

EE/CprE/SE 491 WEEKLY REPORT 7 (4/6/2019 – 4/12/2019)

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 the past week, as asked by the advisor, Dr. Rover, the team finalized a high-level design diagram for the projects system and components to determine all parts needed to create a case with all the capabilities desired by the client. Also, the team printed a 3D model, miniature prototype, connected to locking circuit built in the previous week.

The also explored more about the GSM module with the SIM card for sending a notification through text messaging if the driver is in an emergency. However, it was found that it requires the user to pay for a monthly plan, about \$6/month. The team does not think it is a good approach for the convenience of the client. Thus, other options will be explored to find some other suitable and inexpensive methods to send messages. The GSM module will now serve as a last resort because it is proven to work, but costly.

Past week accomplishments

The design diagram with the subsystems and relationships are shown in Figure 1 on the following page. The phone and key are the inputs to the case. Only one of the two can be inputted at a time. The input will then be detected by object recognition sensors and lid/cover detection sensors. If the sensors verify that the conditions for a valid object in the case, the locking mechanism will take place. The input will be locked and the other object, which is already stored in the case, will be outputted. Also, there is an emergency system that can be triggered at any time. When a user accesses the emergency system, the locking and messaging subsystems will be notified. The locking mechanism will automatically unlock the object being held, and the messaging system will send out a notification to a designated individual.

Along with the diagram was a parts list that listed different components necessary to deliver these functionalities of the subsystems. This included microcontrollers, different types of sensors and chips, and so on. The team has begun to research this, but still has much to uncover to find the best solution.

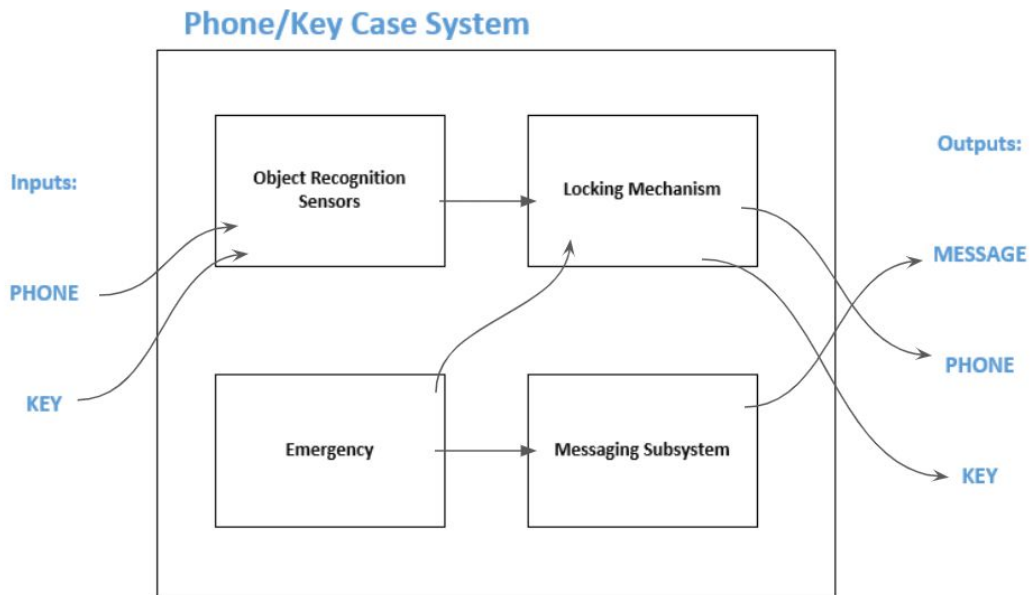


Figure 1

In the past few weeks, the team has been assuming the client has a traditional car key. Another breakthrough in the past week is that the team has found out a way to handle a smart key with the case. The smart key allows the driver to keep the key fob pocketed when unlocking, locking and starting the vehicle. The key is identified via one of several antennas in the car's bodywork and a radio pulse generator in the key housing. The smart key determines if it is inside or outside the vehicle by measuring the strength of the LF fields. In order to start the vehicle, the smart key must be inside the vehicle.

If the client has a smart key, then the signal must be blocked when the key is inside of box otherwise the key case is useless. For testing, members wrapped the smart key with tinfoil and had the driver take the equipped key into the car. As Figure 2 shows, the car couldn't detect any key inside. So, in the future, we would make a metal sandwich structure for the key side of the case.



Figure 2

Another accomplishment is the designing and printing of the prototype. The box and locking mechanism were designed on paper first, then formed from scratch on SolidWorks. The parts were then printed using the 3D printer in the basement of Lagomarcino on campus, as well as with a team member's printer. An image and description of the case exterior is shown in Figure 3, and the locking mechanism is shown in Figure 4.

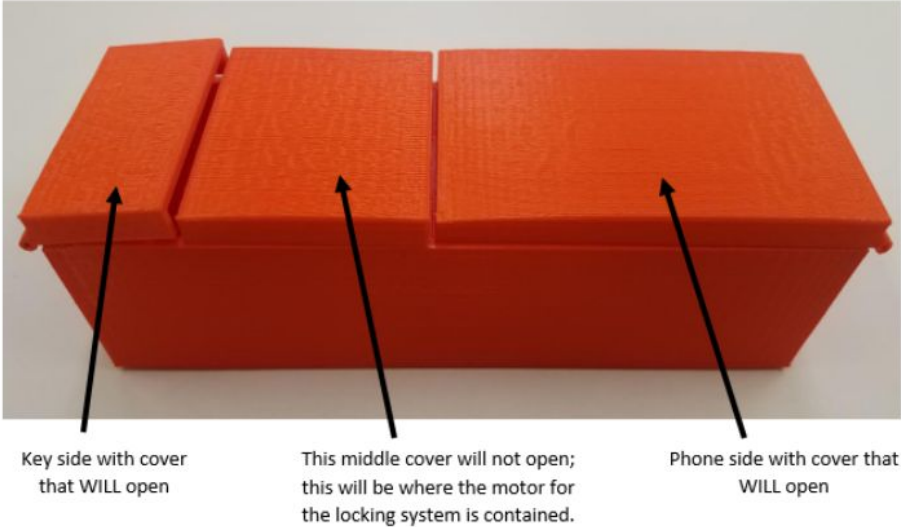


Figure 3

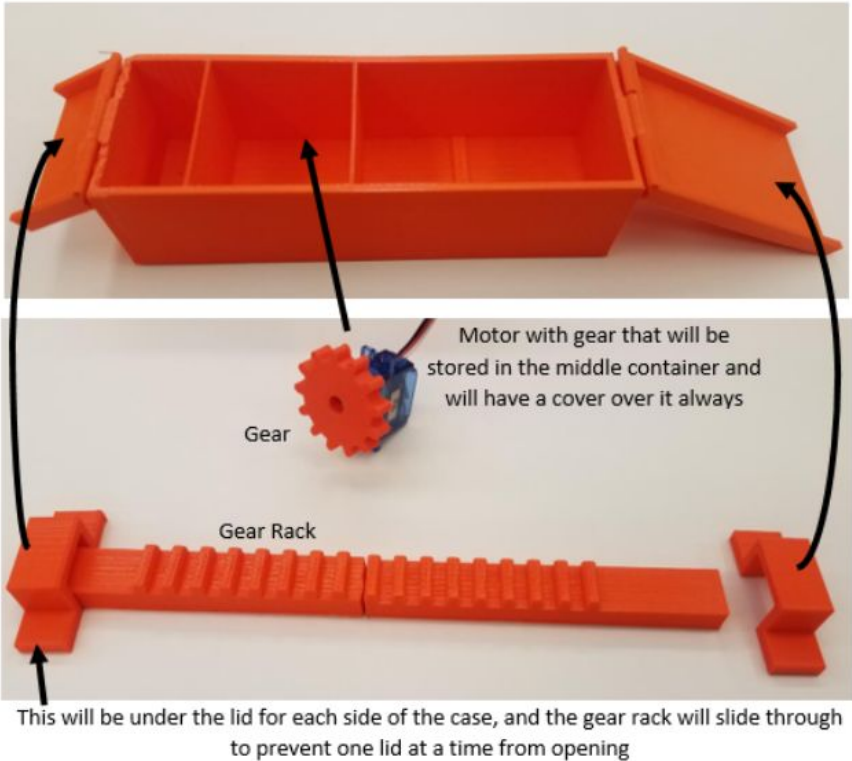


Figure 4

Described below is what each individual team members worked on:

Zixiao Lu: Got the RFID Card reader and writer, meet with the advisor, research on how to implement the RFID and research or alternative approaches.

Yifei Wang: Meet with advisor, research on how to use GSM, test wrapped smart key with Kedan.

Kedan Xin: Meet with advisor. Built the 3D model of locking system. Print the 3D model of the case.

Yue Chen: Assisted Kedan with 3D model building. Researched on the signal blocking material.

Sarah Baratta: Researched the different sensors for the lid detection so that the case cannot be tricked by a simple pressure sensor or magnet sensor. Nearly tested the GSM module with a SIM card but found out the cost and researched a new method.

Individual Contributions Table:

Name	Individual Contributions	Hours This Week	Hours Cumulative
Zixiao Lu	Meet with advisor, research on phone detections	6	40
Yifei Wang	Meet with advisor, research on how to use GSM, test wrapped smart key with Kedan.	6	40
Kedan Xin	Built the 3D model of locking system. Print the 3D model of the case. Meet with advisor.	7	45
Yue Chen	Assisted Kedan with 3D model building. Researched on the signal blocking material.	4	42

Sarah Baratta	Meet with advisor, updated client on team's progress, researched sensors and communication method	5	41
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Plans for the Upcoming Week

The team has finalized the system design, but are missing many sensors that are fit the product's needs. Thus, the team will be continuing research on different parts and learning and testing new things. This information will also be documented in a parts comparison document that may be later included in the Design Document. Also, the RFID sensors arrived this week, but no one in the team knows how to program and use RFID. Some of the members will be focusing on configuring RFID reader and writer.

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

Zixiao Lu: Will integrate the RFID into our circuit and keep researching for alternative way for phone detection

Yifei Wang: Assist Mr. Lu on RFID configuration. Researching on other approach to send messages.

Kedan Xin: Work on altering the SolidWorks design to account for more sound flow for audio and a spot for a charging port. Also, help with the communication issue.

Yue Chen: Making a plan for implementing all the mechanic parts into the box. Continue to research on the signal blocking material.

Sarah Baratta: Focus on the communication subsystem in which a text message or some sort of notification must be sent. Received advice from advisor regarding light detection and voice commands that will be further looked into.