BME/CS 479 Lab 1

Carson Goodwin, Kofi McNair, Saif Kazmi, Group 3, Lab 1
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Introduction

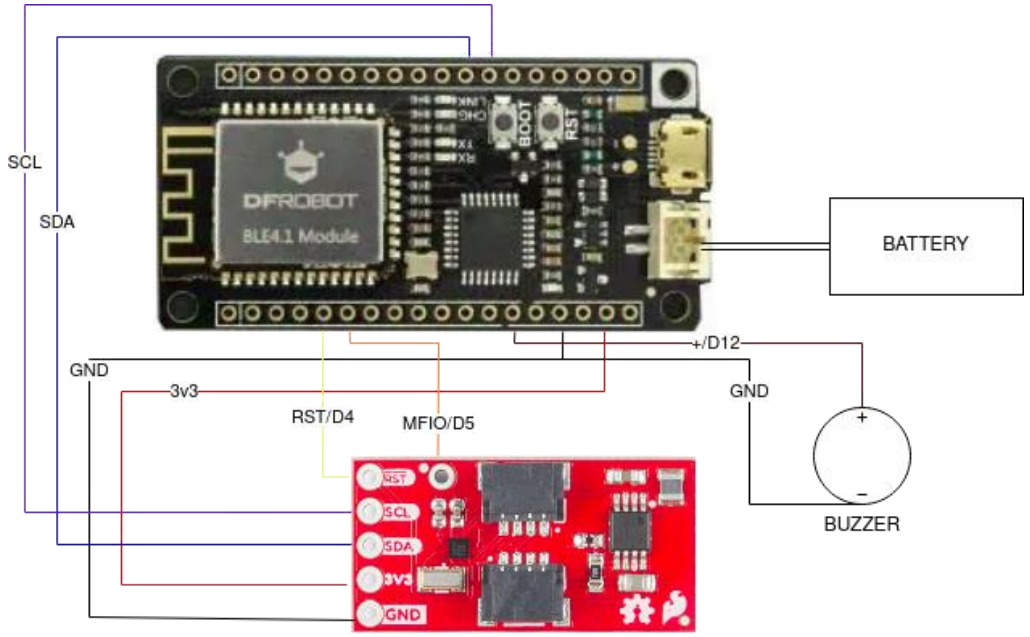
- Personalized Wearable Pulse Oximeter: A Leap into the Future of Healthcare.

- Revolutionizing non-invasive monitoring with compactness without compromising precision."
- The sensors: advanced optical technology (Photoplethesmogram signals- where a light-based signal is used to determine O2 saturation and heart rate
- I2C – the bridge between the pulse oximeter sensor and the fireBeetle Boards-328P

Design: to be worn on the wrist and the index finger: comfort, precision, user friendliness

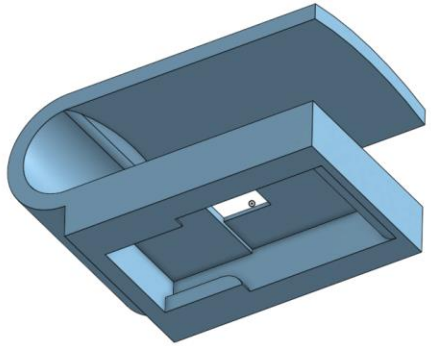
Methods – Hardware

- Circuit Diagram
  - HR monitor, buzzer, and battery connected to peripheral board
  - HR monitor wired according to manufacturer specifications using 3.3V
  - Buzzer connected to digital pin and ground

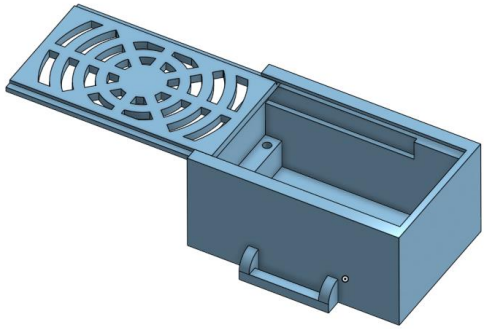


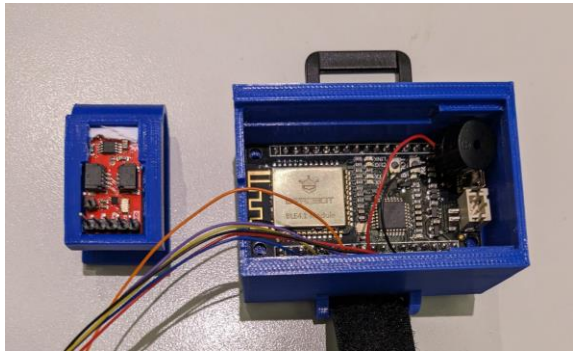
Methods – Hardware (cont.)

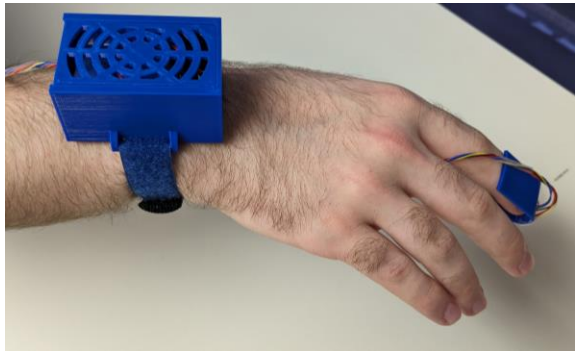
- HR Monitor Clip
  - Securely holds HR monitor while only exposing sensor
  - Clip securely slides on index finger



- Enclosure
  - Designed to hold peripheral board, buzzer, and battery
  - Attached to wrist using Velcro strap



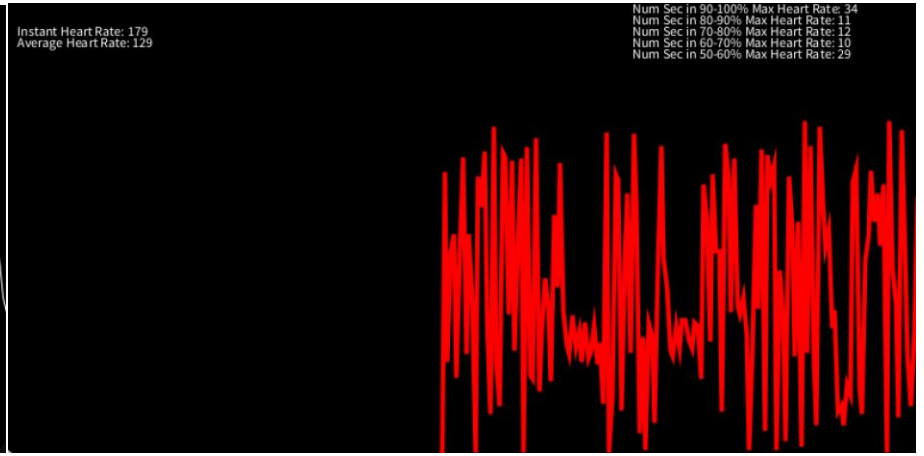


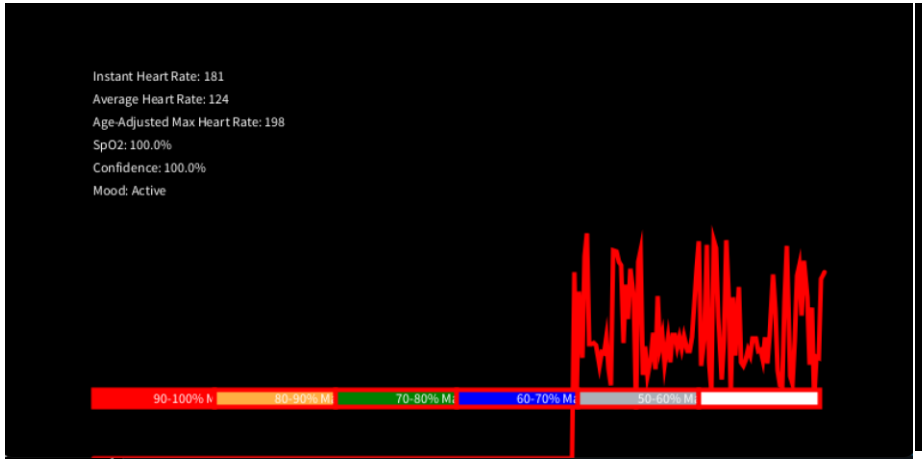


Methods – User Interface

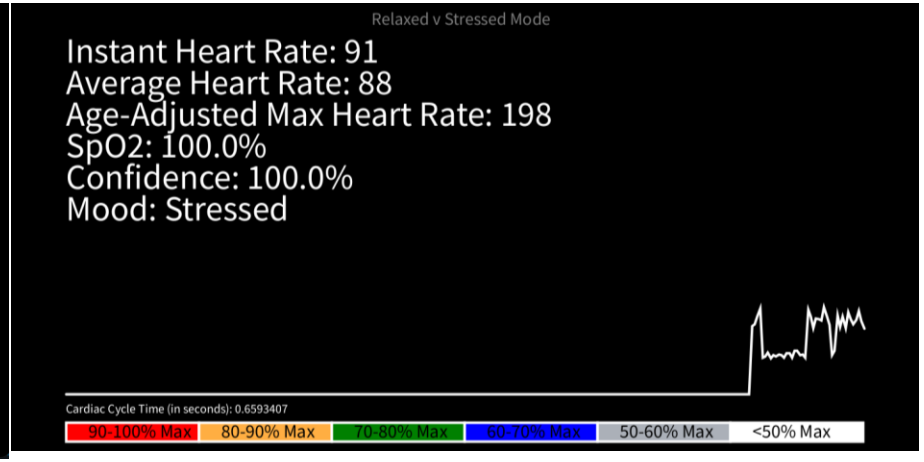
Iteration 1

Iteration 2





Iteration 3



Iteration 4

Methods – User Interface (cont.)

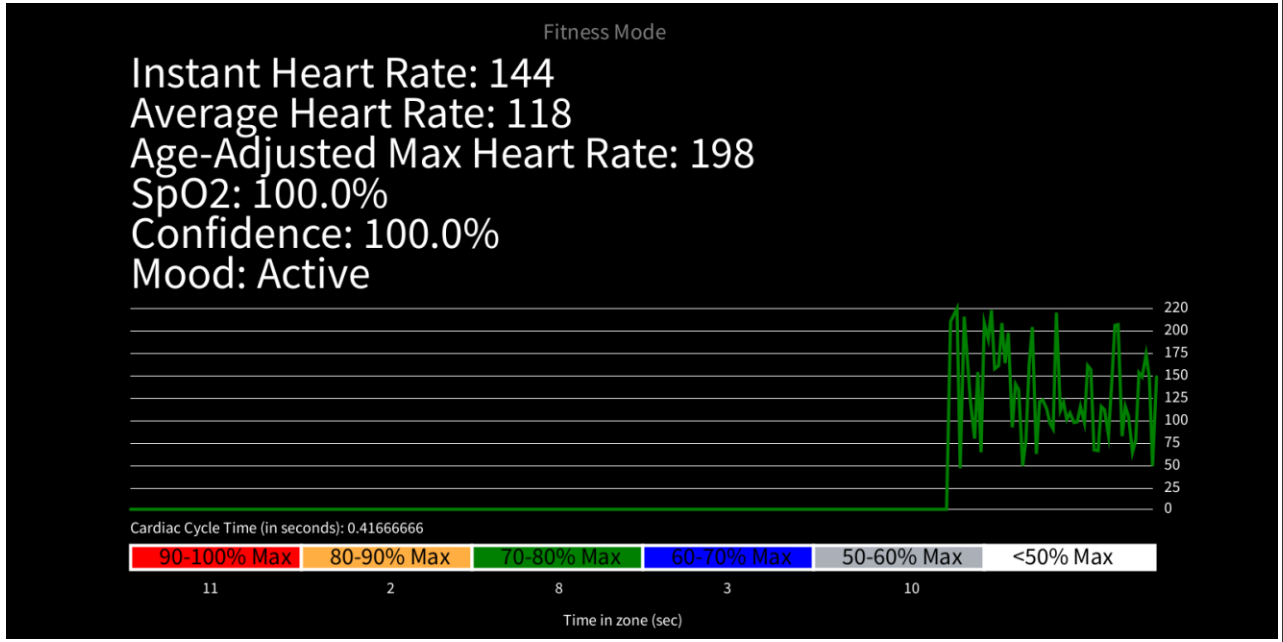
How did you process the data?:

- What we ended up doing to process the data was using a line graph based system where the x-axis spans the last 300 seconds and the y-axis is the instant heart rate at that exact moment.
- Taking all the heart rate values over that x-axis, adding them up, and dividing them by the number of measurements helps us provide an average heart rate over the period of app usage

What filters/algorithms/noise reduction techniques did you use/develop?:

- For any kind of spike sensitive calculations, (e.g. Relaxed vs Stressed mode), we use an averaging system.
- This allows us to measure the average heart rate over a period of time, compare that to the next measurement and conclude whether the user is gaining stress or reducing stress by seeing if the averages are significantly (+10%) different.

Final Iteration



Conclusion

Limitations:

- How do we know how accurate this sensor really is?
- We can only make the device so small because of the off the shelf components
- Limited by our chosen tools and current skillsets

Challenges:

- How do we determine that a User is stressed or not?

  - HR & O2 only provide some limited clues
  - Further research and multi-modal sensing may offer a solution."

- How do we have multi directional serial between Processing and Arduino
- How do we create a competent UI that encompasses all of the info we want to display to the user?

Future Work

- Integration of an accelerometer for activity context

- Inclusion of more sensors for a comprehensive health report