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ECE 2242B Principles of Design
Professor Marinov

Life360 – ECE2242B Project

Personal Notes

18 February 2022

The idea was taken by my teammate during a brainstorming session in the middle of the lecture. We had several farfetched ideas but ended up with what seemed like a good idea. The idea needed to be convenient. This was the biggest issue we wanted to solve was the inconvenience of telehealth appointments.

20 February 2022

My teammate and I have not started working on the project yet but found a sensor that would supposedly solve half of the issue with the project: MAX30100. It measures both the heart rate and oxygen levels from the fingertip. It was easily to implement with just 4 pins. The code is the issue we need to figure out.

24 February 2022

We started delegating the process of the presentation. My teammate and I were both in 2 different places, so we had to use discord which is always a pain. I ended up with the algorithm, block diagram, and cost analysis. My teammate had to work on the reason: not my problem.

26 February 2022

I have not done my part yet except the cost analysis which is basically the easiest part. I need to finish what was assigned to me before our next meeting on Thursday.

31 February 2022

I finished everything except the algorithm. I hope Marinov would not mind and our confidence is enough to win him over. The circuit is done, but the MAX30100 is not on TinkerCAD and to be honest I don't even know how to "emulate" a device. Do I just add a resistor that uses up the voltage that it would supposedly use, or do I have to program a whole software and make it from scratch? Knowing how this course is being handled I would assume it's the latter. I'll just skip this part for now.

6 March 2022

We haven't looked at this course is quite some time trying to catch up with other courses. We started working on the code. Each block works well individually. However, when implemented and integrated with the whole circuit the project falls apart. The code was slowly starting to work even together. We found some helpful tips online that the lab resources didn't do justice.

At the end of an almost all-nighter, the blocks all worked with some even working together. The feeling can only be described in one word, bliss.

8 March 2022

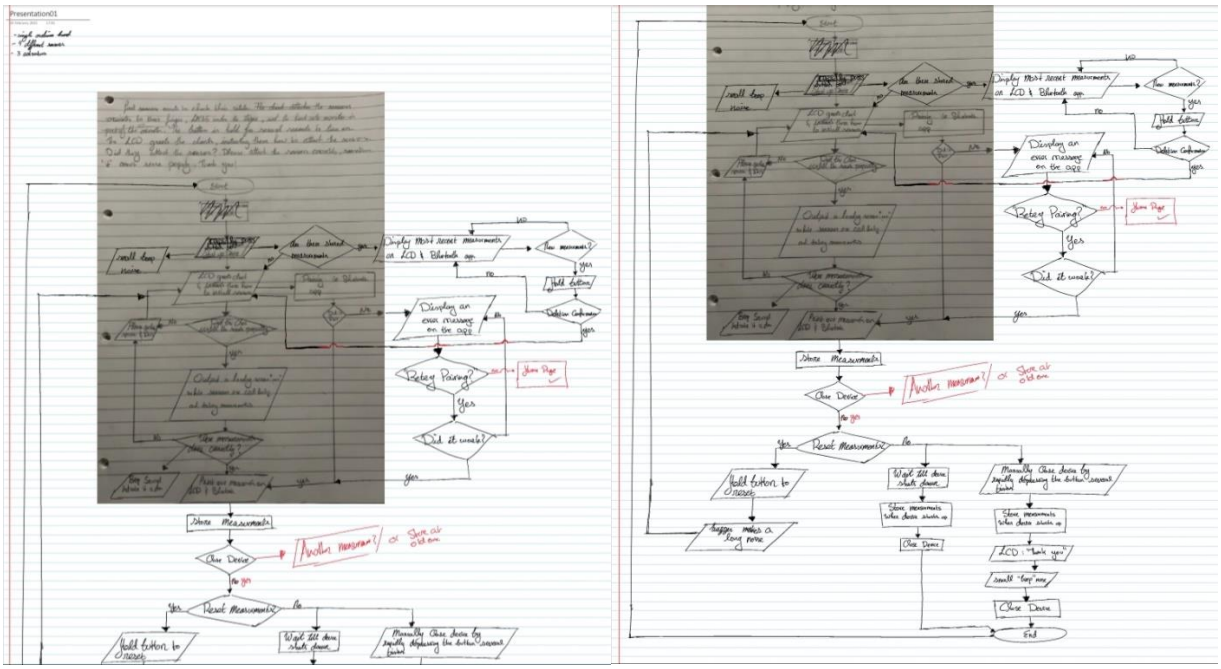
We presented the circuit to the professor and all the contentment that we felt suddenly disappeared just as quickly as it arose. I guess nothing was worth being proud of. It was all fundamentals and nothing interesting. Quite the contrary, the circuit had so many flaws we basically did not do anything. The project was "basic" and "unimaginative". On top of that, the sensor (MAX30100) that was considered two separated sensors is now considered only one sensor. And now we are missing one sensor: on the verge of perhaps failing.

9 March 2022

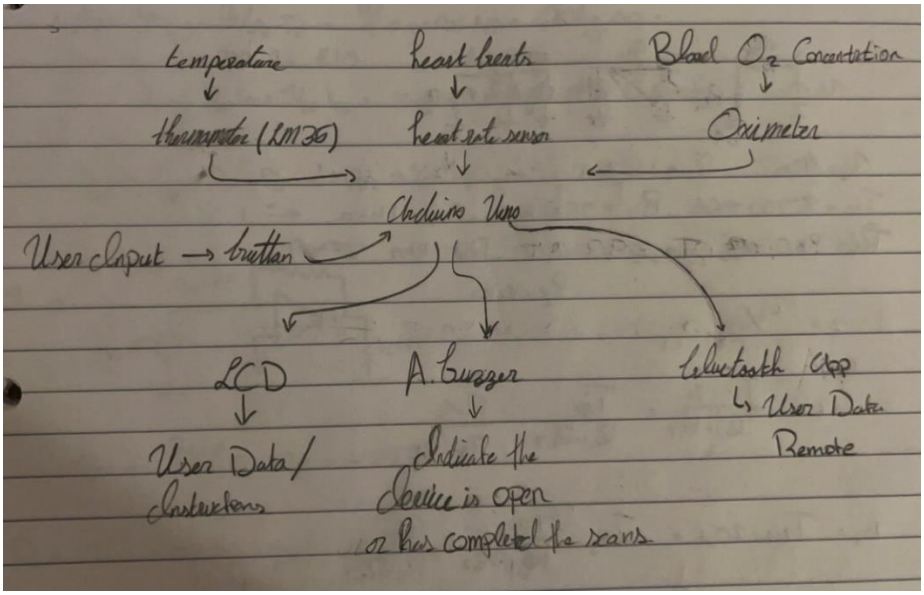
We started working on the code again to fix all the issues pointed out and rebuilding the whole circuit. Basically, we went back to the drawing board. We had to brainstorm why buying our $30 product which is more accurate than not wiser than buying the $300 watch.

Design Development

ALGORITHM PROTOTYPE



BLOCK DIAGRAM PROTOTYPE



Customer Analysis

Alternative Ideas	Complexity	Cost	Functionality	Market Appeal	Engagment	Convenience	**Total**
Blood Pressure Sensor	3	2	1	2	3	2	13
Vitals Sensor w/ Personalized Report	2	1	1	3	1	3	11
On-the-Go Vitals Sensor	1	1	1	2	1	1	7

We started with 3 separate ideas and needed a way to grade each one for comparison.

Complexity is how many components the circuit will end up using, and how difficult it would be to implement?

Functionality: grades how useful the device would be to the client.

Market Appeal: how attractive is the device to potential customers?

Engagement defines how much attention we get from clients.

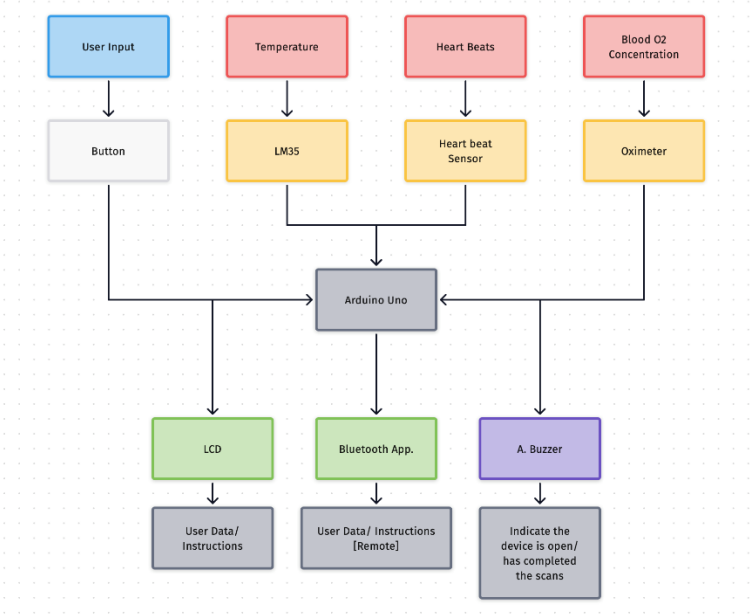
Finally, we needed to grade how convenient the device is so that every consumer can easily start the device and use it efficiently

Cost Analysis

Component	Cost ($)
LM35	$2.12
MAX30100	$6.67
Button	$0.25
LCD	$9.93
Buzzer	$1.55
Bluetooth	$5.89
Arduino UNO R3	$21.44
Total	**$47.85**

Unless we cut down costs, mass production for these devices would be unrealistic and unprofitable.

Block Diagram



After booting up the device, a loading screen will show up on the LCD, followed by the measurements of the LM35, heartbeat sensor and Oximeter (MAX30100).

Input would then be given by the user in the form of a button. The Arduino UNO would then inform the buzzer to make a high frequency sound: resetting the LCD and Bluetooth terminal.

Implementation

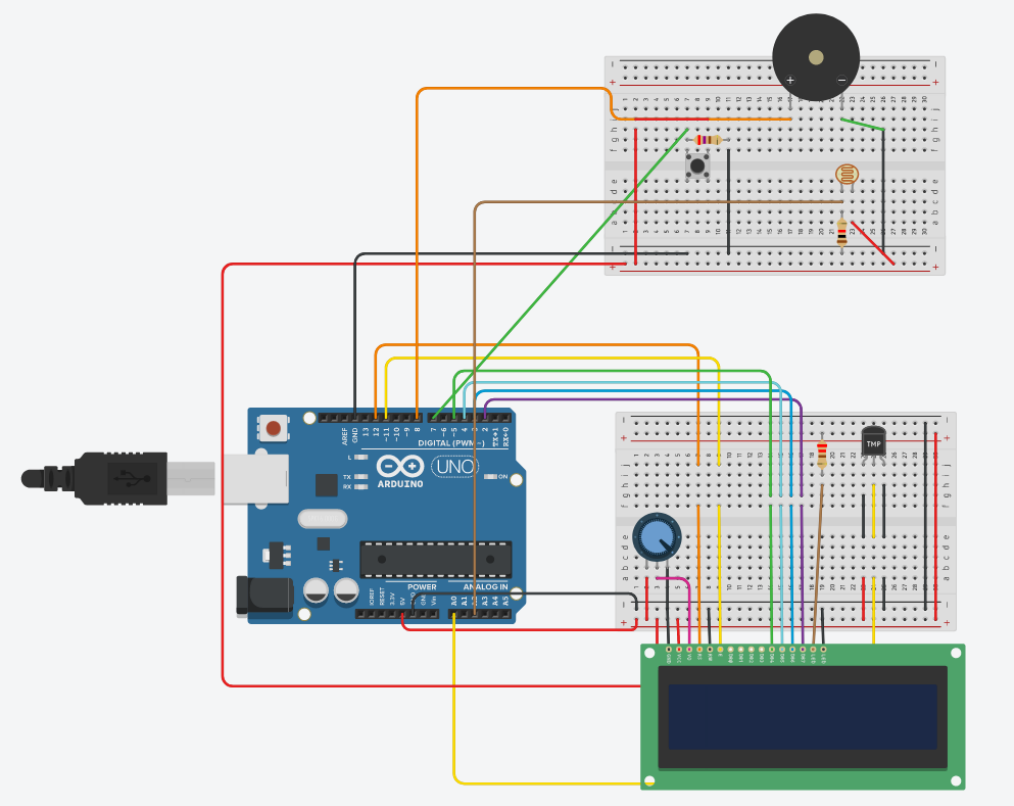
MAX30100 is integrated with the LCD and the LM35 to make one block. This block serves as the main component for vital measurements.

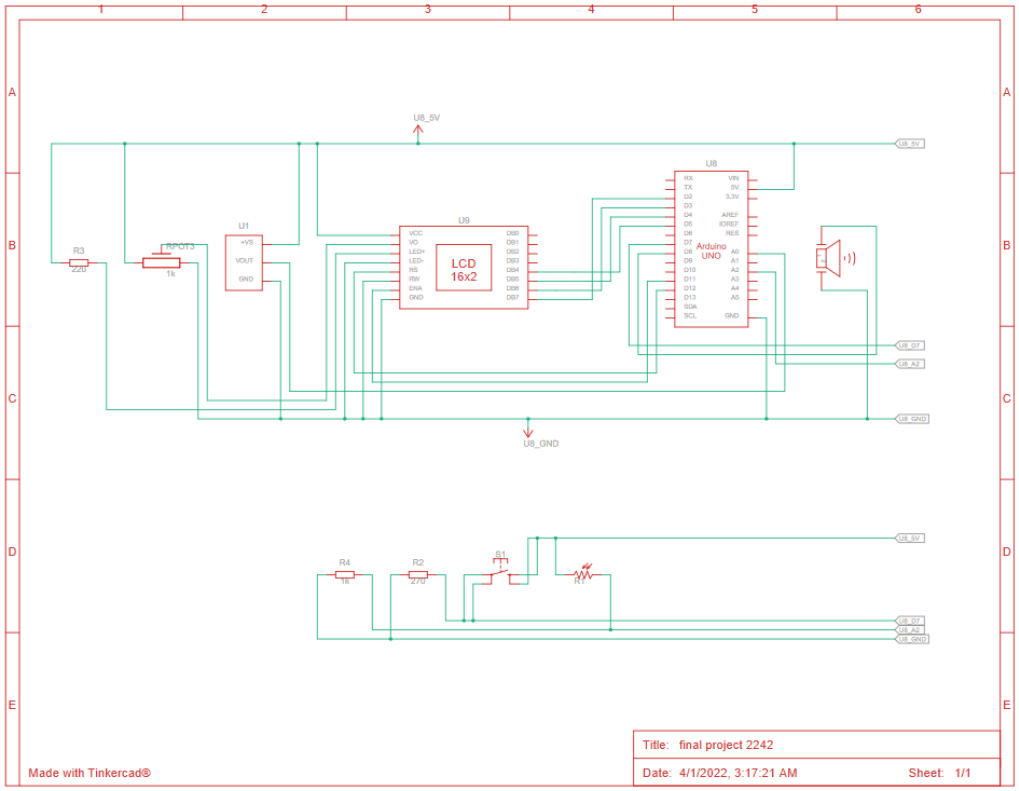
Block 2 is the buzzer and reset button. Whenever the button is depressed, the device resets and the buzzer generates a high frequency noise.

Block 3 is the Bluetooth, which is integrated with the serial monitor. The serial monitor sends its logs to the Bluetooth terminal and prints it.

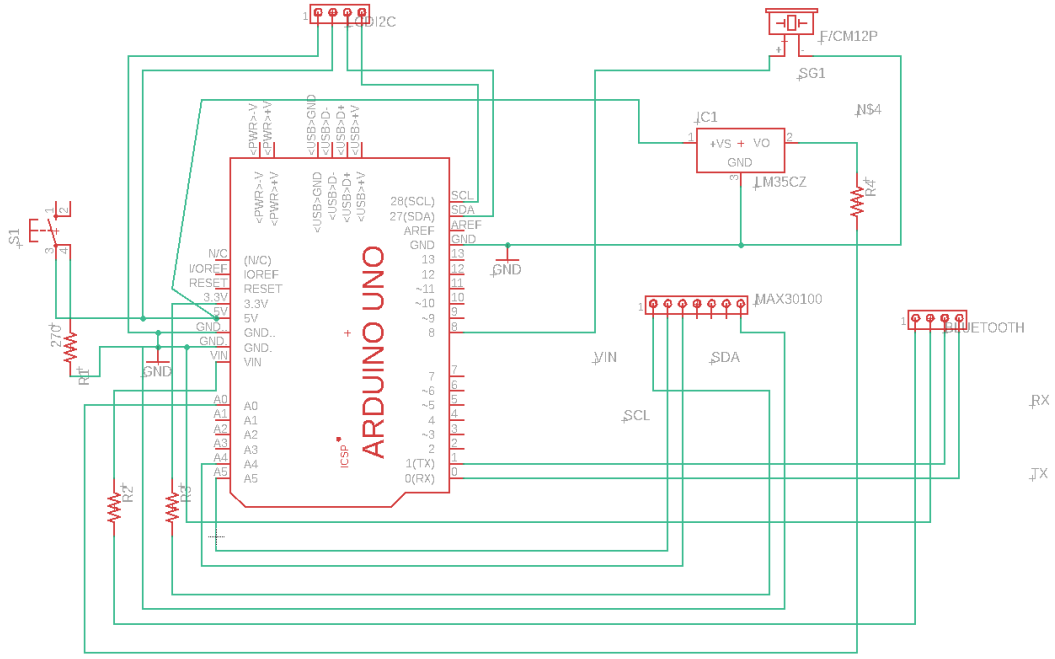
Each component is necessary to ensure the device is fully functional. Otherwise, the device would not work to its full capacity. Each block contains the components it needs to serve its purpose, otherwise the entirety of the block becomes lacking.

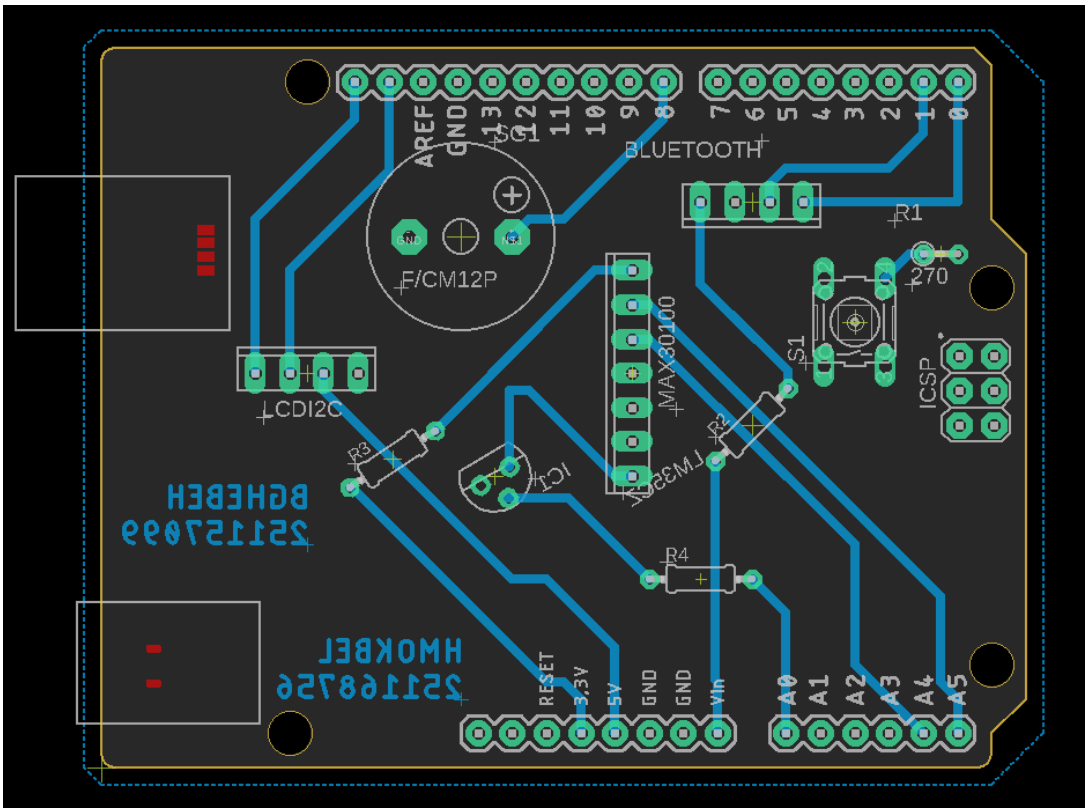
TinkerCAD Simulations & Schematic





EAGLE SCHEMATIC & PCB




AREF
GND
13
12
11
10
9
8
7
6
5
4
3
2
1
0
SG1
BLUETOOTH
R1
270
F/CM12P
MAX30100
S1
ICSP
LCDI2C
R3
R2
IC1
R4
RESET
3.3V
5V
GND
GND
Vin
A0
A1
A2
A3
A4
A5