**EE/CprE/SE 491 WEEKLY REPORT 3   (2/25/19 – 3/1/19)**

**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

After meeting with the project advisor last week, the team was encouraged to find different approaches to solve the road safe driving problems and analyze the pros and cons to help determine which solution will be the best. Using skills learned from the 'Design Thinking Workshop', the team defined the main problem and developed a few solutions, researched those that already exist, and discussed their advantages and disadvantages from the point-of-view of potential users. This was to be discussed with the advisor this week; however, the meeting was rescheduled due to next week. Though other solutions have been investigated, the team has already begun to make process on a design based on the project proposal specs and initial talks with the client.

Hardware that was researched the past two weeks and then decided to purchase as a team has arrived this week. The parts include two 5V locking devices for each side of the road safe case along with an Arduino board. Aside from practicing design thinking, there are no significant changes in the project plan. Currently, the team is trying to see if it is possible to add more advanced functionalities into the project to make the phone case to be more practical.

## Past Week Accomplishments

For the past week, the team allocated some more time outside the project design process and started to look at the problem from different angles. After the 'Design Thinking Workshop' class, them team has been trying to re-frame the issue of safe driving in consumer-centric ways by understanding the real demand of the product through actively researching, engaging and empathizing with people to understand their experiences and motivation. Throughout the process, the team has gained a more in-depth understanding of our problem and made different solutions plan to discuss with our advisor and our client. The following tables regarding the two main categories of potential solutions, a hardware approach or software approach, were created to help the team understand our design decisions and how they influence the user.

Hardware: More Restrictive (can be both good and bad), New Product, Kind of Inconvenient

| PROS | CONS |
|---|---|
| <ul><li>Can't touch or look at the phone</li><li>Safer because a parent or designated person has more control over driver's phone usage</li><li>Easy emergency access</li><li>Has not been made before, first of its kind</li><li>Possibly more preferable by older generation or protective parents because this option is more restrictive and physical</li></ul> | <ul><li>Physical case: needs to be carried at times and must have space in the car to accommodate it</li><li>More expensive to purchase</li><li>If another phone is in the car, driver could use friend's phone <- applies to BOTH HW and SW</li></ul> |

Software: App or Car Port/Communication, Less Limitations (can be both good and bad)

| PROS | CONS |
|---|---|
| <ul><li>The product is already on the phone, so it is easier/more convenient to access</li><li>Ability to look at the navigation (also a drawback)</li><li>Easy emergency access</li><li>Cheaper</li><li>Blocks or replies to calls for the driver to let others know they are driving</li><li>Possibility for driving analysis or parental control/communication options</li></ul> | <ul><li>Driver can look at the phone</li><li>Less control over usage because apps or plug-ins can easily be disabled<ul><li>To undo 'safe-driving mode', user can tap to unset easily or if the app relies on vehicle speed, it may allow for traffic usage while driving</li></ul></li><li>If another phone is in the car, driver could use friend's phone <- applies to BOTH HW and SW</li></ul> |

On the technical side regarding the design currently being pursued, the team did some research on how to improve our project so that it functions more practically, such as sending SMS with Arduino to serve as a form of communication between the driver and designated person that will track the driver's usage of the case, possibly a lighting system in the phone case to help visibility, and camera detection as an added precaution for detection.

Described below is what each individual team members worked on:

Zixiao Lu: Worked on a second check for the cell-phone detection. First, attempted using javaScript jQuery library, which was easy. However, since this project is a embedded system, javaScript might not be used for the case. Currently running some more research on how to do it in a way that is close to CPRE 288, which means the team needs to know what kind of chip is applied in our case.

Yifei Wang: Looking into ISU's 3d printers and found out they are not suitable for our project. Looking into fundamentals about GSM/GPRS architecture. Also, learning five layers of internet architecture, which including application, transport, internet, data link, and physical layer. There is also another OSI model with seven layers.

Kedan Xin: Met with Sarah and Chen to think about the solutions for our project. Decided on object proximity sensor for the primary phone and key detection and small physical locks for the case and purchased them. Reading the datasheet for the sensors and design testing circuit for it.

Yue Chen: Have discussed with Sarah and Kedan about different approaches and made a list of pros and cons of each method. Researched on the more advanced operating system to see if the team can implement more advanced functionalities through tools like the Raspberry Pi or a GSM shield. Have discussed with Sarah about implementing the lighting system in the phone case to assist camera detection of the cell phone.

Sarah Baratta: Looked into college of design 3D printers and found they are not suitable for prototyping due to size and cost restraints. Met with Chen and Kedan to practice design thinking by brainstorming new solutions besides the one the group is currently pursuing. Pros and cons experienced by the user for each solution were explored. Researched tutorials regarding SMS messaging through Arduino with different GSM modules.

**Individual Contributions Table**

| Name | Individual Contributions | Hours This Week | Hours Cumulative |
|------|--------------------------|-----------------|------------------|
| Zixiao Lu | Made the Cell-phone detection in JavaScript but still research on find the right chip to do the phone detection | 7 | 14 |
| Yifei Wang | Research GSM/GPRS architecture, learn five-layer TCP model and seven-layer OSI model. | 5 | 12 |
| Kedan Xin | finding the best solution for our project, purchased sensor and lock, reading the datasheet | 6 | 13 |
| Yue Chen | Researching on SMS with Arduino, comparing, the functionalities between Arduino and Raspberry Pi, corrected locking sequence process for the case, planning for real-time simulation to save the unnecessary parts and circuit production expenses. | 6 | 13 |
| Sarah Baratta | Solution brainstorming, researching GSM modules for SMS, set up method for reimbursement with client, looking into 3D printing campus resources | 6 | 12 |

**Plans for the Upcoming Week**

The team has two major tasks that will be worked upon next week. One task is to begin testing the circuit through computer simulations and/or physical simulations with parts that have already been obtained. Research into additional functionalities the team wishes to incorporate into the design will be pursued as well.

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

Zixiao Lu:  Finish the research on finding the proper chip for our phone detection and conduct the successfully phone detection. Furthermore, trying to sending out signal when the case is closed and opened via internet.

Yifei Wang: Find out a suitable GSM/GPRS suitable for our project. Also, test the modem and network connection on Arduino if the components arrive.

Kedan Xin:  Add sensor and lock to the initial circuit of the whole system. And use multisim to draw and simulate the circuit.

Yue Chen: Started to put the circuit together to test the functionality of the parts. Research more on how to implement the lighting system inside of the phone case.

Sarah Baratta: Investigate different GSM modules to find the most cost effective module that is compatible with the Arduino. Also, assist in testing.