Senior Design Project I and Professionalism Fall 2024

Pressure Sensor Patch

sdmay25-12

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Client:

Adaptive Adventures & BAE Systems

Adaptive adventures

BAE SYSTEMS

Agenda

Overview

Project Requirements

Project Plans

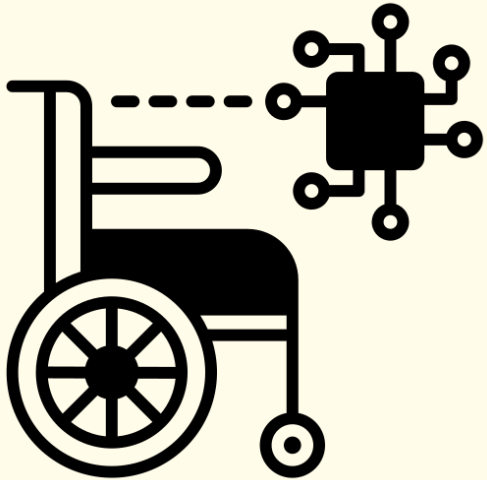
Design

Implementation

Conclusion

Overview

- People with disabilities need special equipment to participate in sports
- Modern technology allows disabled individuals to safely participate in physical activities
- Even with existing equipments, challenges still exist



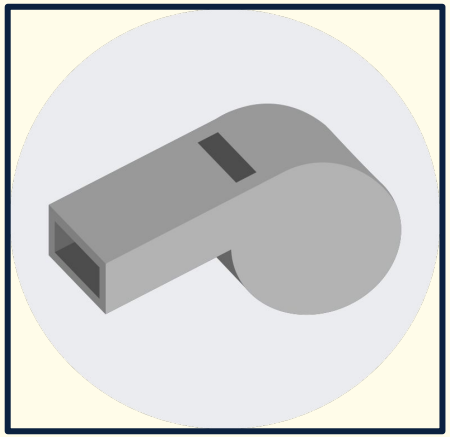
Problem Statement

- People with lower extremity damage or related disabilities may not sense incorrect sitting posture.
- Prolonged incorrect posture can cause pressure sores on the sit bones.
- Severe pressure sores can lead to life-changing consequences or even be fatal.

Intended Users

Athletes with Adaptive Equipment

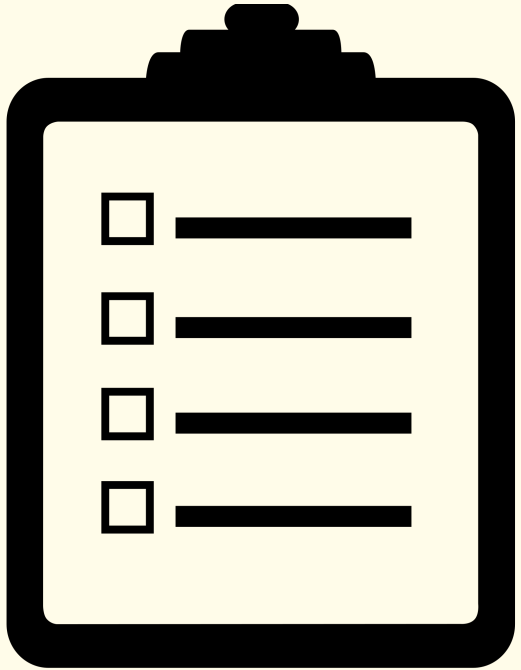
Caregivers/Coaches for Adaptive Sports Athletes



Medical Practitioners and Healthcare Providers

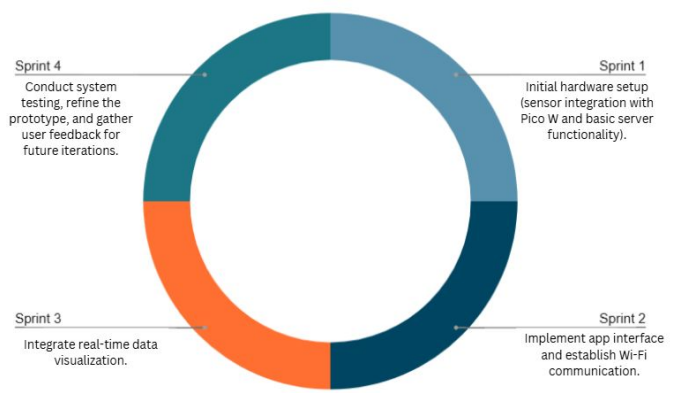
Requirements

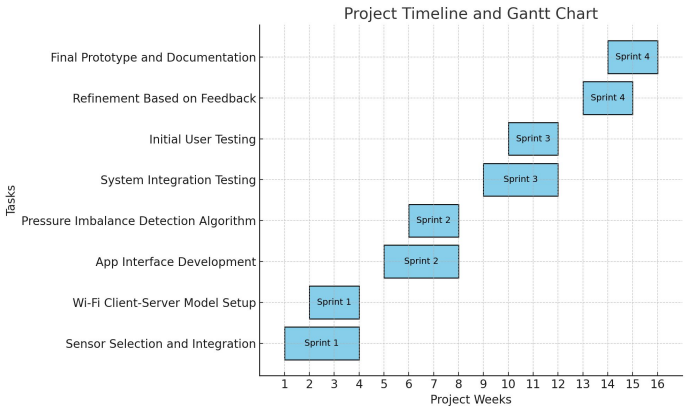
- Detects high pressure levels
- Threshold-based alerts
- Comfortable to sit on
- Easy to use
- Multipurpose



Project Plan

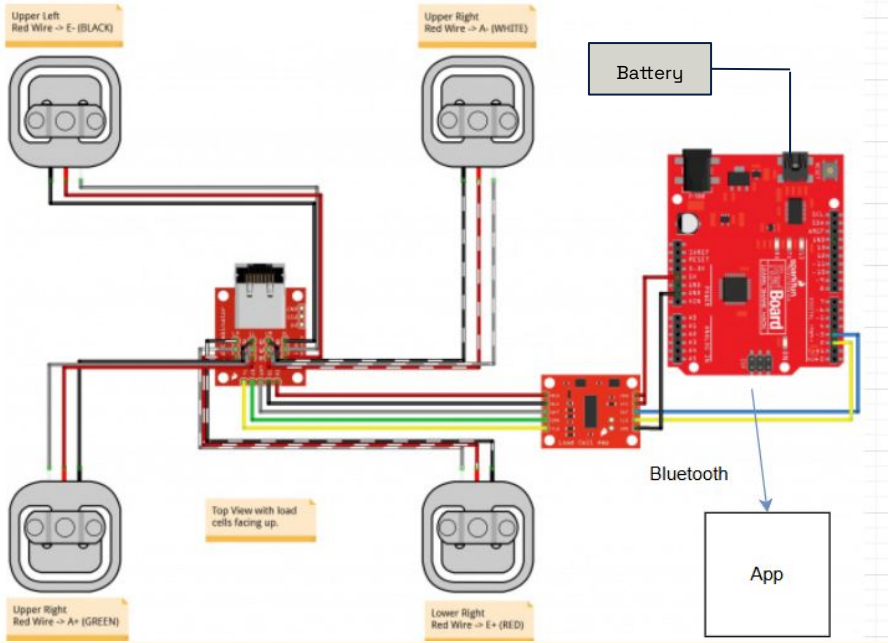
- Predetermined project timeline
- Hybrid Agile and Waterfall project management





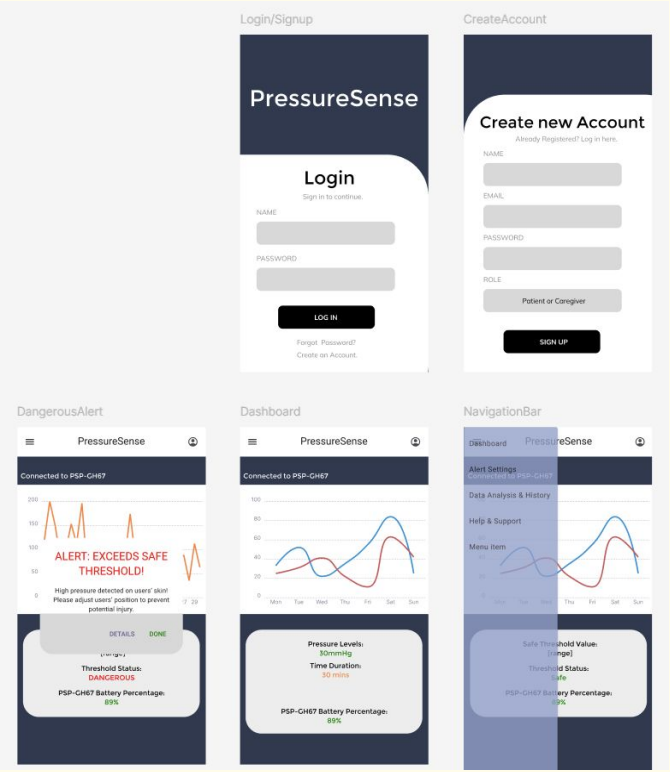
Design - Hardware

- Load Cells
- Combinator
- Amplifier
- Microcontroller
- Battery



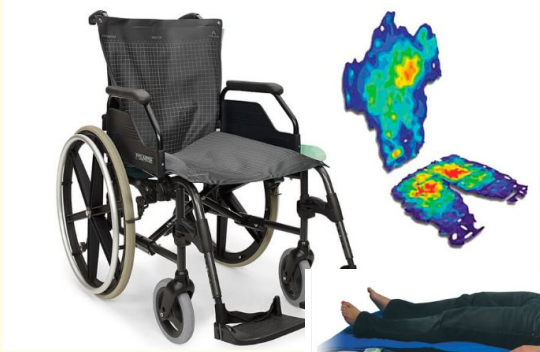
Design - Application

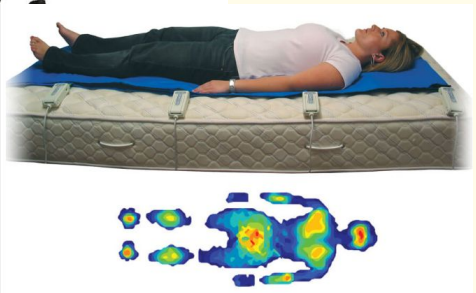
- Communicates with hardware
- Basic features like login and signup
- Graphs for monitoring pressure
- Streaming algorithms used to actively check for pressure imbalance



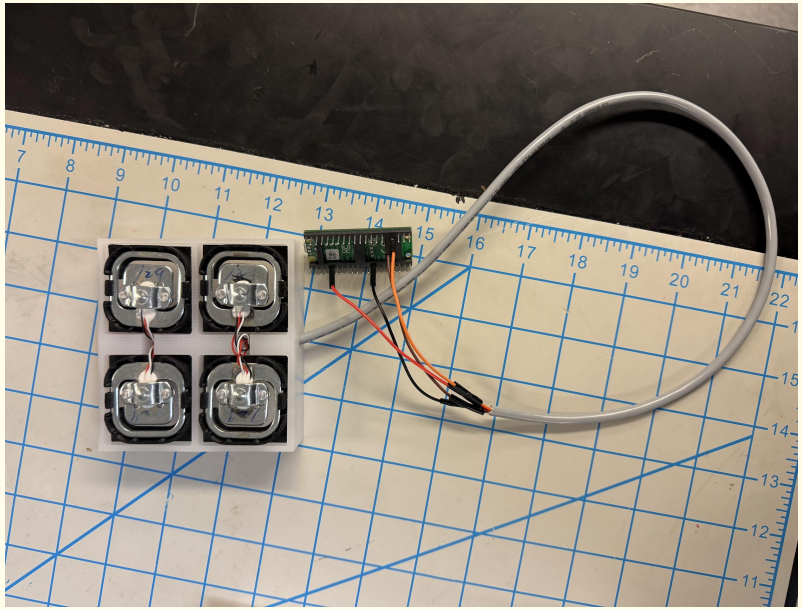
Design - Concerns

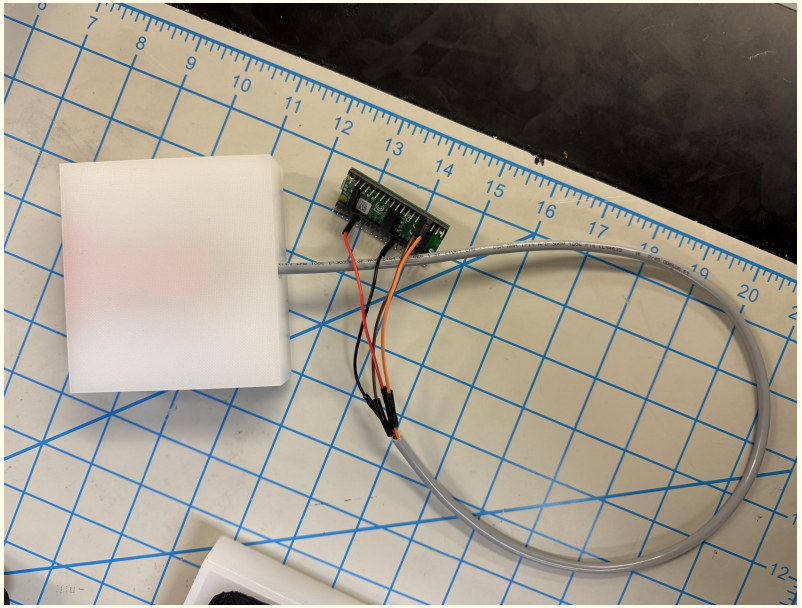
- No universal seat exists
- Device must adapt to many scenarios
- Device must be hard surface



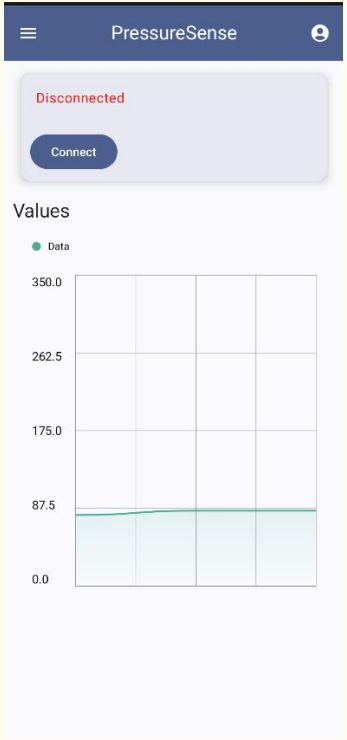


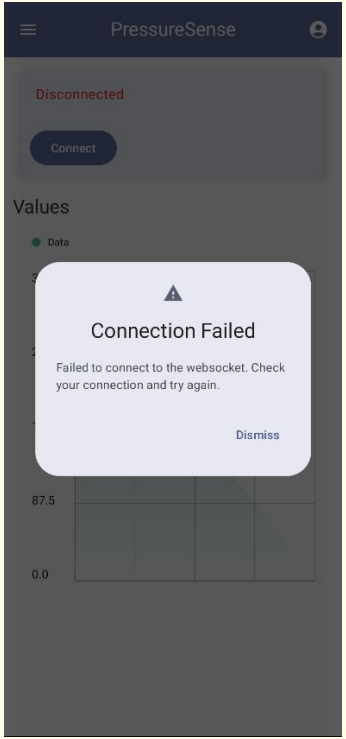
Current Prototype - Hardware

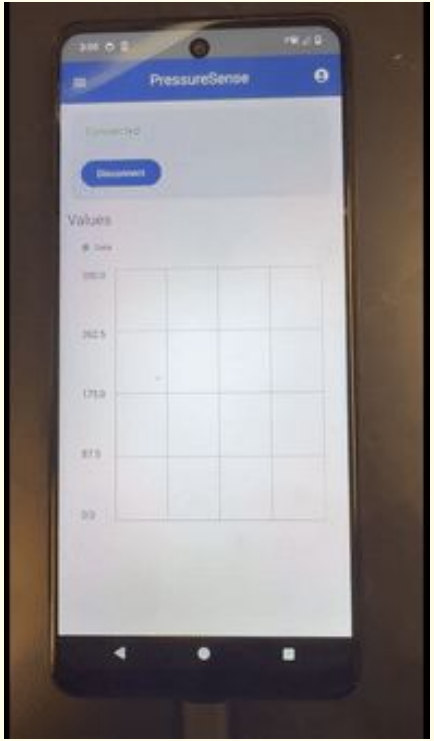




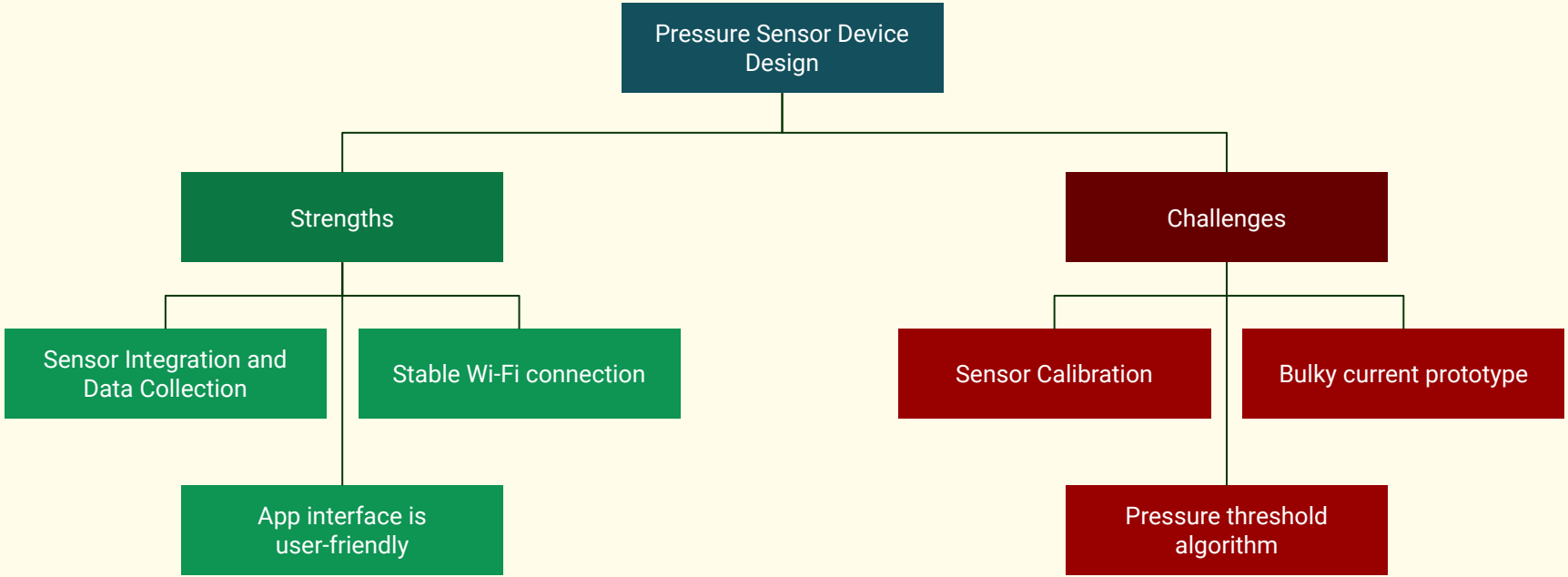
Current Prototype - Application







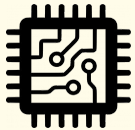
Evaluation of the Proposed Design



Implications & Future Work

Hardware Refinement

1. Work on the physical pressure device design.
2. Further calibrate the sensors.
3. Determine battery capacity



Software Optimization

1. Design the alert algorithm to send notifications.
2. Expand the app's features

Comprehensive Testing

1. Conduct more testings.
2. Gather feedback from intended users.

Conclusion

- Successfully created a **pressure sensing device** that communicates wirelessly with an Android application to display **real-time data**.
- **Achieved two** out of three goals:

1. Developed functional hardware.
2. Displayed weight distribution visually in real time.

- Remaining Work:
  - Data analysis for real-time imbalance alerts.
  - Hardware Refinement.
  - Testings.

Thank you

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