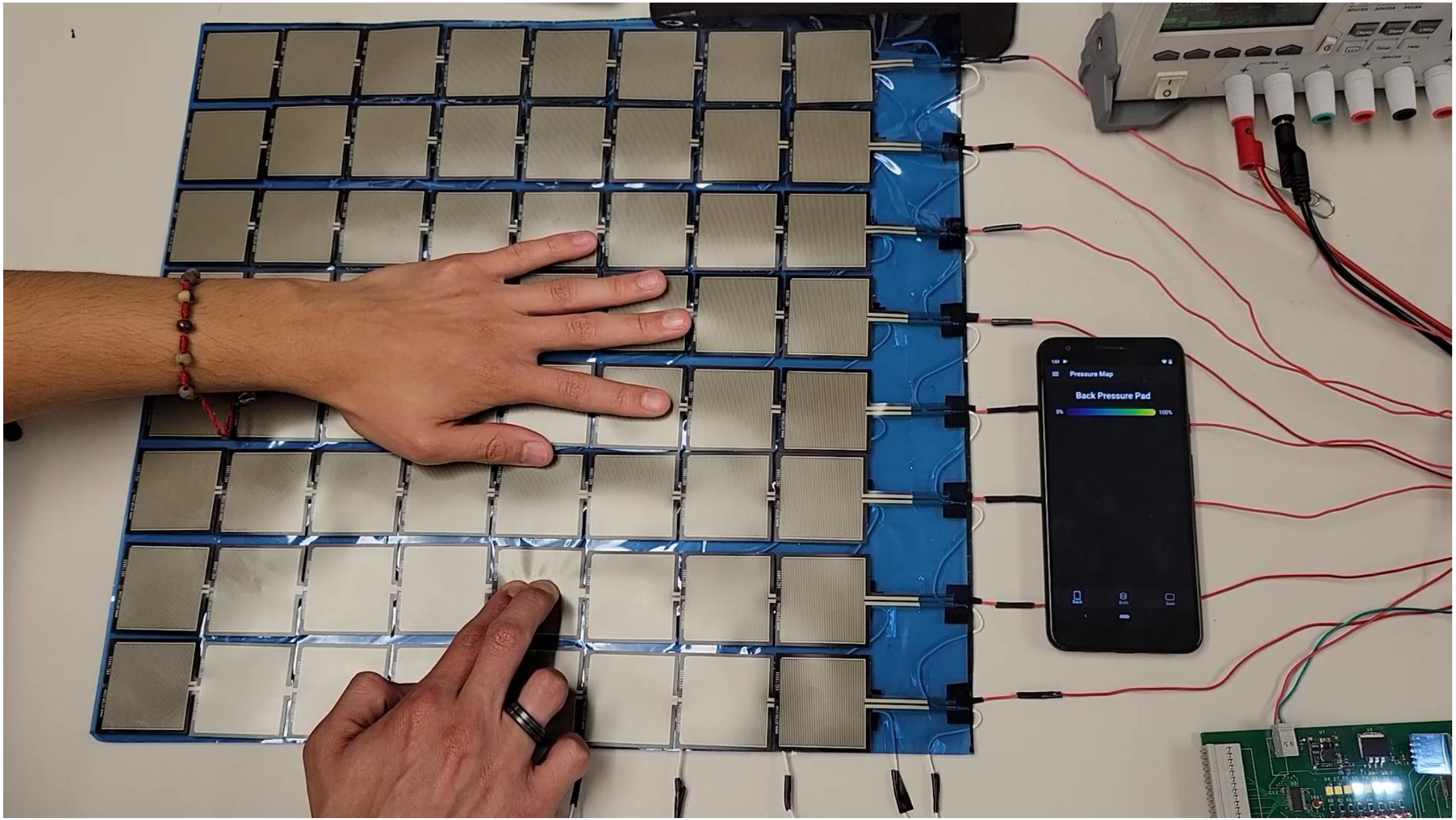
- Neat and Simple
- Light blue
- Navigation
- Pressure map
  - Colorblind assistance
- Bluetooth
- Calibrate

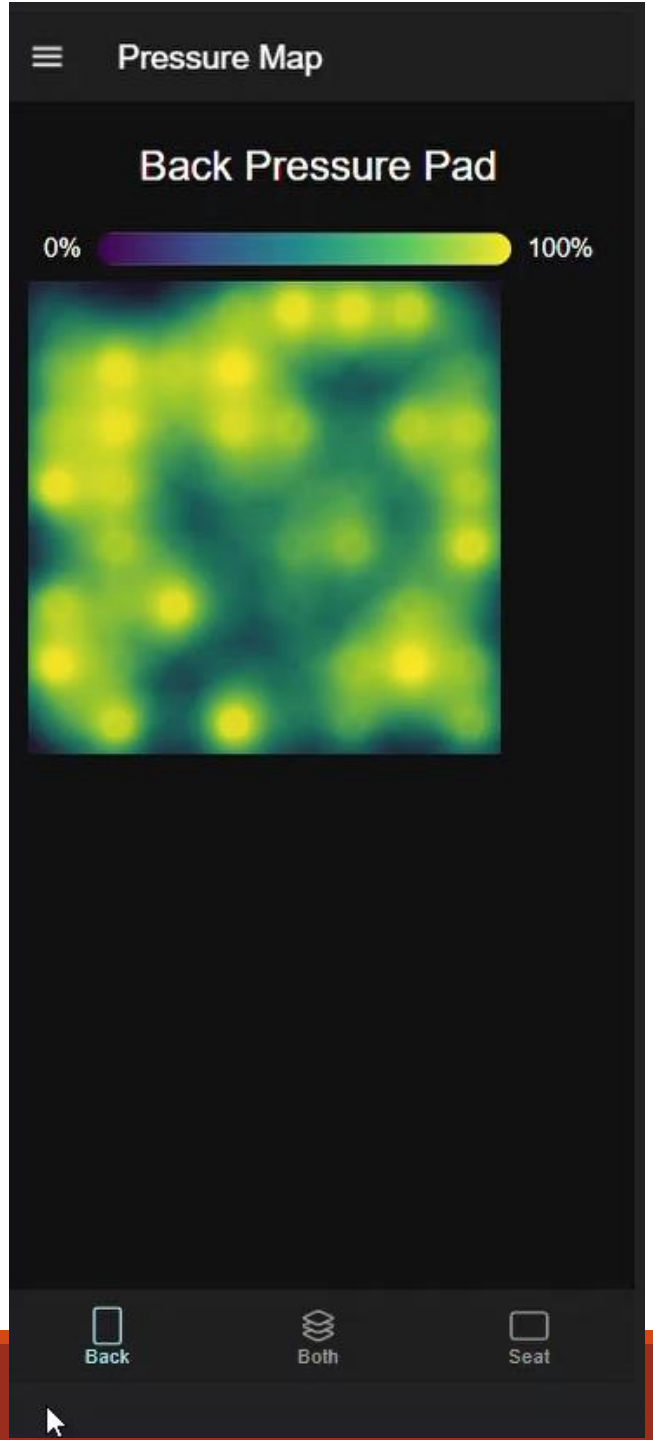


Continuous Calibration System

BMEG




Pressure Map
Back Pressure Pad
0%
100%


Pressure Map
Back Pressure Pad
0%
100%
Back
Both
Seat