Project Deliverable G: Prototype II and Customer Feedback

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Abstract

The main objective for this deliverable will be to outline a plan for the development of our final prototype, and through rigorous testing modify it accordingly. After outlining a plan we will also be describing the way in which we will be testing our second prototype, so that it can be further optimized and completed by the next deliverable; and be ready for design day.

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Introduction

As seen in our lectures, after we have defined both the systems and subsystems we are going to use for our design solution, we must come to the part in which everything will come together by creating a proptype, which consists of the manufacturing, programming, and assembling of all the components our device will be comprised of. After our first prototyping attempt; we have done a proof of concept after ordering the missing parts online. In this deliverable, we will create a physical prototype and also use Tinkercad to have a model which will represent conceptually the way our prototype will behave, and also give us guidance regarding the coding that we must do for our systems to perform accordingly. Finally we will once again describe a prototyping plan and a testing plan, which would be similar to the one presented on the last deliverable, however, this will be more accurate and realistic since by now we have acquired most of the components we need and assembled our prototype. On the other hand, on these plans we will outline how we will make sure our device works properly and optimize previous system concepts presented in the previous deliverable.

System Analysis

For the components we chose in our BOM submitted on our last deliverable we have the following systems:

● Motion alert system: through our PIR motion sensor and our Arduino UNO, we will create a program which sets up alerts sent to the phones of the parents/guardians of the children or pets inside the vehicle, this can be easily done. Also, the motion sensor will be connected to the buzzer so that if it is activated after the car is locked, it can set off the buzzer, this will also be done through a program in the arduino.

● Temperature alert system: through the TMP36 temperature sensor and the Arduino UNO, we will create a program which will trigger a failsafe alarm, in case the motion sensor fails to alert the parents that they left someone on the backseat, when the temperature inside the vehicle arises, the program will also act the same way as the motion sensor in that it will send the parent/guardian text messages and notifications to the parents so that they become aware they left someone on the backseat. As a fail safe, the temperature sensor can also be programmed to the buzzer, in case the first alarm fails.

We will be placing our motion sensor on the ceiling of the car to have a broad view of the backseat. The arduino board and the other components with the temperature sensor(placed in the box we will create using laser cutting) will be placed on the back of the front passenger seat.

Prototype Plan

The prototype plan for our device will be outlined below:

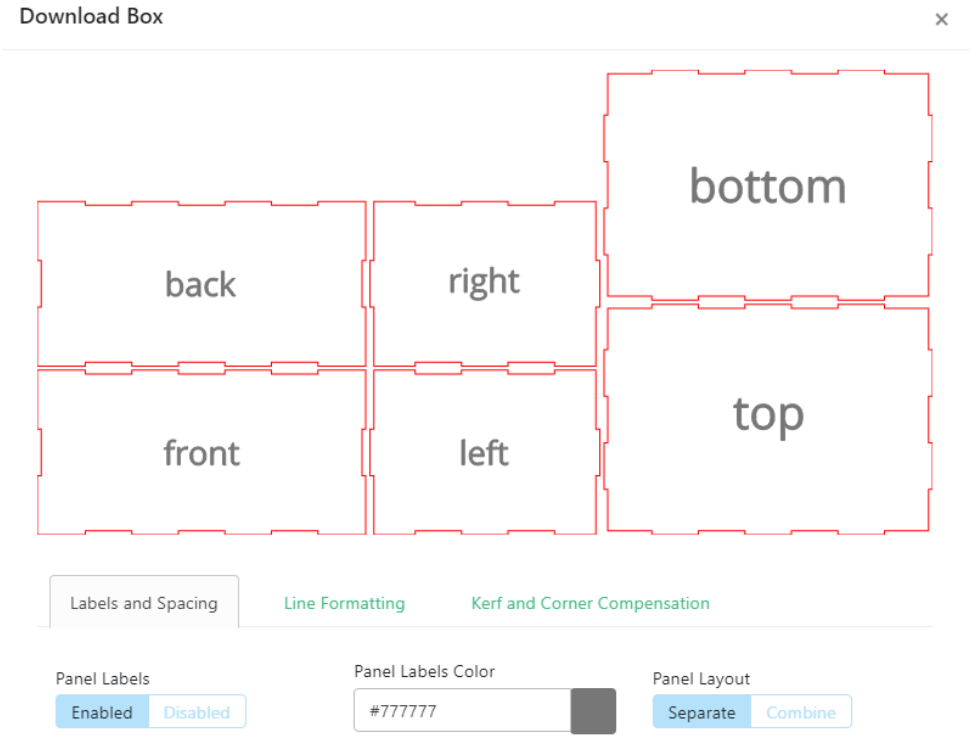
● First, following our BOM we have gathered the components of our prototype from the Maker Store. and also got the other components delivered to us.

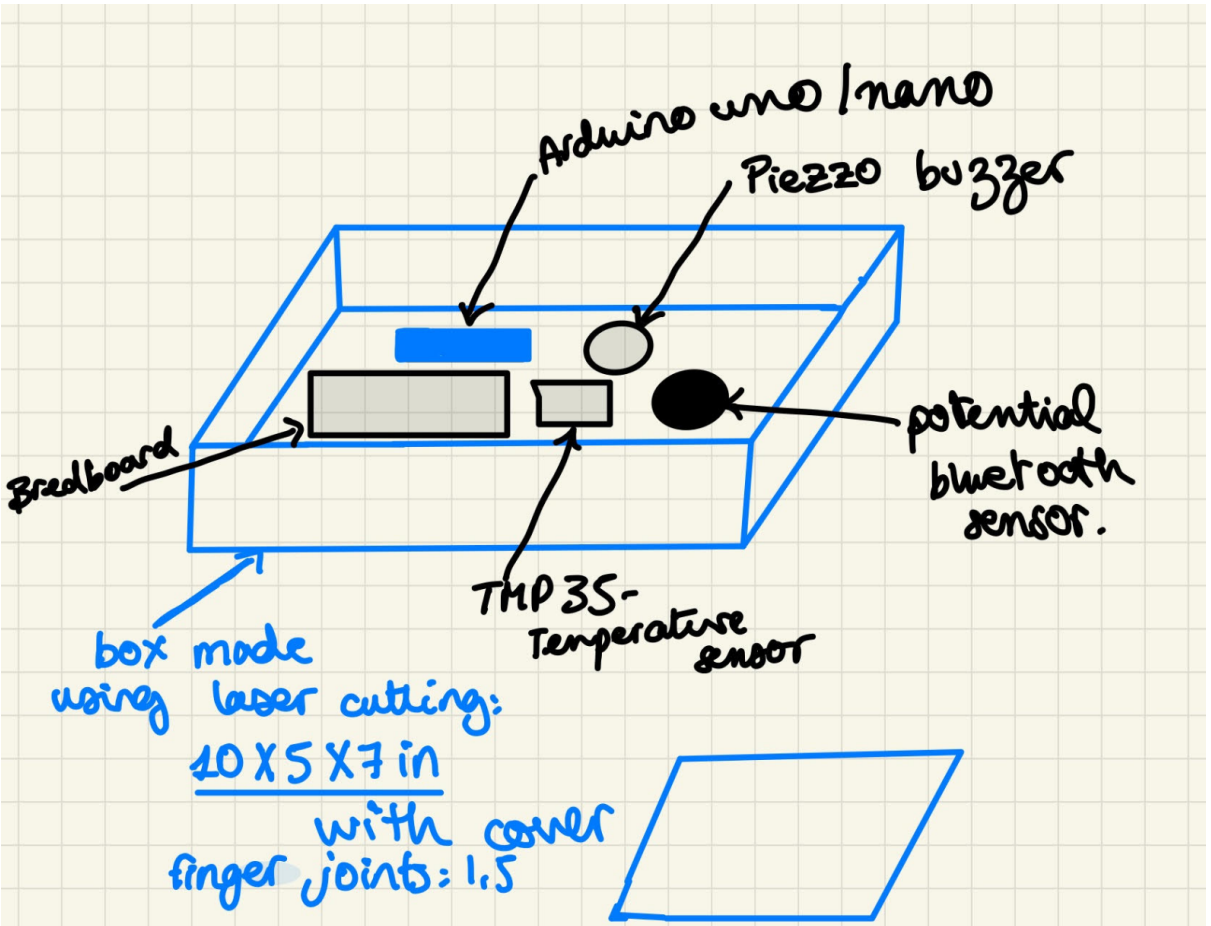
● After gathering all of the components together, we will proceed to build the Arduino and Sensors' circuit, while also creating the code for the proper functioning of our system.

● After building the circuit, and getting it all running (although it does not need to be perfect at this stage), we can make some minor adjustments, we just need to build the prototype to make sure our proof of concept works.

● Lastly, we will proceed to build a box or case for our components so that they can be protected while in use(the box template used in the laser cutting lab).

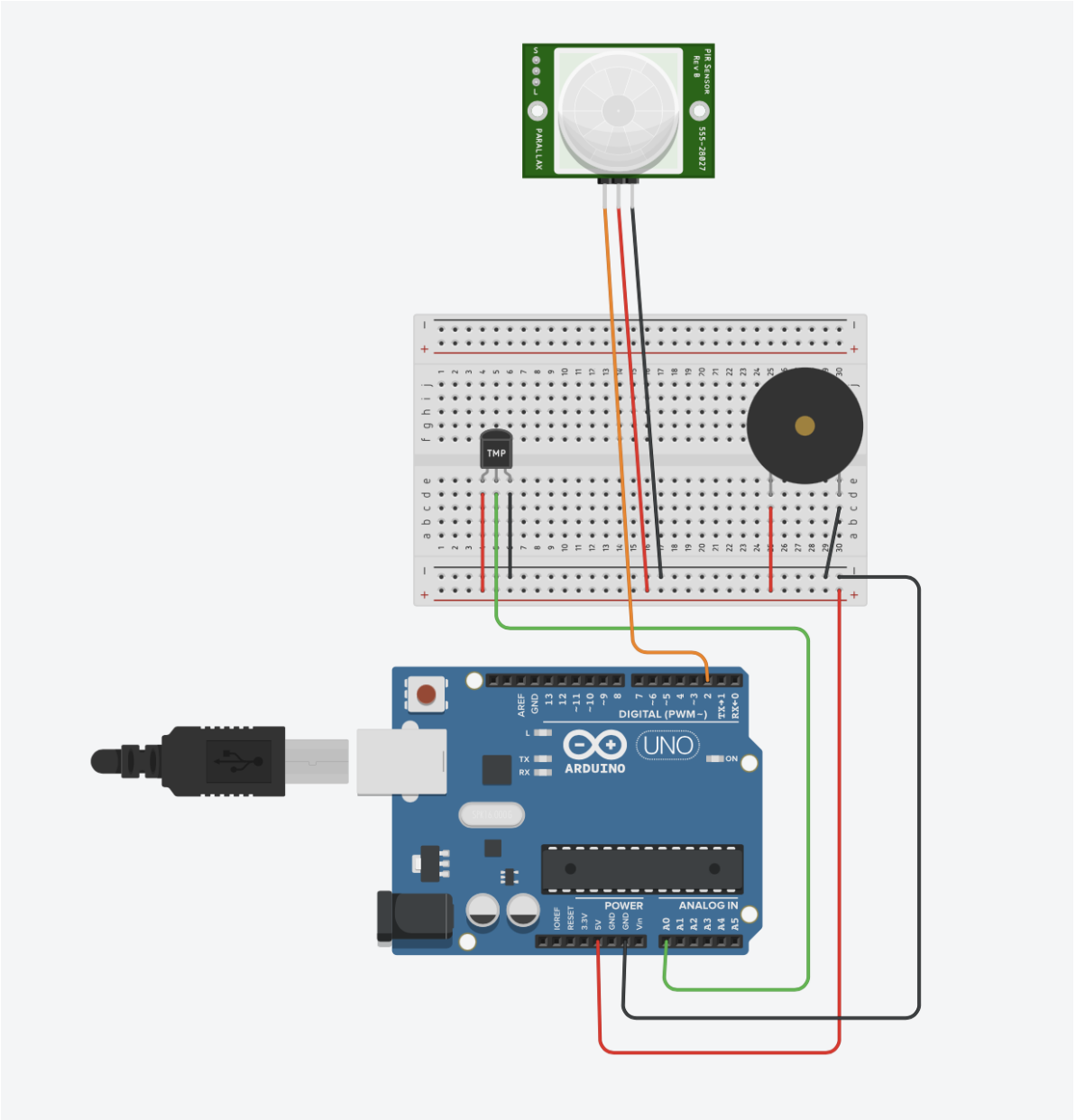
Additionally; we are planning on changing the 9V button batteries to a rechargeable power bank regarding the client's feedback on the sustainability and the safety of the product. Making this change will provide the users to recharge the batteries and prevent the device from running out of power when needed.





Sketch for the box.

PS: the motion sensor will be placed on the ceiling / backseat corner of the car.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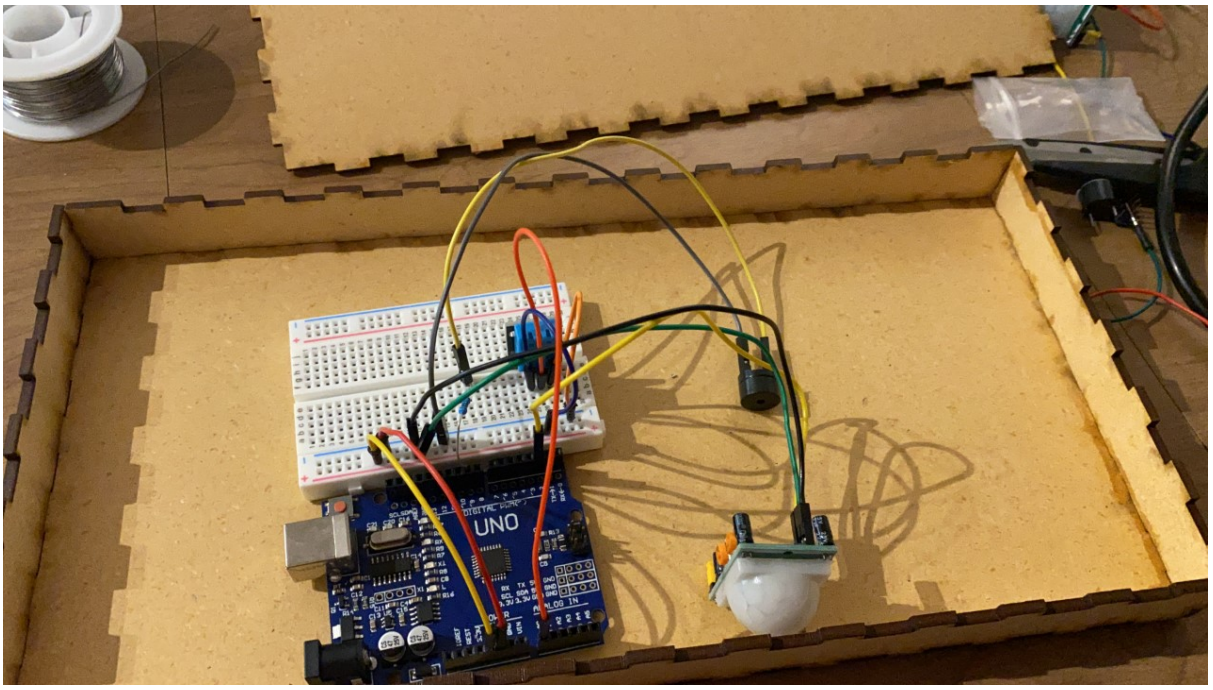

Test plan

For testing our second prototype, we will carry out the following plan:

- We will first test the time that will take for the buzzer to go off after the parent/guardian leaves the vehicle, this is done through tweaking our arduino code.
- Then we will proceed to do the same for our Temperature sensor, which should be programmed to send a second set of alarms in case the buzzer fails.
- We will proceed to test the PIR motion sensor's notification system, and make changes to the program as needed.
- We can proceed to make sure our box or case can withstand some type of force and impact in case it falls or is hit by something or someone inside the vehicle.
- We would then proceed to test that the PIR motion sensor can actually stay stuck to the ceiling of the vehicle and not fall.
- Finally we can test the functionality of the entire system by subjecting it to different temperatures, passing in front of the sensor, and such, to make sure we have a fully capable and complete device.

Conclusion and Reflection on the Client Meeting

Throughout the time frame of this project deliverable, we successfully completed the assembly of our second prototype, which we can conclude is the most important one, since it is the main device which should just be optimized to be presented on design day, without any major changes. We also learned and put critical thinking into action since we came up with problems as one does when bringing an idea into life, and we had to learn to deal with those issues and find alternate solutions for things such as coding, positioning of components, and such. We also got a clearer understanding of the design process and the steps we must take to create, modify, and test a prototype. We have laid a solid foundation to keep working on our design so that it can be ready and fully functional for our design day presentation, which we will make sure we do by tweaking our code and gathering the last components we need to add them to our device.

References

1. Temperature Sensor - TMP36 (SEN-10988). Retrieved October 17, 2021 from https://www.scribbr.com/apa-citation-generator/

2. KY-006 PASSIVE BUZZER MODULE. Retrieved October 17, 2021 from https://arduinomodules.info/ky-006-passive-buzzer-module/

3. PIR Motion Sensor. Retrieved October 25, 2021 from https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor