OP-WATCH

SUPREME DESIGNERS

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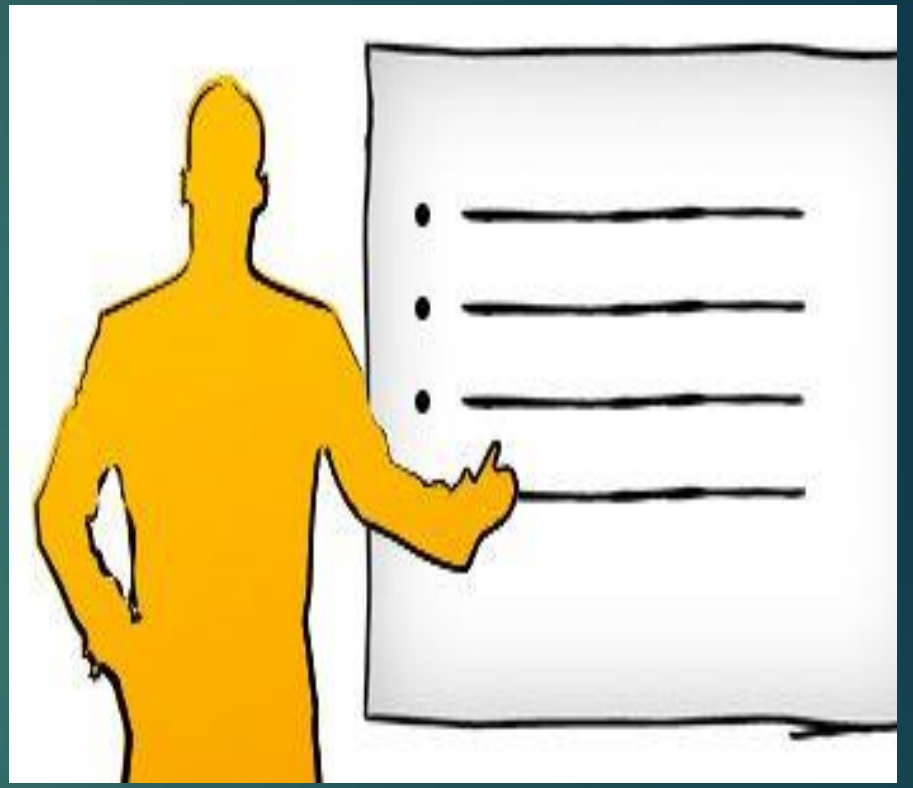
Presentation Outline

- Design Process Summary
- Current Prototype Showcase
- Next Steps
- Challenges Faced and Lessons Learned



Who?

- Mostly trade industry-based
- ¾ were male (between ages 20-30)
- Stigma and discrimination amongst all users
- Another highly affected demographic – homeless

What?

Needs
The device triggers an emergency response to prevent death or harm to the overdosed user
The device is easy-to-use
It's non-intrusive, the wearer isn't conscious of its presence at every second
It's inexpensive, less than $100
It's discreet, does not attract the attention of others
It's durable, won't fail due to normal abuse
The device is water-resistant

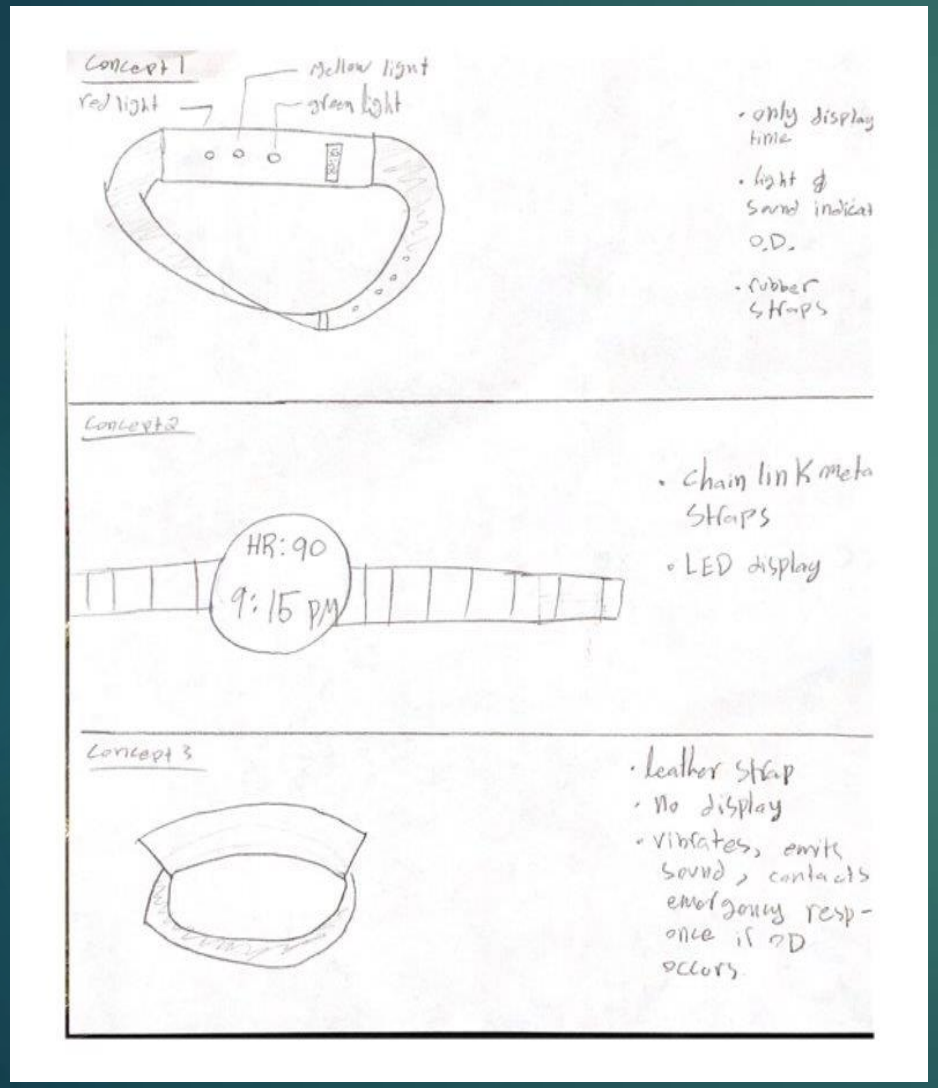
What?

#	Need	Design Criteria
1	The device is discreet	Watch size (mm^3) GPS tracking system Weight (lbs) Watch shape
2	The device is user-friendly	Weight (lbs) Watch shape
3	The device is non-intrusive	GPS tracking system
4	The device is low cost	Cost ($)
5	The device is waterproof and durable	Watch material

Problem Statement

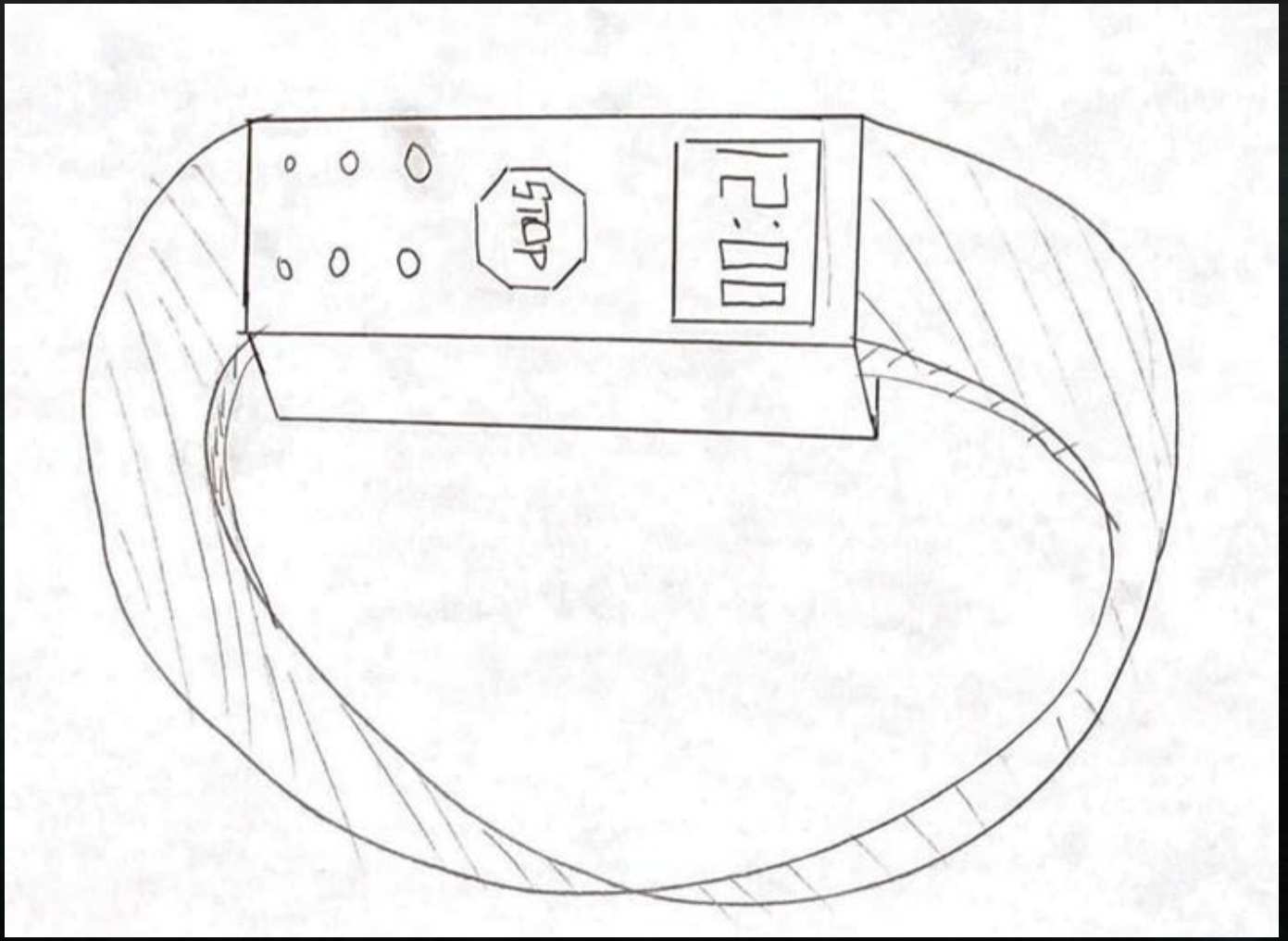
"Opioid users are in need for a device that will monitor the possible risk of an overdose. It is discreet, durable, and sends out an emergency response to local paramedics indicating the current location of the user in the event of an overdose."

Three Concepts and Benchmarking



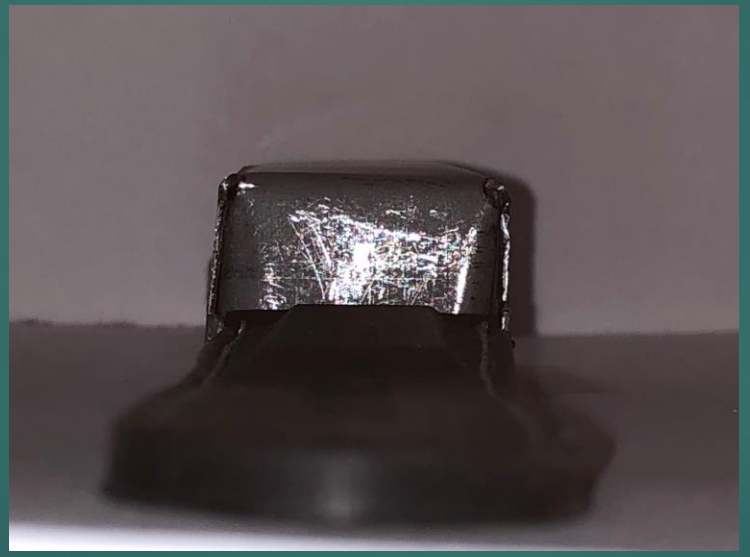
Concept	1	2	3
Cost	$100 (CAD)	$100 (CAD)	$100 (CAD)
Weight (g)	145	125	175
Material of Case	Metal	Metal	Metal
Material of Straps	Rubber	Metal	Leather
Shape of Case	Cuboid	Cylinder	Curved
Pulse Range	25 bpm-250 bpm	25 bpm-250 bpm	25 bpm-250 bpm
Pulse Accuracy	+/- 2 bpm	+/- 2 bpm	+/- 2 bpm
Safety	Yes	Yes	Yes
Optical Sensor	Yes	Yes	No
Power	Replaceable Battery	Replaceable Battery	Replaceable Battery
Tracking System	GPS	GPS	GPS
Heart Rate Digital Display	No	Yes	No
Display Time	Yes	Yes	No
Sum of Values	35	33	27

Final Global Concept



Prototype I

Top
View



Front
View

Right-Side
View

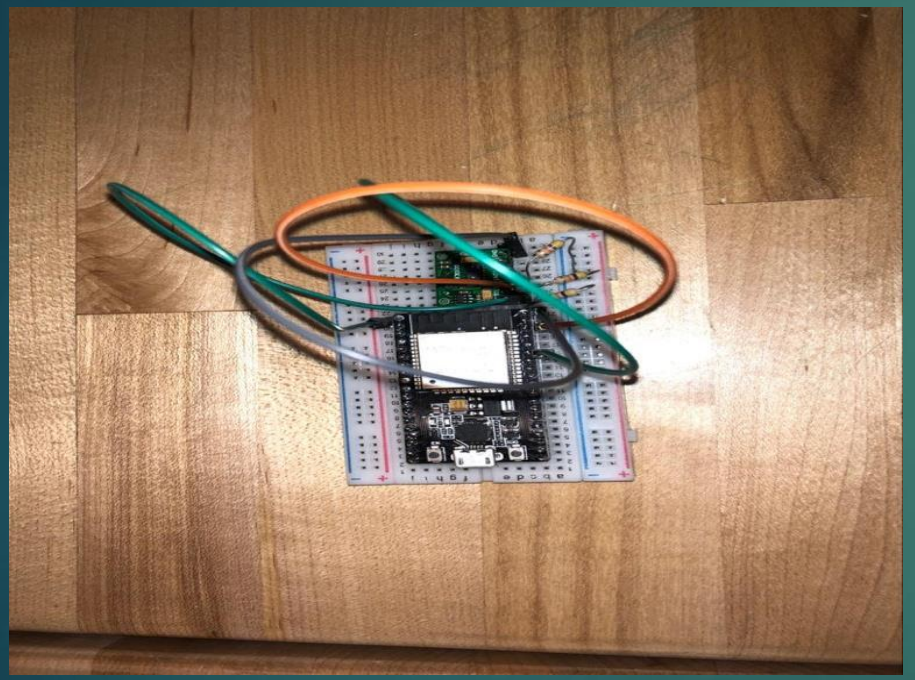
Prototype I Test and Outcomes

- Test plan included volunteers wearing the watch for a full day and sharing feedback with the team
- Feedback included:
  - Restricts wrist movement
  - Metal edges at bottom are irritating to skin
  - Hard to wear/remove clothes
  - Metal corners can get caught on clothing or fabric
  - People always ask, "what are you wearing on your wrist?"
    - Attracts attention
- Based on the feedback, a decision was made to change the manufacturing process

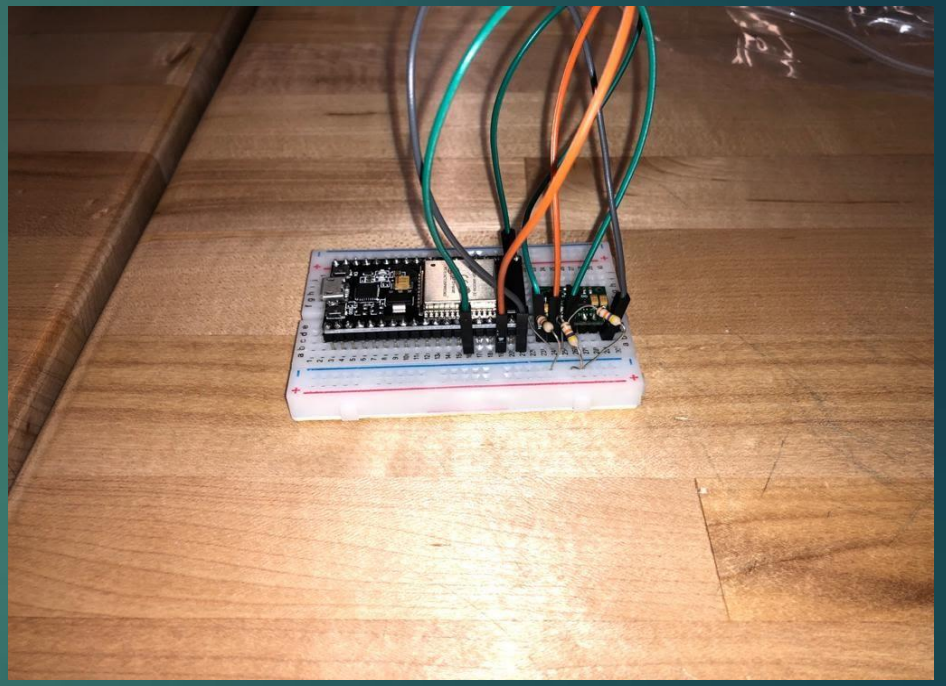
Prototype I Assumptions and Fidelity

- There are no cutouts for LEDs and OLED screen
- Case is empty, weight is assumed but inaccurate
- Dimensions were assumed
- Materials are the exact same as we would like to use in real life
- Fidelity rating: **medium**

Prototype II (Breadboard Circuit)



Top
View



Front View

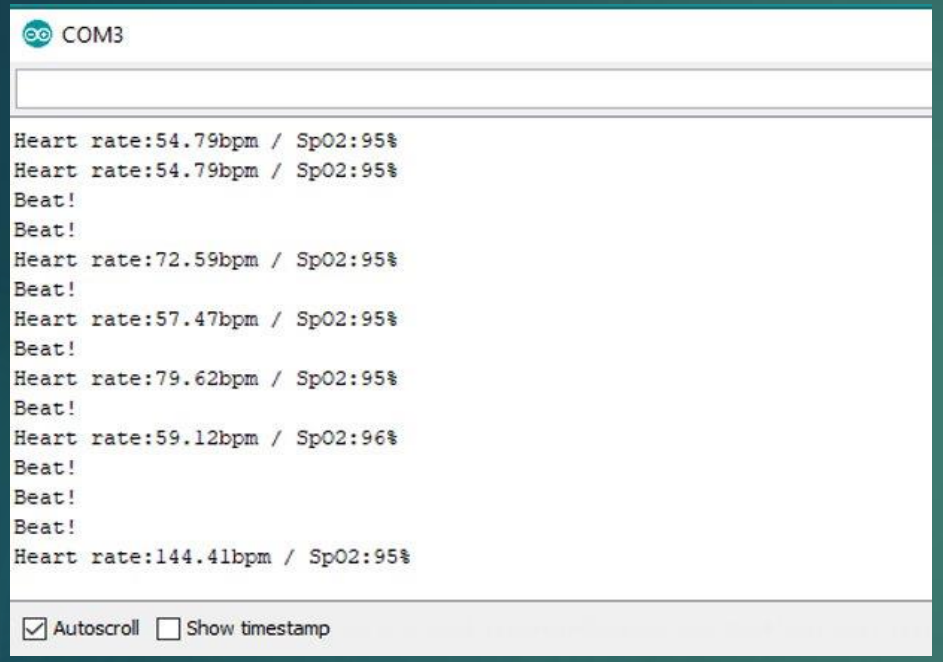
Prototype II Assumptions and Fidelity

- Place where values are being measured is assumed
- Activity that the user is performing
- Movement of the device
- Prototype was very focused
- Fidelity rating: **low**
- A more comprehensive prototype can be made to address the assumptions

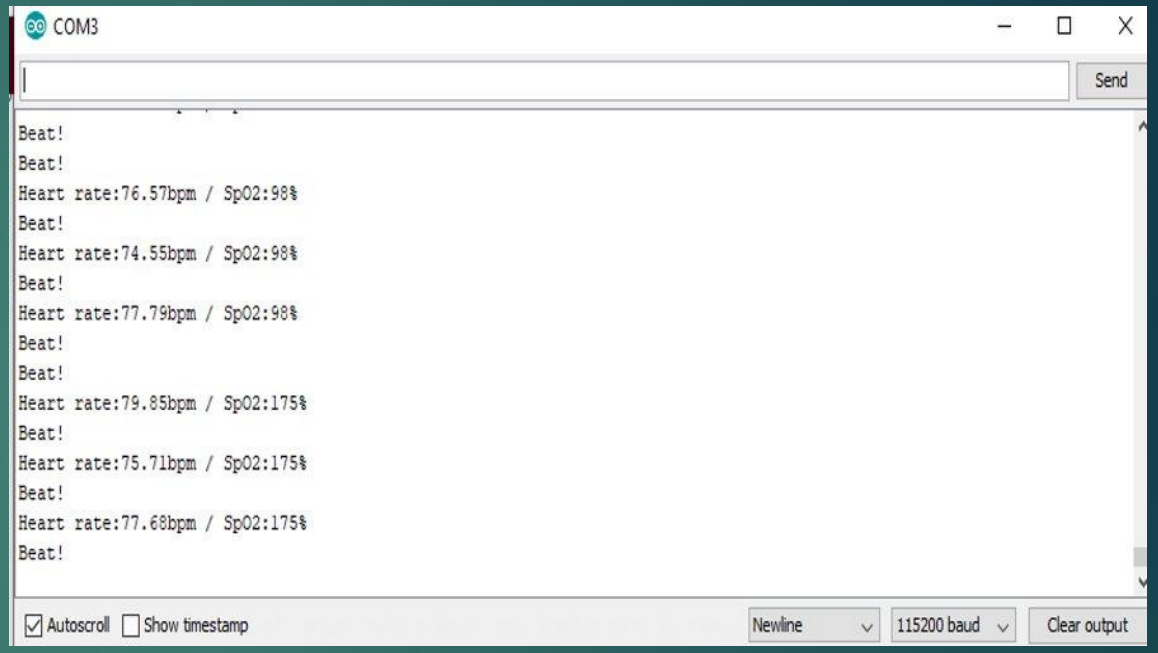
Prototype II Test and Outcomes

- Objective was to test the precision of the MAX30100
- The test plan involved a volunteer placing his finger on the sensor for 30s
- Uniformity of measured values was then determined
- A limitation of this is that it tests precision, not accuracy
  - Could have compared it to another device's results
- It was discovered that the sensor defected
  - Finger must be placed very specifically on MAX30100
- The values obtained did not satisfy our precision requirements

Prototype II (Arduino Monitor)



Serial monitor displaying fluctuation in heart rate

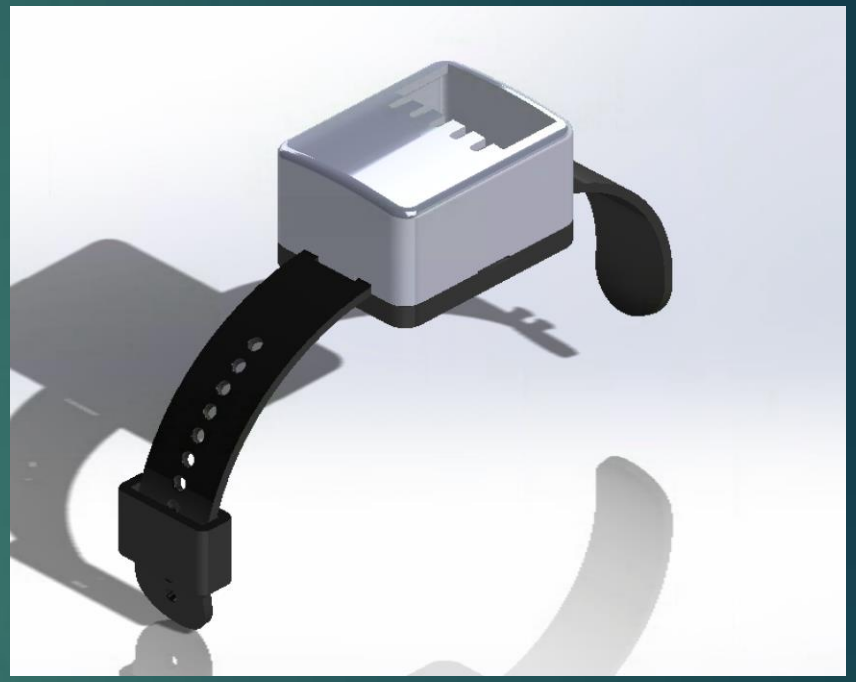


Serial monitor displaying fluctuation in oxygen saturation levels

Current Prototype Demonstration

Next Steps

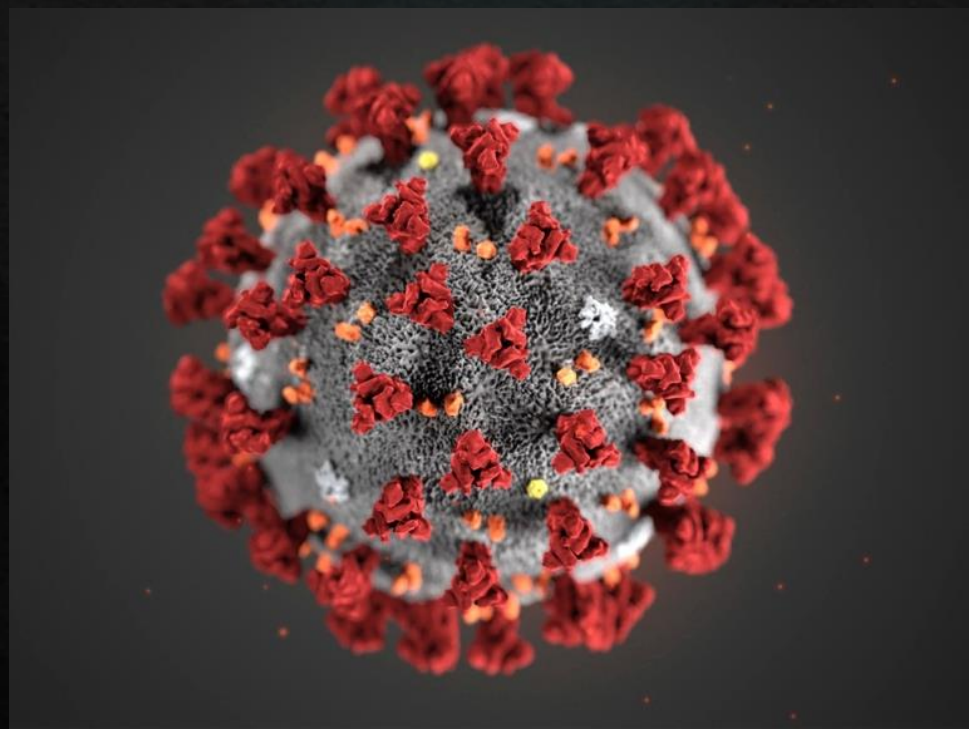
- Create the final metal casing and attach it to the rubber straps
- Test and attach OLED screen to the device
- Implement LED lights to reflect heart rate and SpO2 levels
- Add vibrational motor and rechargeable batteries
- Create a STOP button
- Solder all components together



Analytical model of Prototype III

Challenges Faced and Lessons Learned

- COVID-19
- Time Management
- Organization




Questions