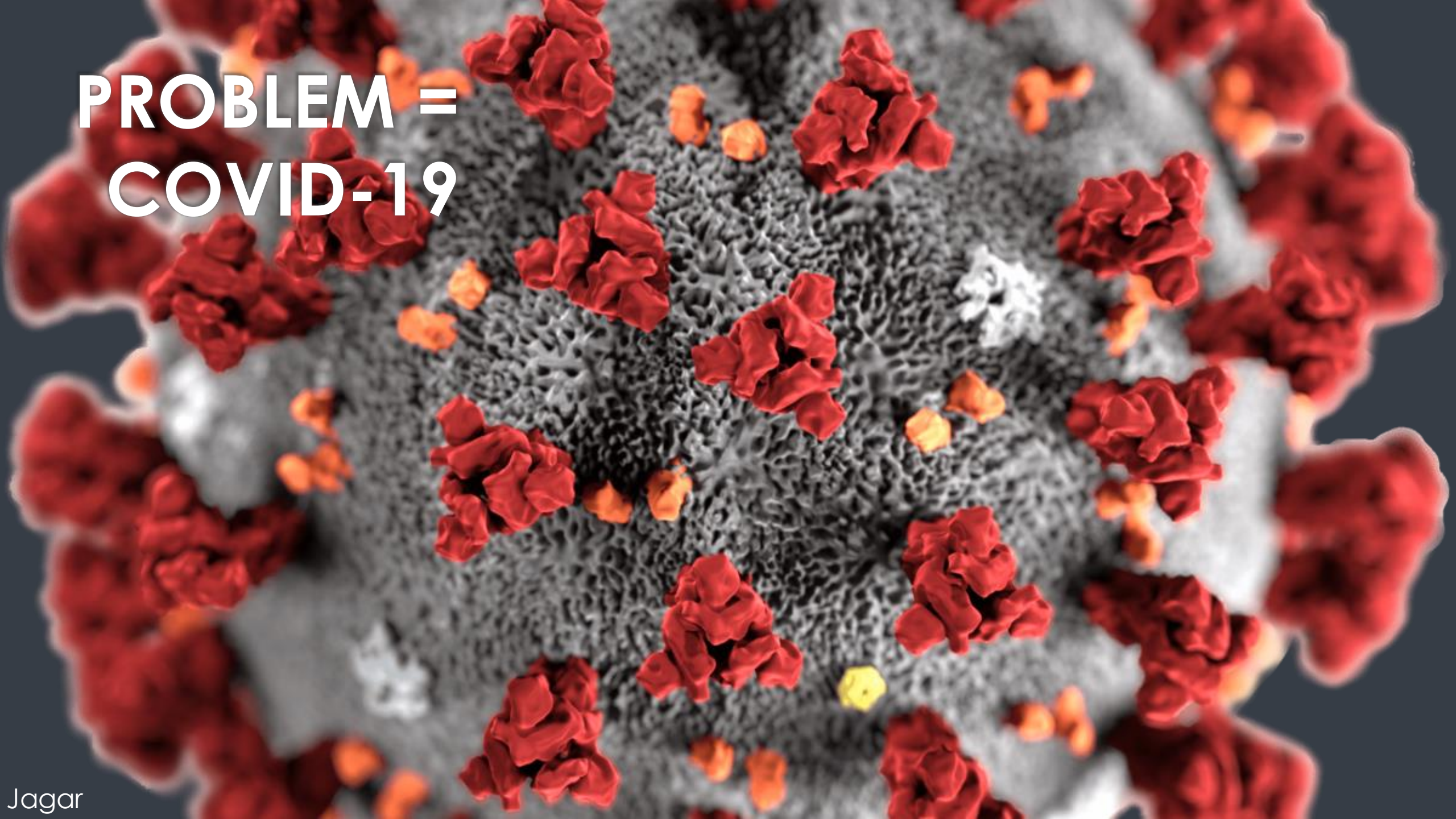
THE SOCIAL-DISTANCE SENSOR

JAGAR, PRESTON, BRAEDEN, *ISAAC


PROBLEM =
COVID-19

FUNCTIONAL NEEDS

- COMFORTABLE
- SIMPLE/EASY TO USE
- DETECT PAST 6 FEET
- QUICK RESPONSE
- ELDERS CAN OPERATE WITHOUT TROUBLE
- COMPACT SIZE
- LIGHTWEIGHT

Braeden

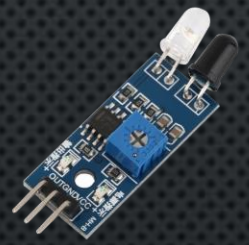
BASIC SPECIFICATIONS

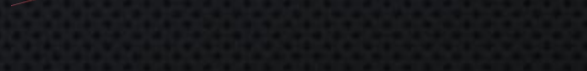
- ADJUSTABLE AND COMFORTABLE DEVICE TO KEEP ON WRIST
- A SENSOR TO DETECT A PERSON PAST 6 FEET FOR SOCIAL DISTANCING GUIDELINES
- MUST BE EASY TO USE
- DEVICE RESPONSE LESS THAN 5 SECONDS
- LEDS CAN BE SEEN DURING THE DAY

Braeden

EARLY BRAINSTORMING IDEAS

Measure Distance





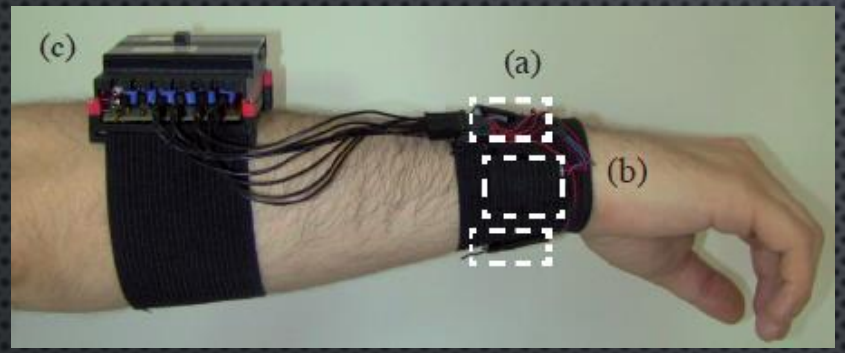
Alert user

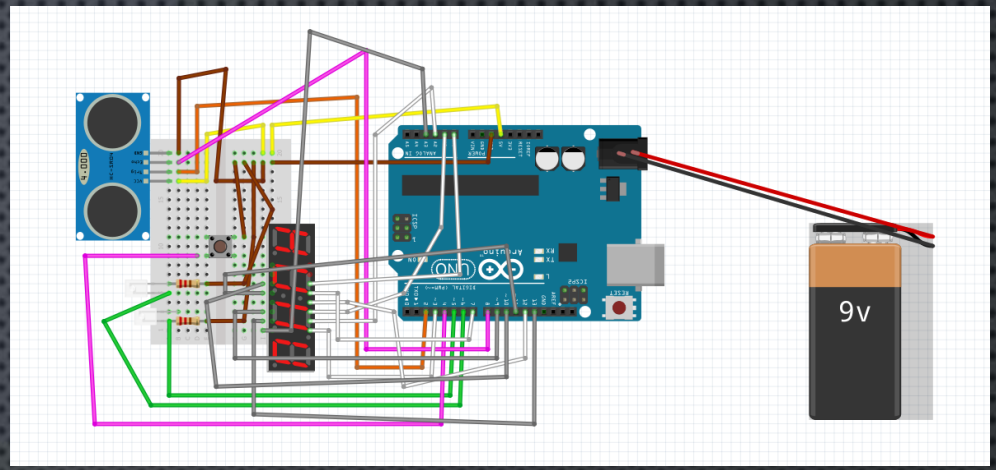
Comfortable

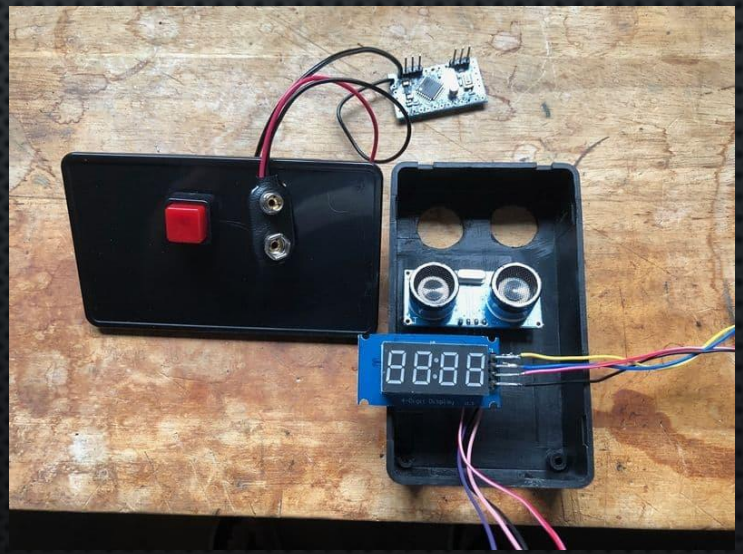
Power efficient

Jagar

POSSIBLE DESIGNS







Jagar

DECISION MATRIX

		Ultrasonic Velcro with LED/Button		Laser Rubber with LCD/Switch		Ultrasonic Velcro with LED/LCD/Button		
Selection Criteria	Weight	Rating	Weighted score	Rating	Weighted score	Rating	Weighted score	
Accuracy	20%	8	1.6	5	1.0	8	1.6	
Easily read display	20%	8	1.6	9	1.8	10	2.0	
Power usage	5%	8	0.40	7	0.35	6	0.30	
Comfort	20%	7	1.4	8	1.6	7	1.4	
Ease of use	15%	8	1.2	6	0.90	8	1.2	
Time	5%	6	0.30	8	0.40	6	0.30	
Durability	5%	4	0.20	3	0.15	3	0.15	
Size	10%	5	0.50	4	0.40	4	0.40	
Total score			7.2		6.6		7.35	
Selection							X	

Braeden

BILL OF MATERIALS

Item Name	Quantity	Cost
Adruino Uno R3	1	$23.00
Magnetic Wristband	1	$16.00
Ultrasonic Sensor	1	$4.95
Jumper Wires	23	$1.14
6 x 6 x 5 mm button	1	$0.07
4-digit LED Segment display	1	$8.20
Red and Green LED light	1 of each	$0.07
9V Carbon Battery and Adapter	1	$7.55
Breadboard	1	$0.60

Total Cost of materials: $61.58

ENGINEERING ANALYSIS

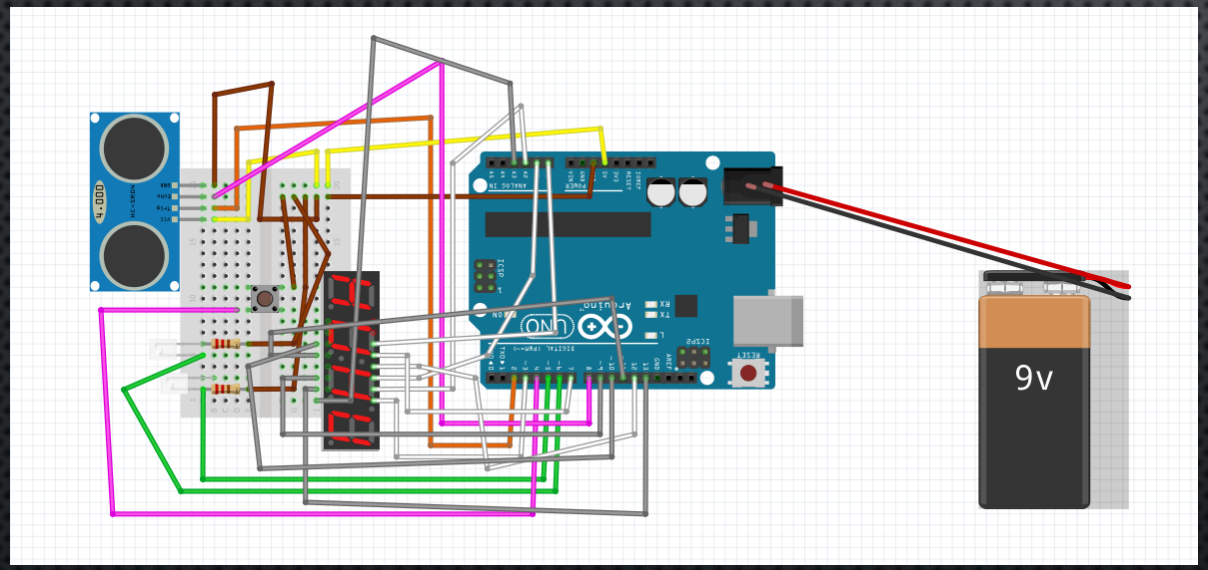
Item Name	Power Draw 1 mA = 1 mAH	Amount of Time On per hour (Clicked 7 times per hour for 5 hours)
Arduino UNO R3	46.5mA (7 secs)	49 seconds, 245 seconds
2 LEDs (Green, Red)	0.666mA (3 secs),	21 seconds, 105 seconds
4-digit 7-segment display	75mA (3 sec)	21 seconds, 105 seconds
Ultrasonic Sensor	6.3mA (13 ms)	0.091 seconds (91 ms), 0.455 seconds
Total:	128.466mA, 128.466mAH Estimated: 3.25mAH / day (mAH * s/h * seconds on)	91.091 seconds, 455.455 seconds per day

Preston

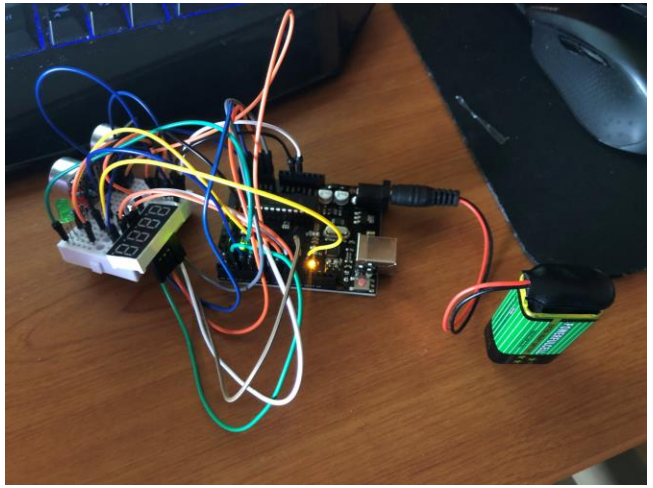
CODE LOGIC

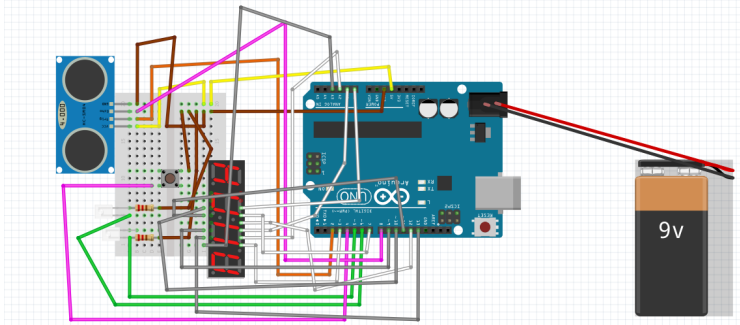
- Simple logic, complicated code
- Always waiting for button input from user
- Once input received, distance is measured and output in less than a second

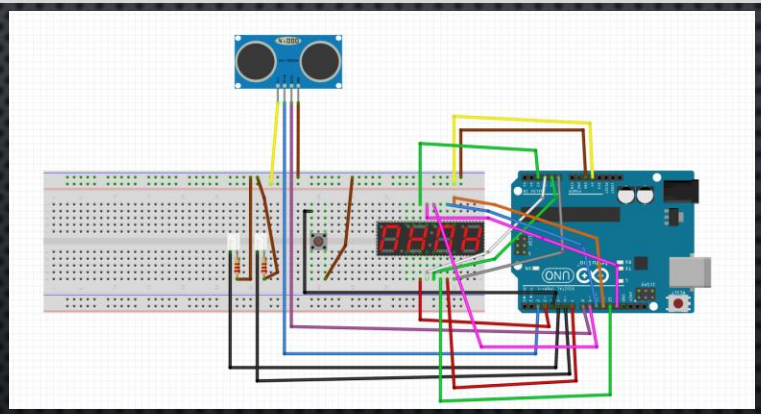
3D MODEL

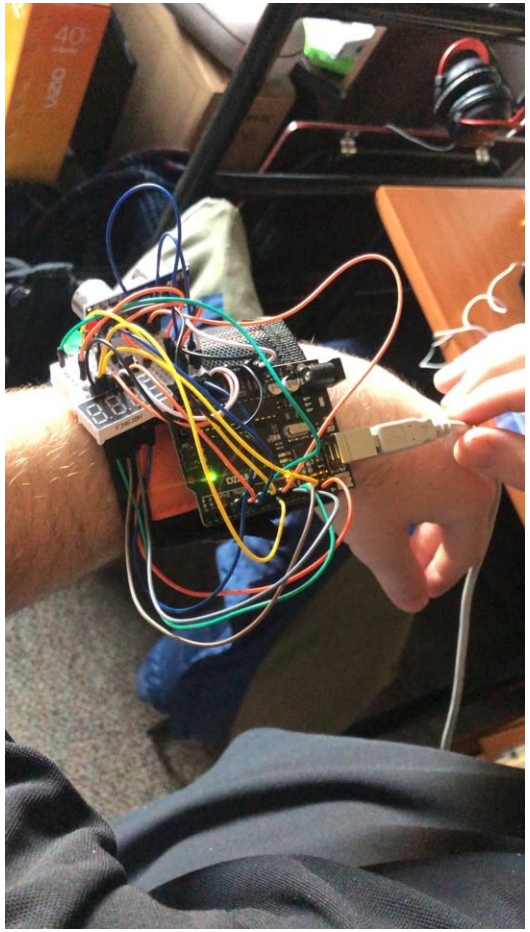


Isaac





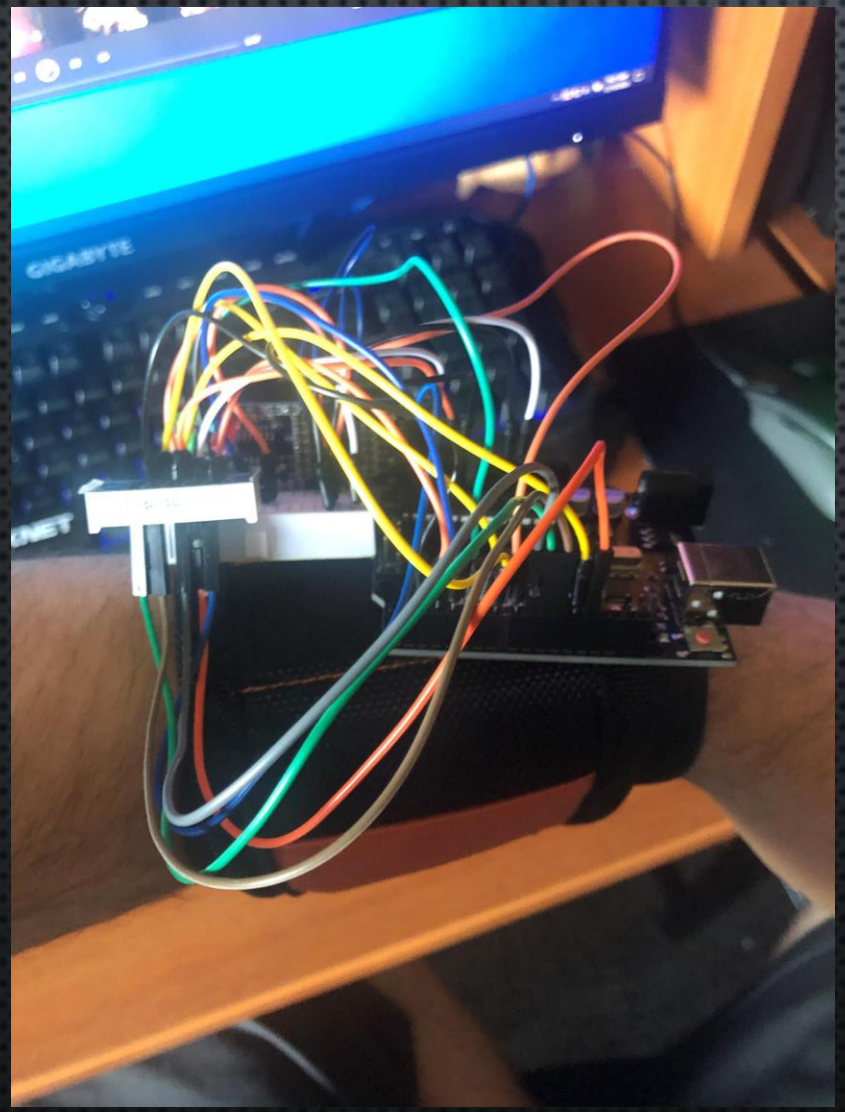


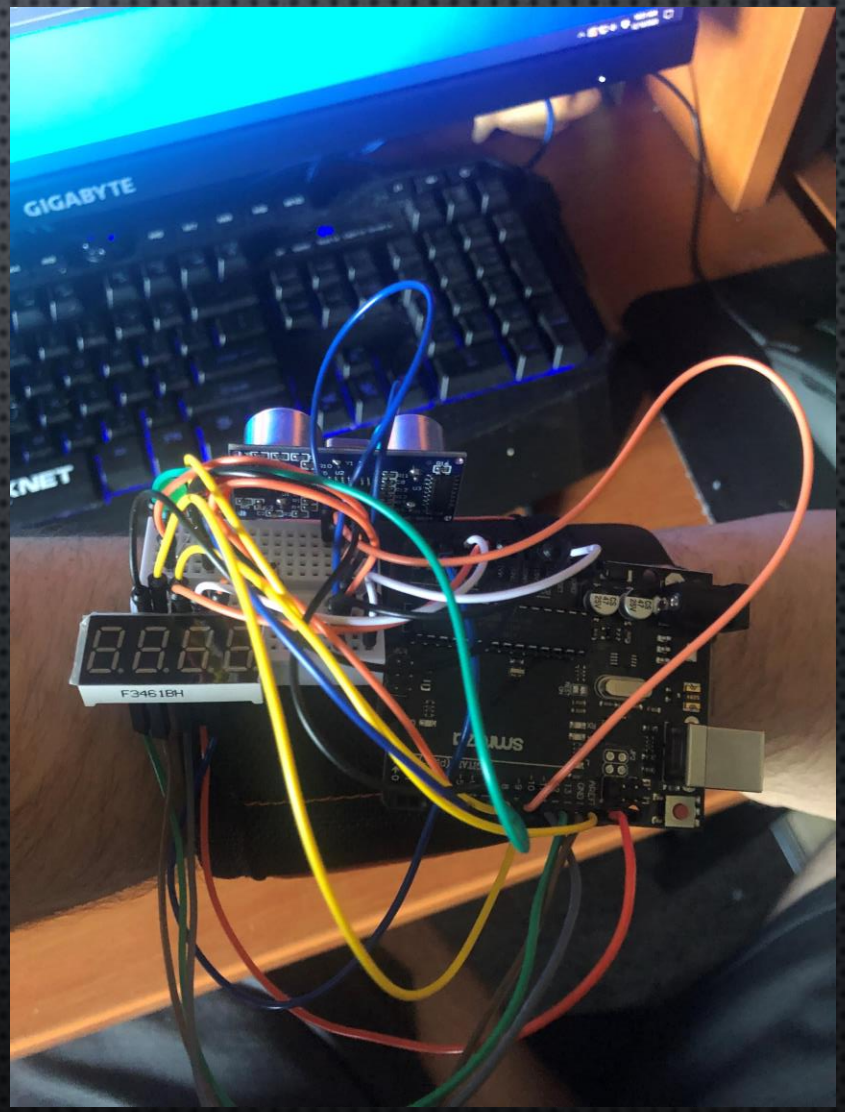


FINAL PROTOTYPE

PRESTON

FINAL PROTOTYPE FINISHED BUILD





Problems and Solutions

- What problems did we run in to?
  - Code
  - Size
  - Shutting off the Arduino
  - Online class/COVID

- What would we do different in a design refresh?
  - Smaller Wires
  - Slightly bigger breadboard
  - More accurate sensor
  - Bigger button

Isaac, Preston

SOURCES FOR PROJECT

- Malik, Namya, "Social Distancing Sensor: Devices that Use Ultrasound and Radio Frequency Communication to Facilitate Social Distancing" (2020). *ENGS 86 Independent Projects (AB Students)*. 14. https://digitalcommons.dartmouth.edu/engs86/14
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