EE/CprE/SE 491 WEEKLY REPORT 8 (4/13/2019 – 4/19/2019)

Group Number & Project Title: (5) Road Safe Phone Case

Client: Christine Shea-Hunt

Advisor: Dr. Diane Rover

Team Members/Role: (Software) Zixiao Lu, Yifei Wang

(Hardware) Kedan Xin, Yue Chen, Sarah Baratta

Weekly Summary

For this week, the team made some improvement on the actual physical casing due to the mechanical misalignment. The casing could not secure the gear rack during the mechanical movement and the motor could not be secured on the casing. In order to solve these problems, The team designed some mechanical parts to secure the gear on the casing of the prototype. The first task was handling the track, which secures the mobile gear rack. This part will be mount on the top of the casing cover for the stable movement of the gear rack. The second thing is the motor holder which will be installed in the case to secure the motor in a fixed position.

Also, in order to improve the security of the casing, the team is leaning towards using a magnetic sensor instead of the simple pressure sensor or push button for the case cover, which can easily be bypassed by a user. The magnetic sensor can dramatically improve this security feature; thus, the team has created a parts comparisons of these sensors and other parts to help guide the final design decision.

Past week accomplishments

For this past week, the team has completed the mechanical parts design for the phone case and ordered the a magnetic sensor for improving the security feature of the case. Also, the team has completed the plan to implement the electrical circuit into the phone case, and a team member has ordered one 3D printer for the convenience of the production of the parts.

Due to the issue in which the servo motor did not quite fit perfectly into the phone case prototype, hole had to be cut on one side of the middle section of the case. However, the 3D printed wall is too thin to support the servo motor; thus, the team has created a holder of the motor to let the gear contact more smoothly with the gear rack. The following page shows the SolidWorks modelling of the new/altered components. The gear rack and the track that holds in it place is shown in Figures 1 and 2 respectively. The component to keep the motor in place can be seen in Figure 3.

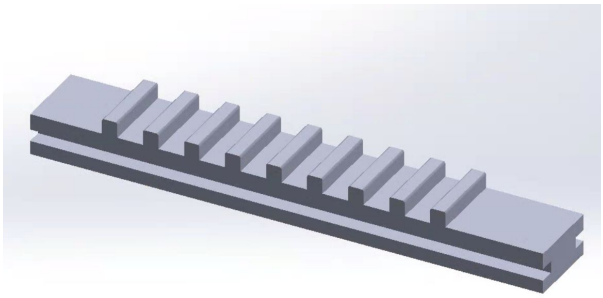

Figure 1: Gear Rack

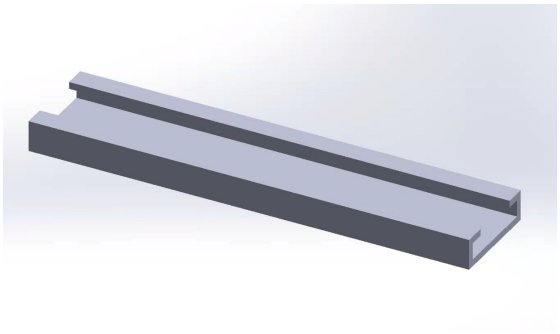

Figure 2: Track for Gear Rack

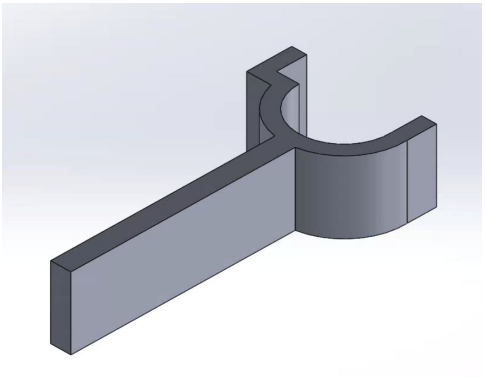

Figure 3: Motor Holder

Building off of the high-level block diagram included in the Status Report for Week 7, a list of parts needed for each subsystem. The team has set out on researching various products that are being sold for each type of product and determining which is best depending on price, functionality, and other characteristics. The microcontroller comparison table is shown in Figure 4, the lid detection sensor comparison table is shown in Figure 5, and the remaining comparisons are in a document shared by the team which is continuously being added to as the more components are researched.

Microcontrollers

Raspberry pi	Arduino Uno	Arduino Nano	Adafruit Brand
Expensive ($35) Additional, complex capabilities (not needed for project), Can support multiple programming languages, About 700MHz depending on size -> very fast	Reasonably-priced? ($25) Multiple pins, Can support multiple programming languages, 16MHz	Cheapest ($17 for 3 boards) Smaller size than Uno, Multiple pins, Requires soldering for testing, 16MHz	Adafruit Feather 328P - Atmega328P 3.3V @ 8 MHz ($12.50), requires soldering for testing Adafruit Trinket - Mini Microcontroller - 3.3V Logic - MicroUSB ($6.95): Minimal pins, requires soldering for testing

Figure 4: Microcontroller Comparison

Lid/Cover Detection Sensors:

Magnet/Hall Effect Sensor	Proximity Sensor (Ping/ IR Sensor)	Push button/ Pressure Sensor	Reed Switch Sensor	Light Detector w/ LED (Transmitter/ Receiver)
Magnet and sensor would need to be hidden in case and not disclosed to driver, so that they are not aware of how to falsely trigger a sensor	Can detect the distance from one object to the next, though if another object was in close proximity, the sensor would not be able to distinguish the difference	Can be falsely triggered by driver on purpose if the user has knowledge of the sensor or even by accident.	Same functionality as the Hall Effect Sensor. However, the size/layout is more convenient for the case	Light emitter will send a beam that will only be sent to a detector, which would only be able to transmit and activated the lock when in a position in which the lid is closed.

Figure 5: Lid Detection Sensor Comparison

Green headings signify that the team has decided that the corresponding part is best for the design. As for yellow headings, the team is deciding between those components, and may need to investigate more.

Described below is what each individual team members worked on:

Zixiao Lu: Met with other members and continued to work on RFID configuration.

Yifei Wang: Met with other members and worked on part comparison table.

Kedan Xin: Improve the prototype. Searching for different type of sensors for case detection.

Yue Chen: Helped design the mechanical parts of the casing, Made the plan for installing the circuit in the case.

Sarah Baratta: Researched and documented the different parts needed for the project. Meeting with team to work on the prototype.

Individual Contributions Table:

Name	Individual Contributions	Hours This Week	Hours Cumulative
Zixiao Lu	Met with other members and continued working on RFID configuration.	4	44
Yifei Wang	Met with other members and worked on part comparison table.	4	44
Kedan Xin	Improve the prototype, searching for different type of sensors.	6	51
Yue Chen	Helped design the mechanical parts of the casing, made the plan for installing the circuit in the case.	6	48
Sarah Baratta	Researching/documenting various parts needed for the project, helping with prototype improvement.	6	47

Plans for the Upcoming Week

The team plans to use the majority of the next week for preparing final documents and designs that can be presented to the clients and to others that have interest on the project plan and progress. Also, the team will soon have a presentation to instructors regarding the design decisions made and how much progress has been made this semester. Thus, the presentation slides will be constructed and assigned evenly to the members to talk about during the team speech, which will be practiced together before final presentation.

Additional time outside of end-of-semester preparation will be focused on testing the RFID tags and implementing them into the Arduino-controlled locking system to experimentally verify that they work and are viable sensors.

Described below is what each individual team members plans to work on:

Zixiao Lu: Try to make some progress on RFID configuration, meet with others to work the final version of project plan and design document, make the presentation slides.

Yifei Wang: Work the final version of project plan and design document, make the presentation slides. And practice for presentation if possible.

Kedan Xin: Keep improving the prototype. Trying to figure out RFID system and do some test of the case open/close sensor.

Yue Chen: Starting to do the experiments about testing the solution about blocking the key fob signal. Keep improving the mechanical security of the case

Sarah Baratta: Work with other team members to test the RFID with the Arduino and locking system as well as to finish up project documents and presentation slides.