Iowa State University

492 Senior Design Group 20-24

Wearable Cardiac Monitor

Client/Advisor:
Prof. Cheng Huang

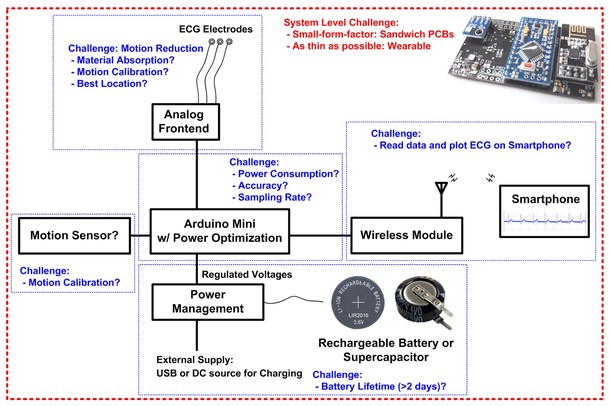
Scott Beard *Sam Kimball* *Vincent Lazzaro* *Peyton Sher* *Ruiyu Sun* *Andrew O'Brien*

College of Electrical and Computer Engineering

Problem: Even though there are many Wearable Heart Monitors out there, but they are expensive.

Solution: Create a device that is inexpensive, compact, and can monitor the heart and relay the information through bluetooth to a smartphone.

User: The heart rate monitor will be intended for anybody that feels as though something is not working properly with their heart.



Power Management

Analog Front End

Arduino Mini with Power Optimization

Wireless Module

Functional Requirements:
- Continuous monitoring
- ECG Display
- Battery Life of 48 hours

Non-Functional Requirements:
- Wearability
- App Design
- Memory

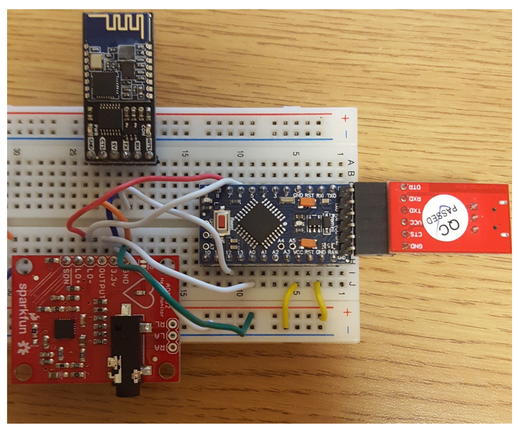
Operating Environment:
- Connected to the body
- Condition involving physical activities, sweat, weather.

Project Resources

ETG Shop

Thielen Health Center

Coover Lab Equipment

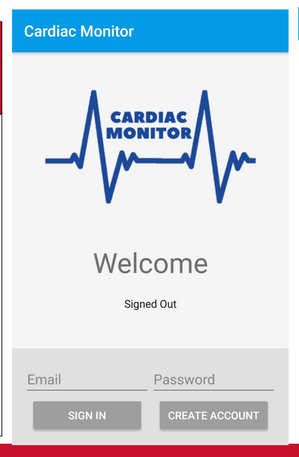


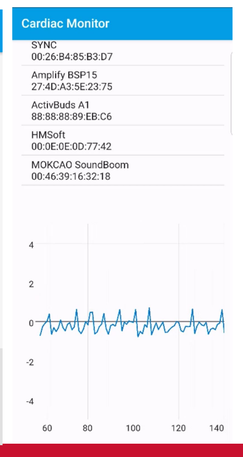
Software

Arduino IDE - C Language

Android

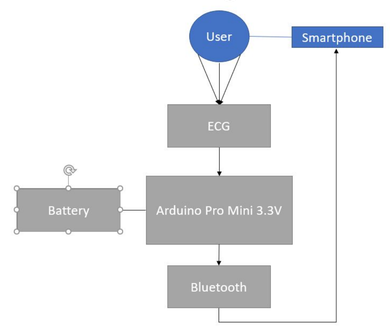
Google Firebase



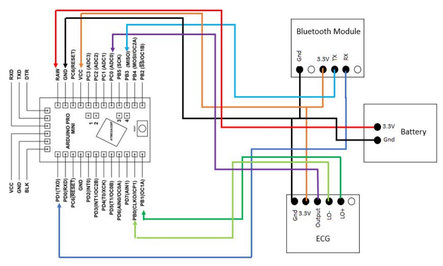


Design Approach

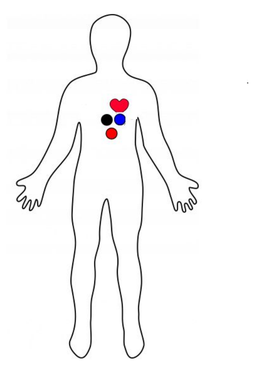
Block Diagram



Block Diagram



Electrode Placement

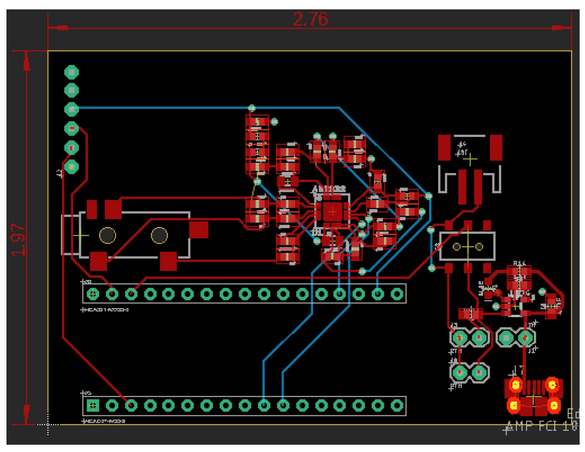


Holster Concept

Hardware

Arduino Pro Mini 3.3 V 8 MHz
Bluetooth Mate 4.0
Single Lead Heart Rate Monitor - AD8232 PCB
Rechargeable Li-Ion Battery 3.7 V / 3000mAh
3-lead electrode cable
3M Electrodes

Design Schematic



50 mm x 70 mm, 4 layer PCB

AD8232 and peripheral hardware

Arduino Mini

Wireless Module

USB Recharge circuit

Testing

Connectivity: Connecting the device to a smartphone and checking if the device is still connected or not.
Data Collecting: Plotting the data to verify we are seeing a heartbeat.
Sending and Receiving Data: Sending data to a smartphone and having the smartphone communicate back to the device.
Power Consumption: Measuring how much power we are consuming.

Engineering Standards and Design Practices

IEEE Standards

Circuit and Block Diagrams

Agile practice & values

Commenting on Code