University of Ottawa

GNG 1103[B]: Group 19

Deliverable H – Prototype III and Customer Feedback

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Abstract

In this deliverable we discuss our prototype III and the analysis of how prototype testing has gone. After the deliverable analysis is completed a bill of materials must be made.

1. Key Concepts

1.1. Microcontrollers

Microcontrollers are small computers that store codes and executes those codes using outside hardware. They are key components to any complex circuit. The main microcontrollers used are the UNO R3 style controller.

2. Prototype II Components & Analysis

This prototype is the culmination and subsequent testing of each individual components for weakness and possible avenues of failure. Please Note that for material access reasons, testing conditions and miscommunication there are parts that could not be included in this prototype.

The first component to be discussed is the components in the Arduino housing. These consist of our soldered protoboard, Arduino, and rechargeable battery. The soldering on the protoboard is clearly the work of an amateur and will need to be improved upon in future iterations. The Arduino housing itself could also be improved with a better hole placement for the wiring. The major upgrade made in this portion of our design is a rechargeable battery. This battery will be plugged into the console of the vehicle and will be constantly feeding the battery power while the car is on and using the batterie's while it is off. With that in mind the power display lights can be omitted, saving on costs.

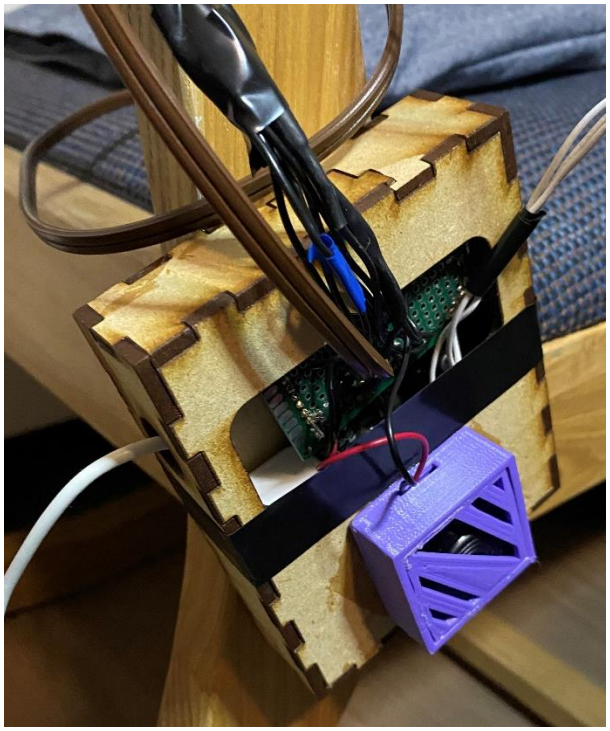

Figure 1: Arduino Housing

The Sensor module in this iteration was scaled up to accommodate all the wiring and the holes for the sensors were moved around. This has done nothing but improvements. With the implementation of the protoboard the temperature sensor has been experiencing an error which occurs relatively often

(25% huge error rate!), I believe this to be due to hardware issues and can be solved by reconstructing this portion.

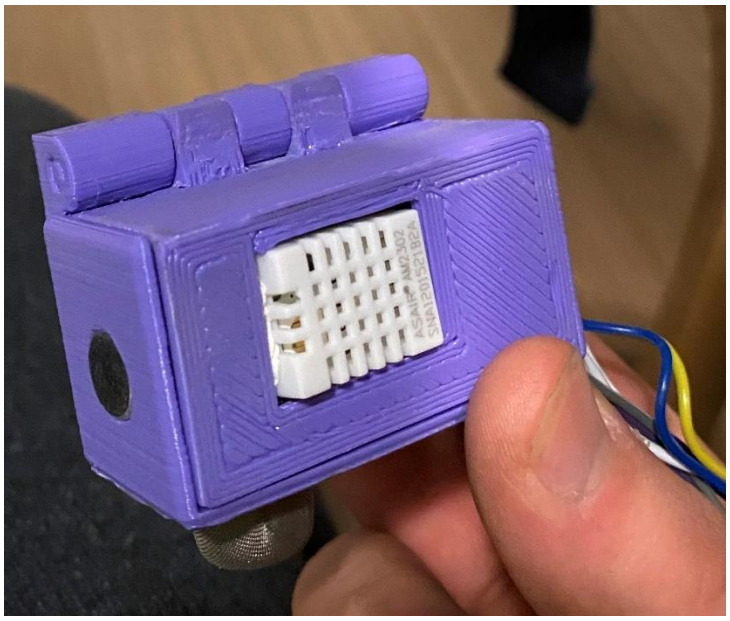

Figure 2: Sensor Housing

The fan has been upgraded to a larger one with a better air output, it is now 80mm in diameter and a new revolution speed of 2500 rpm.

Figure 3: Fan

The next point of review is the entire system, which has a few kinks to work out. The overall issues are just the testing apparatus. I do not have access to a vehicle therefore I can not test our product in an ideal scenario, instead I have recreated a driver seat and backseat setup with two chairs. Realistically the components of our prototype can be put in any location on the vehicle if a few guidelines are followed. The sensor module must be at roughly the same height as the child or just below, the fan must be directed towards the child and coming from a height greater than the child.

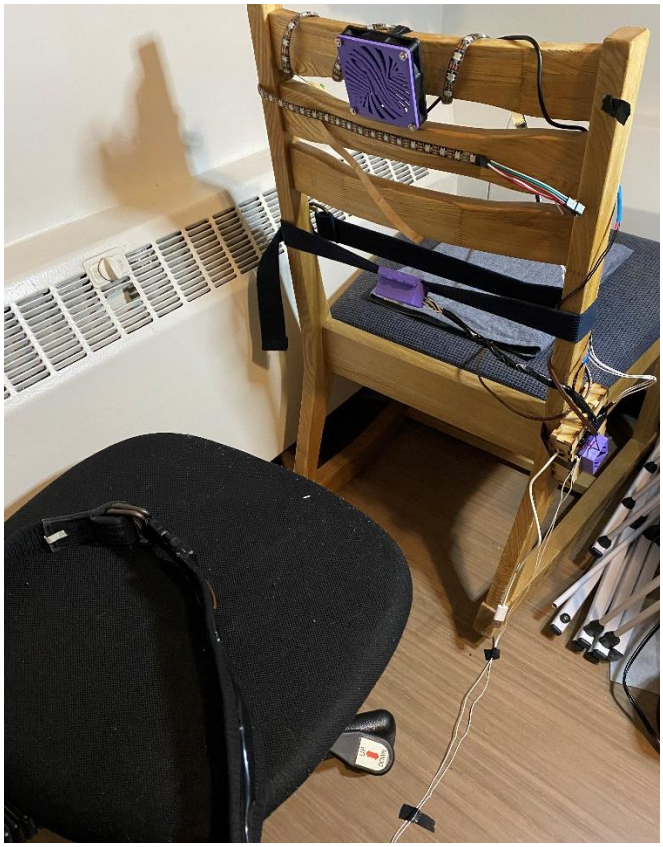

Figure 4: Entire System

The first scenario is when no driver is present but there is a child present. There is no dangerous environment detected and so there is just a simple alert going.

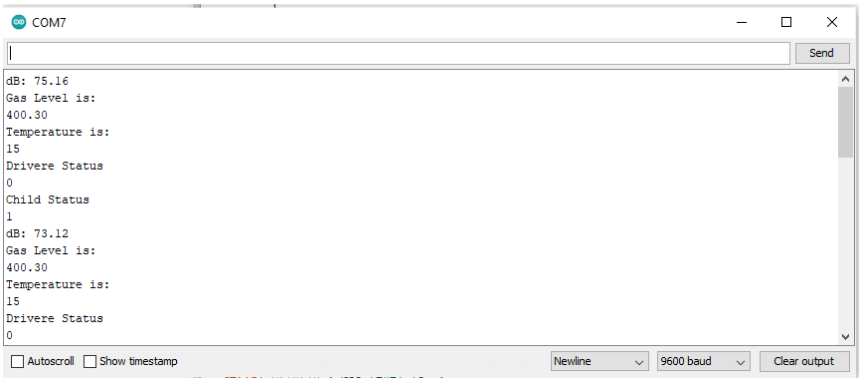

Figure 5: Serial Monitor for scenario 1

The second scenario is when the temperature/sound/gas is too high for the child and will set off our alert system, which now includes the RGB strip. Unfortunately, since our testing in prototype 2 there has been an issue with the light strip an id will no longer activate. This must be investigated before the 2nd.

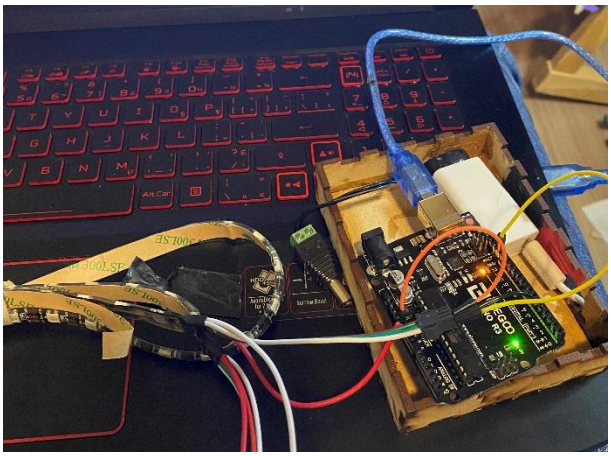

Figure 6: Difficulty with light

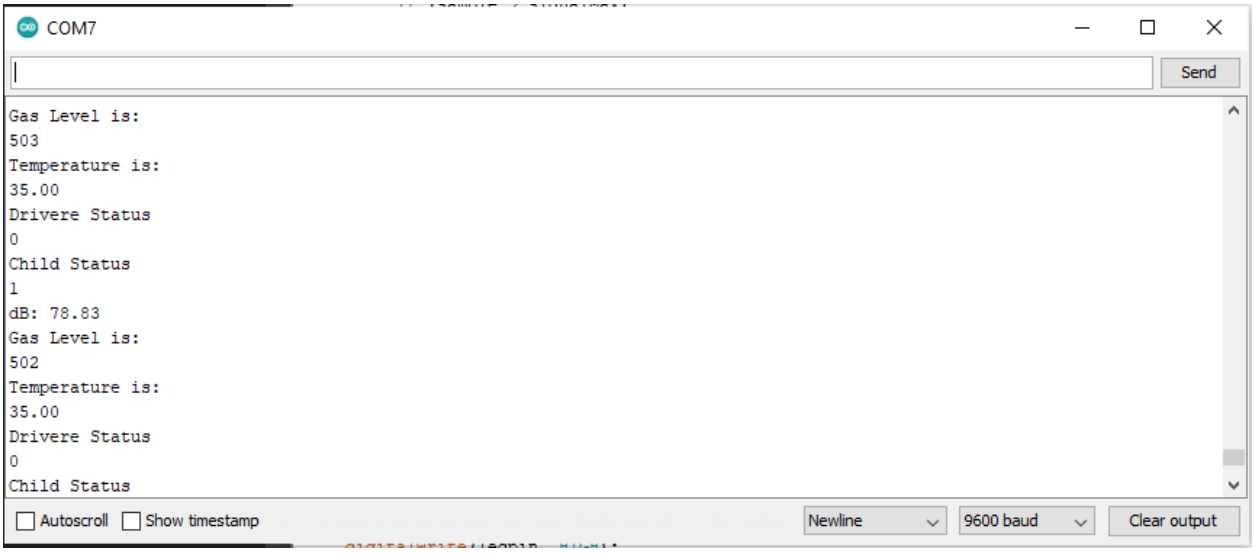

Figure 7: Serial Monitor for Scenario 2

Unfortunately, due to difficulty with access to hardware, the application alert system could not be physically installed and so we could not test it in conjunction with the rest of our components. The code is being made/created, and the application will look like last iteration.

3. Customer Feedback

The feedback from our client were to adjust the Battery to a rechargeable kind. We have began using a rechargeable 9V battery. We hope that with this change it'll be an even more reliable system, as it charges while the car is on. With more feedback on this third iteration from new parents as well as

older parents there is a consensus that it is a quality design, however, the note given is that the product should have even more decisions on what the system can look like. This would simply mean that there must be more length given in the wiring as well as more equipment to affix the system to wherever in the vehicle they would like.

4. Updated BOM

Owing to the limited budget, we need to spend money prudently and cautiously. Thus, we have listed a potential costs table below.

Part#	Part Name	Description	Cost ($)
1	Humidity/Temperature sensor (DHT22)	Link	9.99$
2	Gas Sensor (MQ-6)	Link	6.50$
3	Microphone amplifier (3.7W ClassD)	Link	8.00$
4	Buzzer (Active)	Link	2.00$
5	Auxiliary Fan	Link	12.00$
6	Elegoo - Micro control.	N/A	0.00$
7	9V connection cord	Link	1.30$
8	Velcro	Link	0.11$
9	9V Battery	Link	0.00$
10	LEDs x 4	Link	1.20$
11	5V LED strips	Link	5.00$
12	Thunkable	Link	0.00$
13	Laser Cutting	N/A	0.00$
14	3-D printing	N/A	0.00$
15	Wiring x2	Link	5.00$*
16	Double sided adhesive	N/A	0.00$
18	Wood MDF	TBD	2.50$
19	Filaments	N/A (Leftovers)	0.00$
20	Zipties x4	Link	2.36$
21	Resistors x3 (2x 220ohm)	Link	0.70$
22	Protoboard	Link	0.50$
23	GSM Module	Link	5.30$
24	SIM 800l	Link	2.68$
Total			**63.08$**

4.1. Equipment List

Part	Description
Protoboard	Wiring block used to centralize circuits
Multimeter	Use to measure electronic components of the system
3-D printer	This machine will be used to make the case for the sensor and possibly other things

Laser Cutter	This is a machine that will be used to cut out the pieces for our cases to the Arduino
Soldering/solder	Used to connect wiring between sensors and
Jumperwires	Used to make non permanent connections during the prototyping stage
ThinkerCad	Used to virtually create circuits before physical production begins
DHT lib	Library for the DHT 22 sensor
MQ-6 lib	Library for the MQ-6 sensor
Class D lib	Library for Class D microphone Amplifier

5. Wrike URL

https://www.wrike.com/workspace.htm?acc=4975842&wr=20#path=folder&id=758826352&vid=47240218