ECE - Capstone Design 1

TEAM FOXTROT

SAFEPAWS

FINAL DESIGN REVIEW

Overview

- Introduction
- Competitive Advantages
- Subsystems Approach
- Reflection
- User’s Journey
- Design Overview
- Upcoming Plans
- Conclusion

Our Team

Nathan Phan

Team Lead / Sensors

Victor Gonzalez

Communications

Terry Jenkins

Data Systems

Our Team

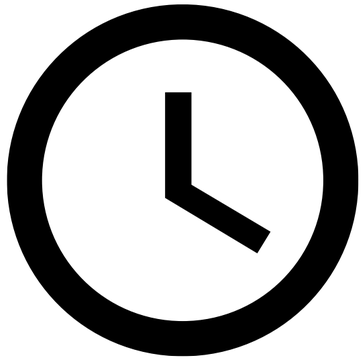
Clayton Lott
Power Systems

DeArirreis Vance
Software

Vuk Marojevic
Faculty Advisor

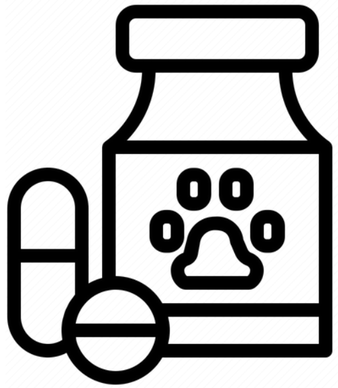
S a f e P a w s

The Problem



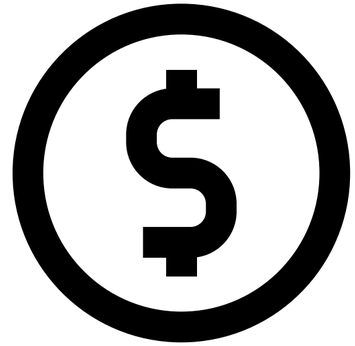
Problem 01

Owners can lead busy lives that can leave limited time for continuous monitoring of their dogs' health.



Problem 02

Veterinary visits can be time-consuming, costly, and may not offer timely insights into a pet's health.



Problem 03

Current pet health monitoring products on the market are complex and expensive, which limits accessibility for some owners.

S a f e P a w s

Our Solution

Continuous & Convenient Monitoring

Designed for Pet Comfort

Less Expensive than Competitors

Competition

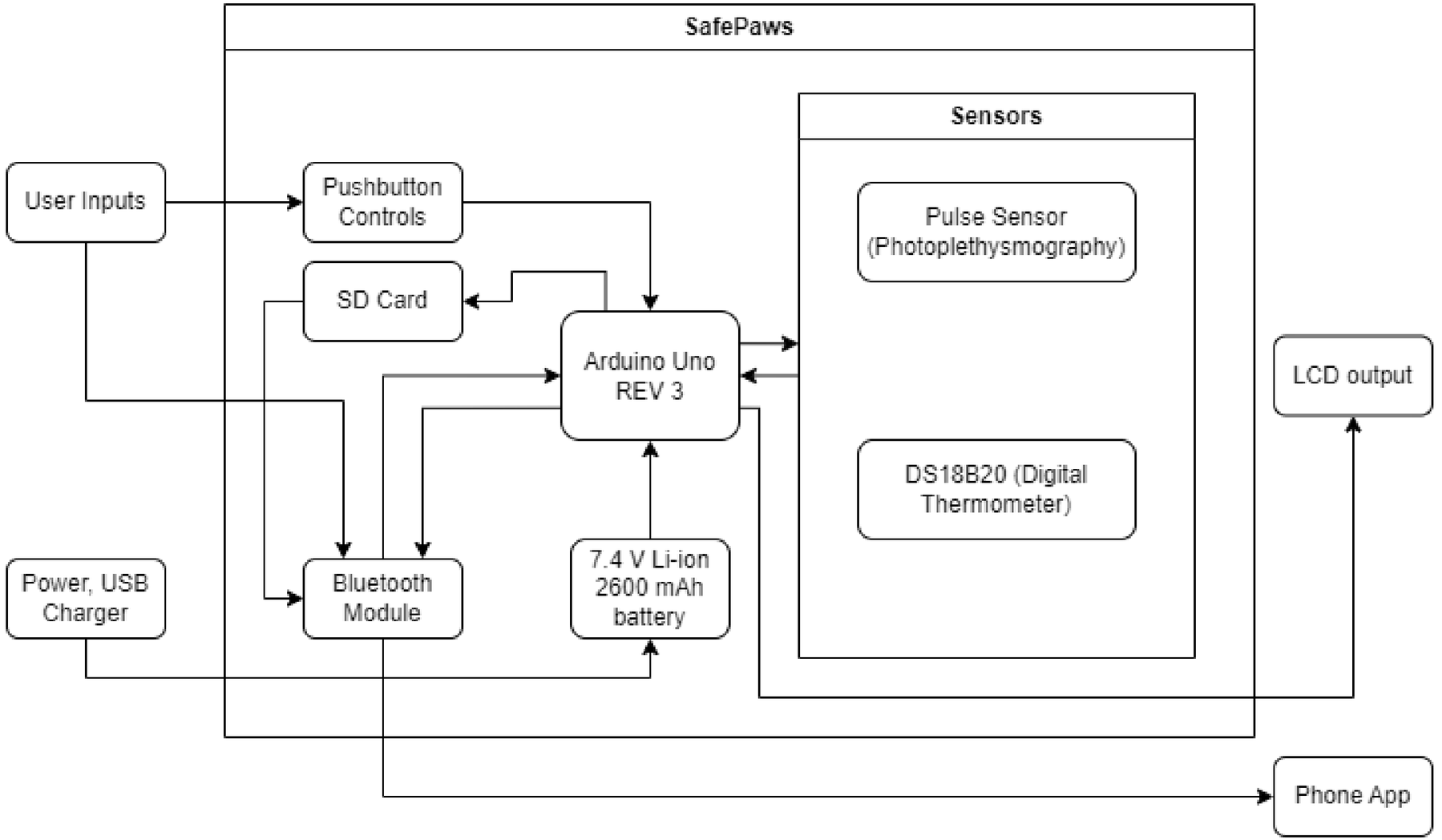
DogLeggs [1]

- Specialized use
- Limited connectivity

PetPace [2]

- Expensive initial cost
- Added subscription fees

Design Overview



01

02

03

04

Subsystems

S a f e P a w s

Controller

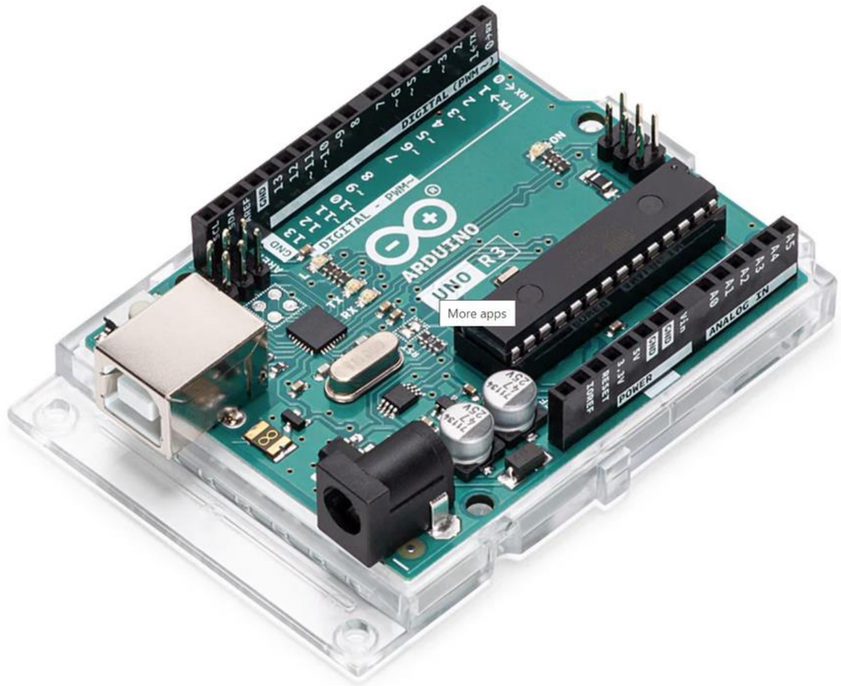
Arduino Uno REV3

Advantages: [3]

- Low-power requirement
- Support for a wide range of peripherals
  - SD card read/write
  - WiFI/Bluetooth
- Digital/analog sensor support
- Well-supported software library
  - SD-FATLIB (FAT16/FAT32 file systems)
  - Arduino BLE (Bluetooth), ConnectionHandler (WiFI)

Alternatives considered:

- Basys Board (HDL-based programming)
- Raspberry Pi (Lack of hardware/sensor support)



Arduino Uno REV3

S a f e P a w s

Communications

File Storage & Wireless Connectivity

SD Card

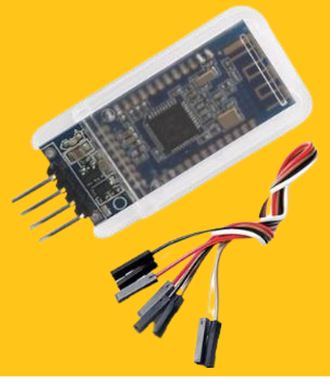
Zittop SD Card Read/Write Module [4]

- Supports standard SD card sizes
- 480GB read/write speed support
- Allows for SD card removability and hot-swapping
- Multi-volt operation (3.3V or 5V)
- Low power use

Bluetooth

DSD TECH HM-10 M Bluetooth 4.0 LE [5]

- Bluetooth 4.0 support
- 4-wire connectivity
- Bluetooth Low Energy (BLE)
- 1.0 Mbps data transfer rate



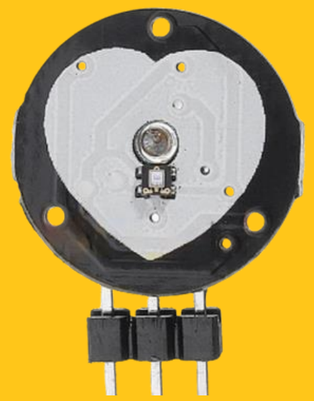
Sensors

Heartrate and Temperature Monitoring

Heartrate Sensor

Pulse Sensor (Photoplethysmogram)

- PPG utilizes a light-emitting diode to detect changes in blood volume [6]
- LED wavelength output is 565 nm
- Ease of use

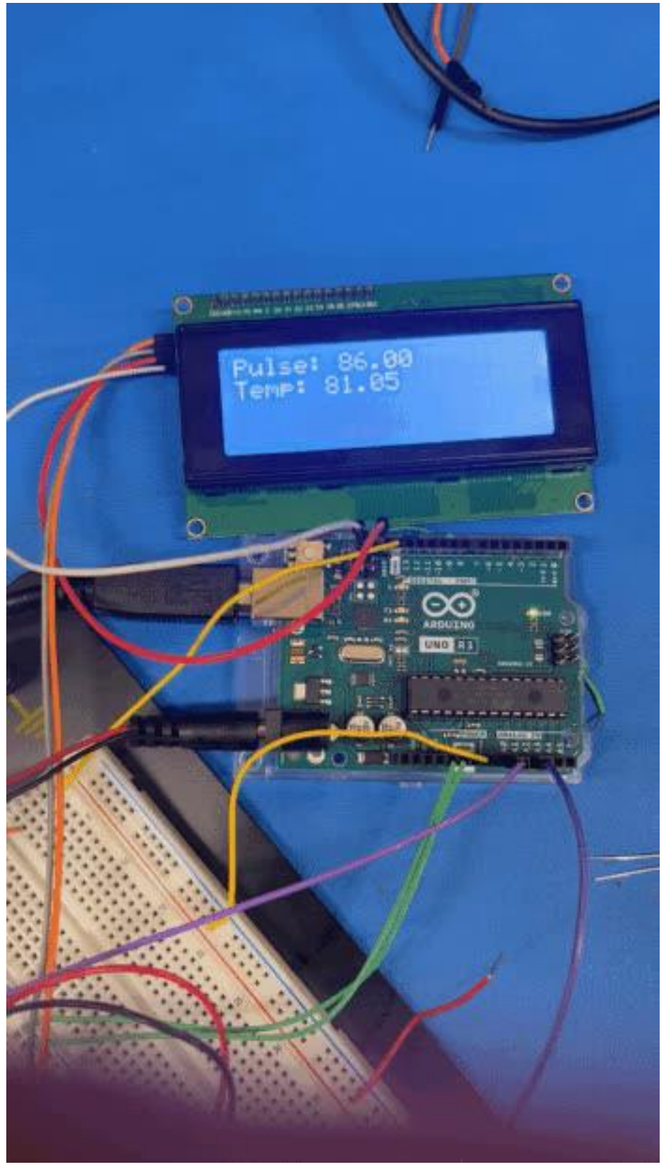


Thermometer

DS18B20 (Digital Thermometer)

- DS18B20 uses one-wire interface feature [7]
- Wider temperature range versus the alternatives
- More accurate readings

S a f e P a w s



Sensors

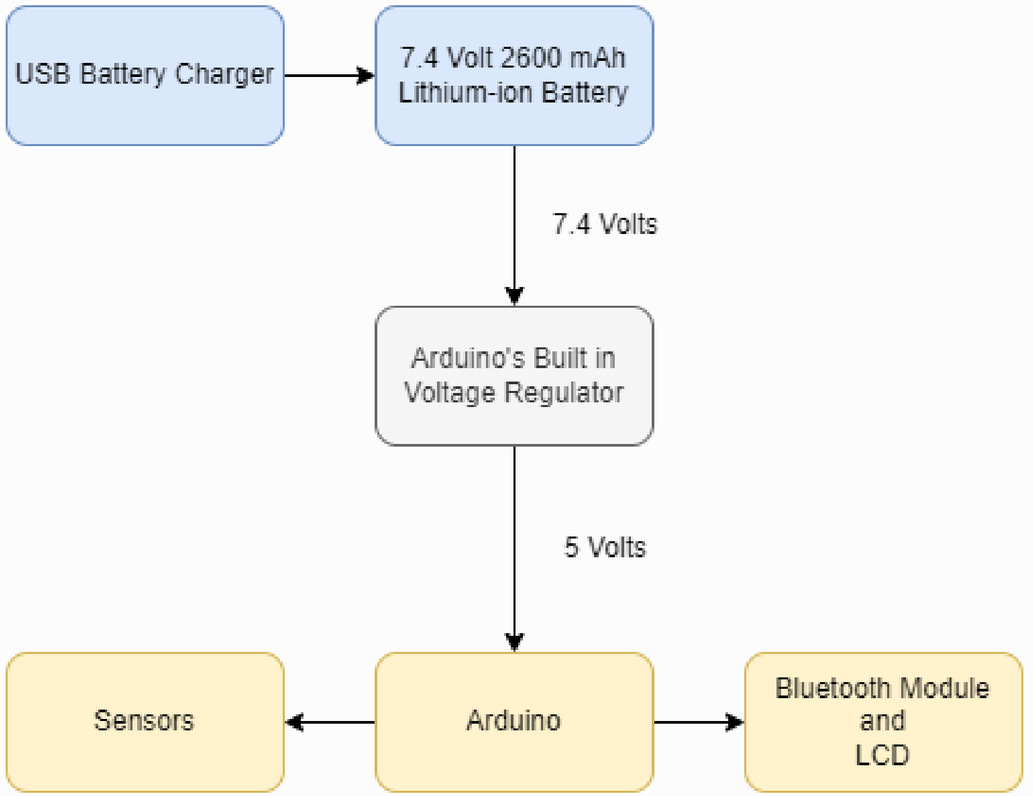
Power

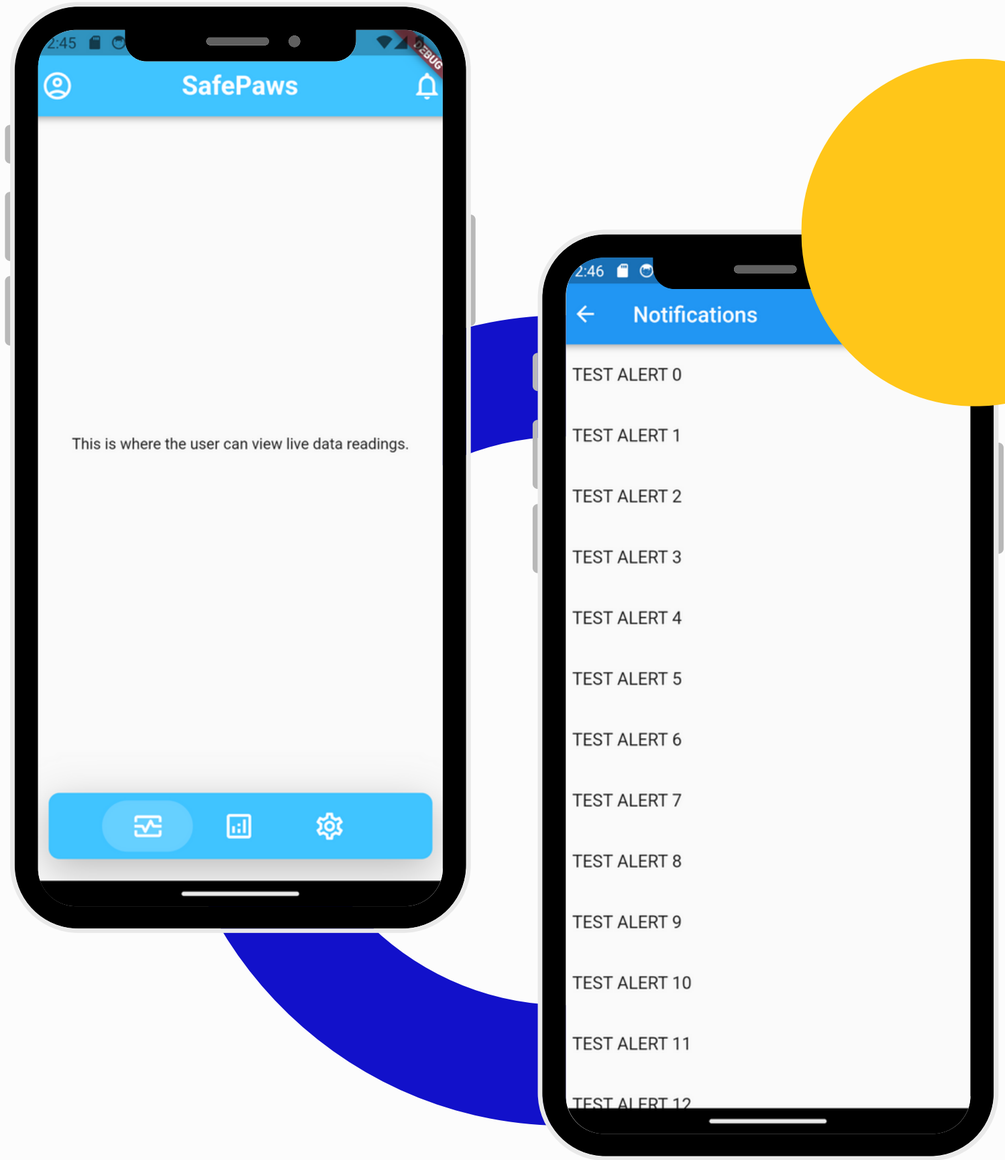
Power System & Voltage Regulator

Lithium-Ion (Li-ion) Battery

- 7.4V 2600mAh li-ion battery capacity
- Arduino steps down usage to 5 volts
- 37 hours of usable battery life

  (goal of 24 hours)
- Removable battery
- USB rechargeable

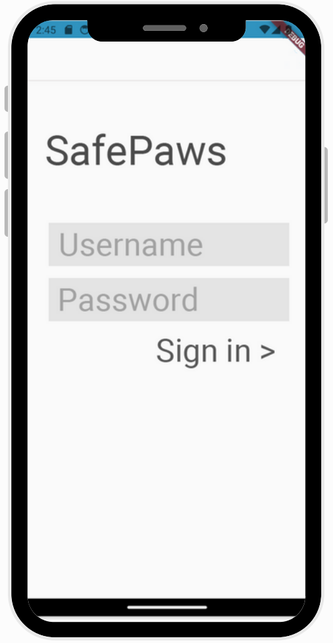


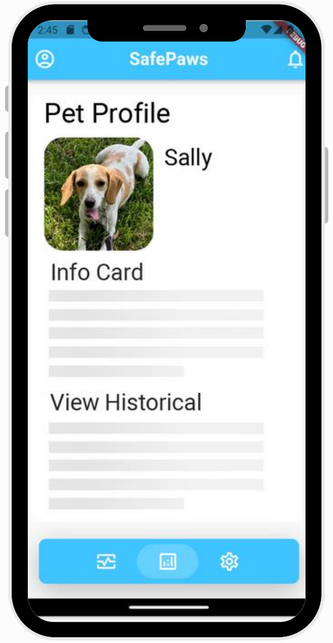


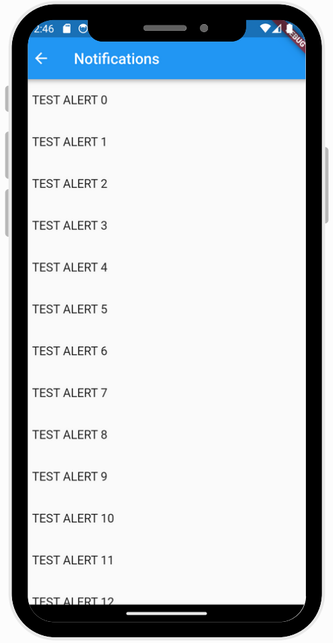
Mobile Application

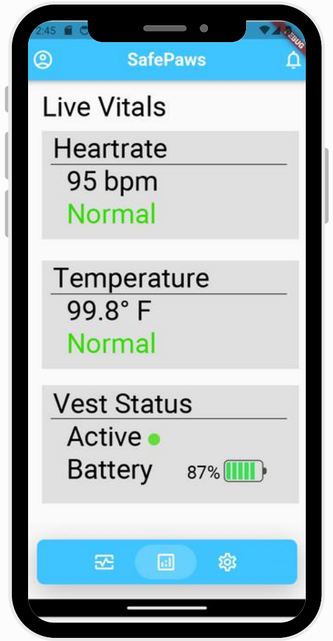
- **Easy to Use**
- **Modern Design**
- **Cross-Platform Compatibility**
- **Notifies & Alerts the User**

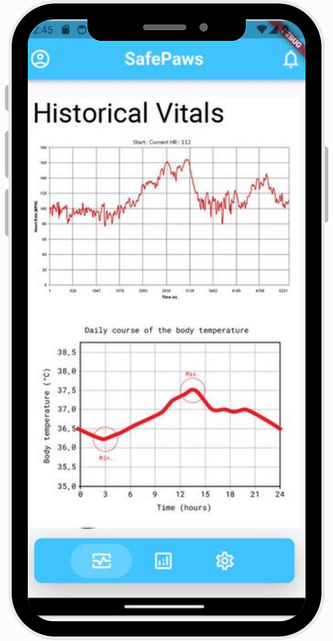

2:40
SafePaws
This is where the user can view live data readings.

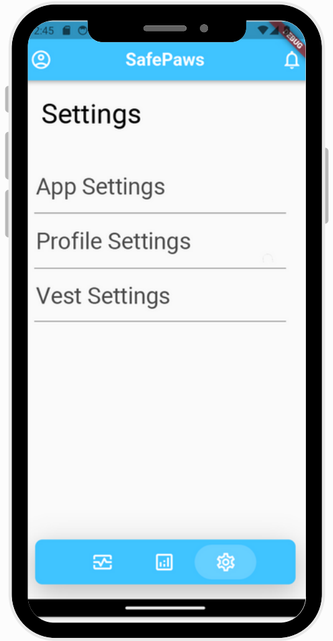

SafePaws
Username
Password
Sign in >


SafePaws
Pet Profile
Sally
Info Card
View Historical


Notifications
TEST ALERT 0
TEST ALERT 1
TEST ALERT 2
TEST ALERT 3
TEST ALERT 4
TEST ALERT 5
TEST ALERT 6
TEST ALERT 7
TEST ALERT 8
TEST ALERT 9
TEST ALERT 10
TEST ALERT 11


SafePaws
Live Vitals
Heartrate
95 bpm
Normal
Temperature
99.8° F
Normal
Vest Status
Active
Battery
87%


SafePaws
Historical Vitals
Daily course of the body temperature
Body temperature (°C)
Time (hours)


SafePaws
Settings
App Settings
Profile Settings
Vest Settings

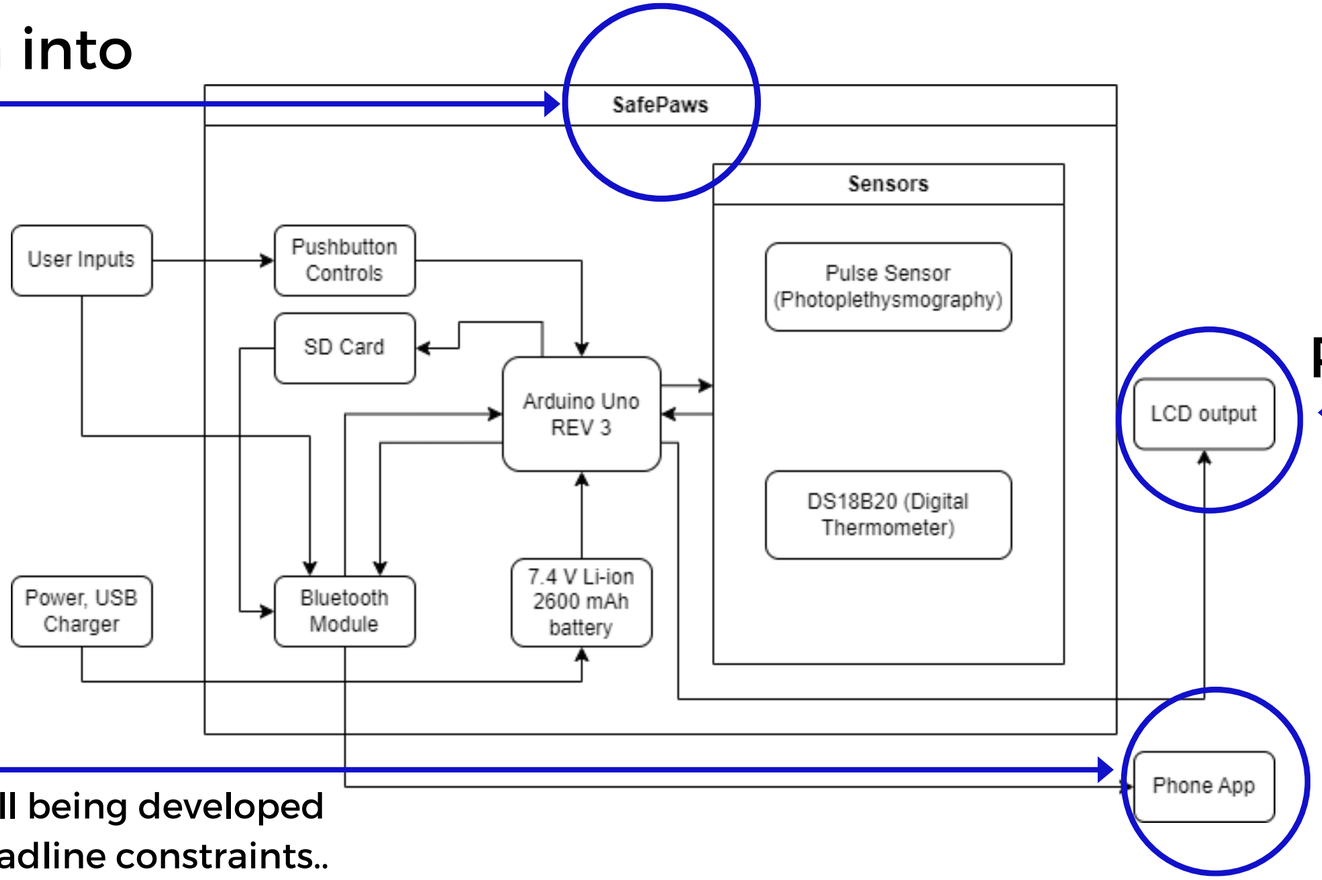
S a f e P a w s

S a f e P a w s

Upcoming

Implementation into vest

Subsystems are currently configured loosely; the next step is to integrate them into the vest in such a way to meet our constraints (water resistance, insulation, etc.).



Removal of LCD

The LCD is currently installed for testing purposes only. It will not be integrated into the final design, as the required data will be transmitted wirelessly to the mobile app.

App Development

The application software is still being developed with the intention to meet deadline constraints..

Reflections

Challenges

- Teamwork
- Design

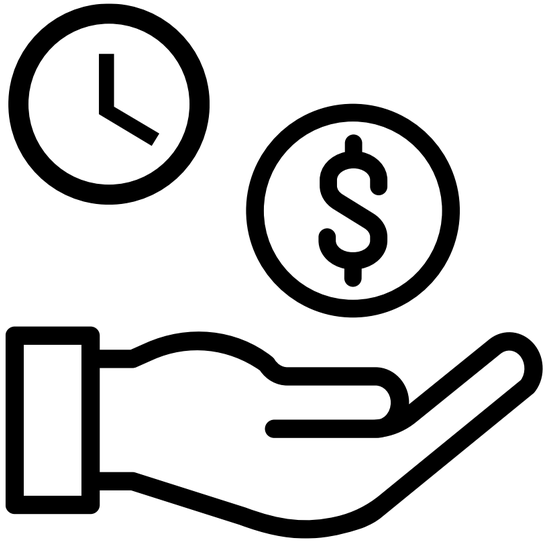
Limitations

- Time
- Money
- Lack of knowledge

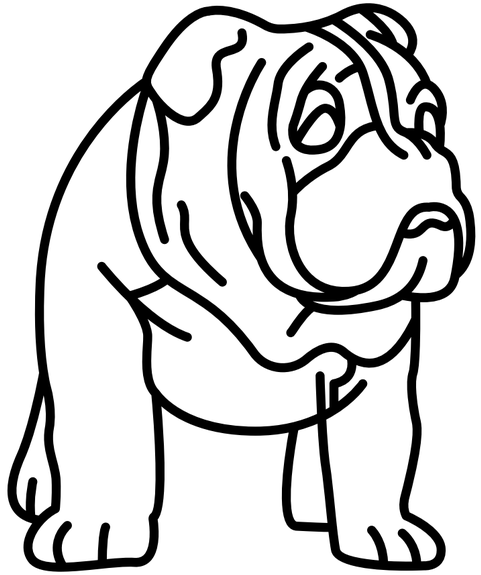
Lessons Learned

- Coding
- Communication

Conclusion



Our journey began with the need for more accessible health monitoring for pets.



SafePaws is a convenient, continuous tool that allows the user to remote monitor their four-legged companion.

References

[1] “Dog Leg Wraps, Braces, & Carpal Support | Hygroma Treatment Solutions,” dogleggs.com. https://www.dogleggs.com/ (accessed Sep. 01, 2023).

{2] “How it works - PetPace,” PetPace.com, https://petpace.com/how-it-works/ (accessed Sep. 01, 2023).

[3] “Arduino Uno R3 Specification Sheet.” Arduino Documentation. https://docs.arduino.cc/hardware/uno-rev3 (accessed Oct. 20, 2023).

[4] “Zittop SD Card Reader/Writer for Arduino,” Amazon. https://www.amazon.com/Virtuabotix-Reader-Writer-Arduino-Microcontrollers/dp/B0089SYU9C (accessed Nov. 8, 2023).

[5] “DSD Tech HM-10 for Arduino,” Amazon. https://www.amazon.com/DSD-TECH-HM-10-Bluetooth-Compatible (accessed Nov. 8, 2023).

[6] “Waterproof 1-Wire DS18B20 Digital Temperature Sensor,” Adafruit.com. https://www.adafruit.com/product/381?gclid=CjwKCAjws9ipBhB1EiwAccEi1l_Cpjkz6gxzXgaTveIUXcOG1HRZNsbkSlXBfyg8ZbmgEaWvQ2WrZRoCuzlQAvD_BwE (accessed Nov 8, 2023).