Temperature Sensor for Veterans

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Introduction

Problem: Veterans and other users with paralysis or loss of sensation would like to participate in outdoor sports, often in extreme temperatures. Due to their conditions, these users cannot always monitor their affected extremities for conditions like frostbite or overheating. Both the users and supervisors of assisted sports programs need a way to monitor their temperature to pursue outdoor activities with peace of mind.

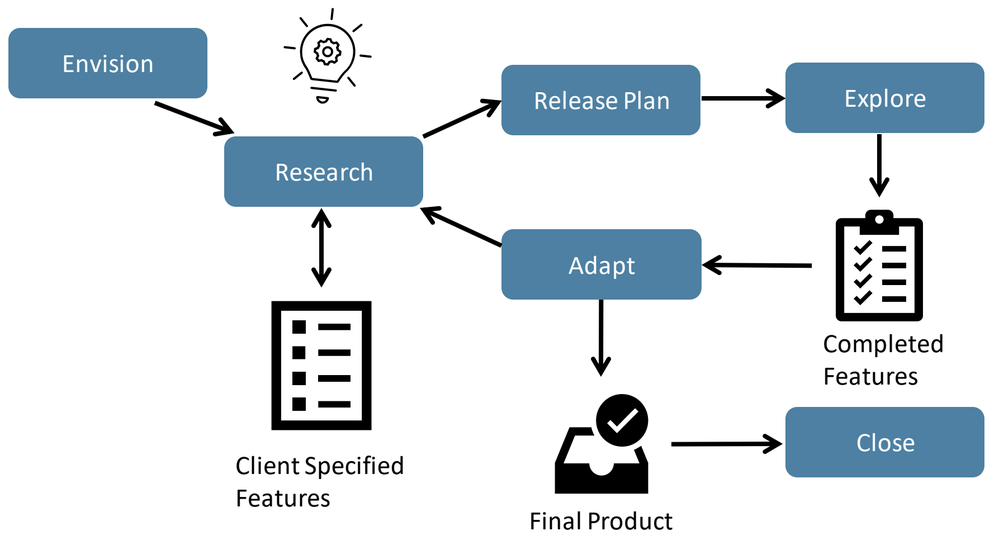
Overview

Our team created a system consisting of temperature sensing hardware as well as Bluetooth and radio frequency modules for communicating this temperature data to the user and supervisors. The hardware package attaches to a user's arm or leg with a probe that can be routed to fingers, toes, or other areas that need to be monitored. Once turned on and connected, the device will send temperature data by Bluetooth to a connected phone as well as by RF to any associated devices. Users can view this temperature data in real-time as well as customize the temperature alert cutoffs and alert method. Users can also configure the app to relay this data to supervisors, and supervisors are able to monitor multiple users at one time.

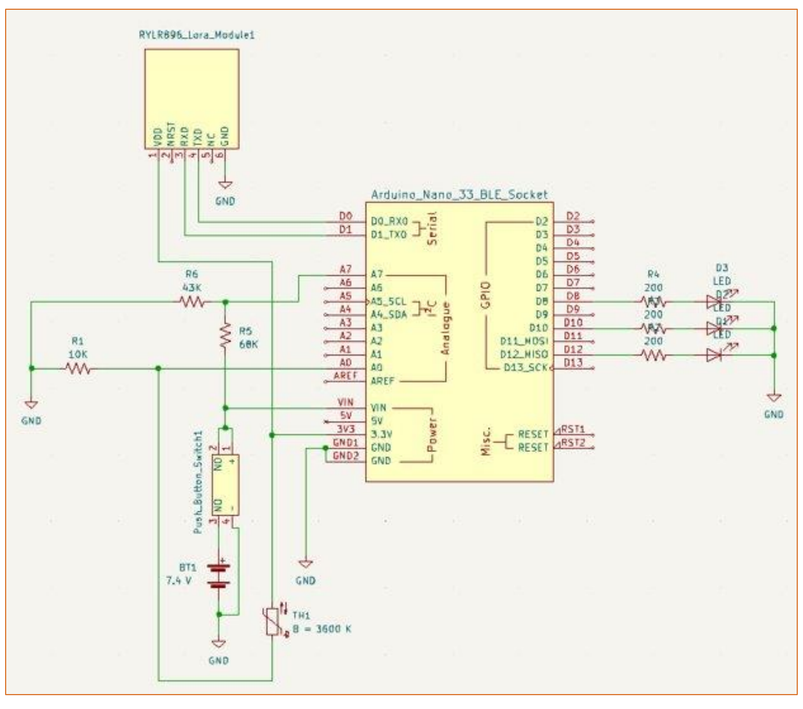
Engineering Process

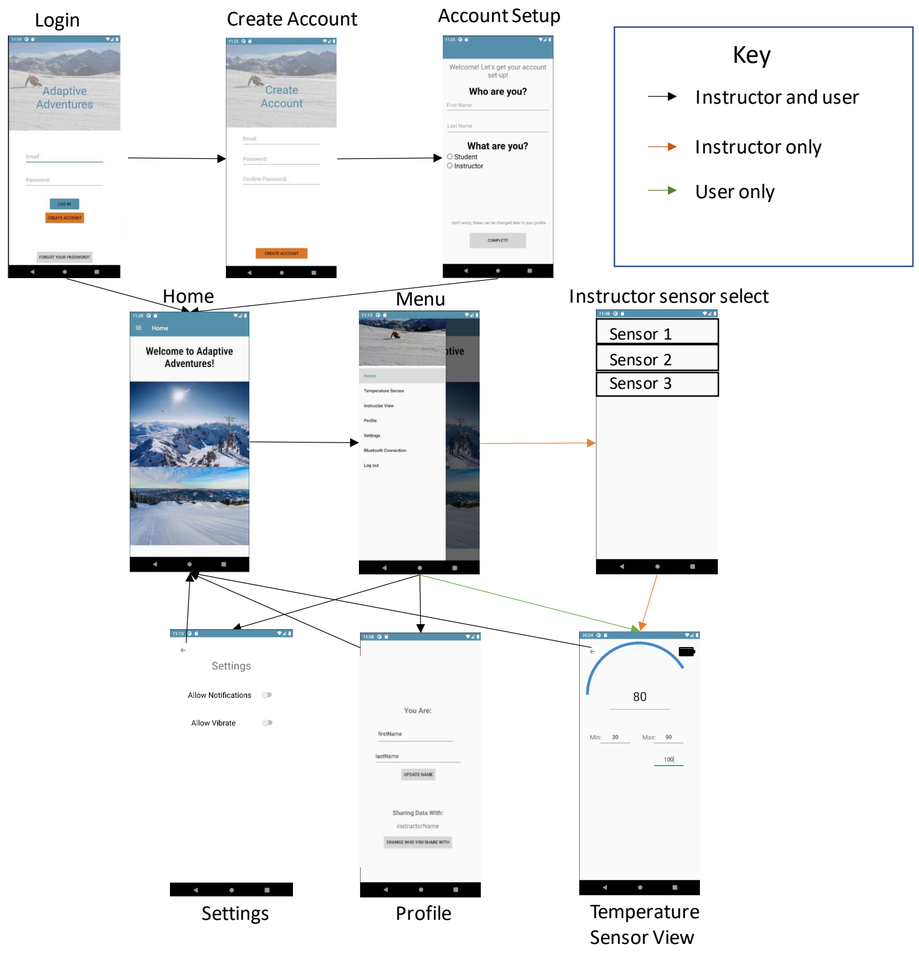
Our project development team utilized a hybrid approach consisting of both waterfall and agile aspects. While defining scope, requirements, and design constraints, our team heavily exercised a waterfall process; however, in development, testing, and deployment stages, our team shifted to an agile approach in order to work through and adapt to issues that were observed during development.

Throughout the entire duration of the project, our team held the opinions and personal experiences of the users as the most vital component for product development. Meetings with the Client and Potential Users were conducted on a bi-weekly basis where our team was able to gain insight from users as well as provide updates on progress.



Implementation





Results

- Results of Device
  - Ability to obtain temperature data measurements every 10 seconds accurate within 2 degrees Fahrenheit
  - Capable of transmitting and visualizing temperature data through radio frequency communications to receiver of supervising individual
  - Capable of providing on-board alerts for low battery life, temperature range exceedance, and loss of connection between device and supervising individual
  - Exceeded requirement of 8-hour runtime
  - Capable of recharging batteries
- Results of Phone Application
  - Capable of creating both user and supervisor accounts
  - Capable of visualizing temperature measurements
  - Capable of visualizing battery life of device
  - Capable of providing notifications of temperature range exceedance and low battery life
  - Ability to transition between pages using integrated menu bar
  - Ability to view profile
  - Ability to change acceptable temperature range

Impact

Our phone application and physical device will allow individuals to pursue the activities they love regardless of their physical ability. Users will no longer be limited by their uncertainty of when frostbite will set in allowing them to spend quality time with friends and family doing activities they love.

Conclusion

Our device was able to meet the key requirements of temperature sensing and handling that data within the application. While there is future work to be done in optimization of the device and strengthening connectivity, we have successfully created a prototype that can be polished to meet and even exceed our user's needs.