UCF Senior Design I

S.M.A.C
Smart Mail Automated Center

Department of Electrical Engineering and Computer Science

University of Central Florida

Dr. Samuel Richie

Initial Project Document and Group Identification Divide and Conquer

Group 9

Shane Bramble-Wade	Computer Engineering
Tyler Rothenberg	Computer Engineering
Tyler Guerrero	Computer Engineering
Andre Villaran	Computer Engineering

Project Narrative

In today's world, ordering packages and food from the internet is a way of life. As convenient as it is, online delivery has a downside; It is not all that uncommon to find out that the package has gone missing before the homeowner has been able to retrieve it. It turns out, 36% of Americans have experienced package theft! 45% of these people have experienced theft more than once. [1] There is no question that online delivery has made our life easier, but our goal with S.M.A.C is to remove all the stress of receiving package deliveries.

S.M.A.C features a rugged lock box which may be unlocked through either a smartphone application by the user or by scanning an approved package by the delivery personnel. When the delivery is made, the delivery driver simply scans the item and places the item in the box, then closes the lid. The box will automatically lock itself and notify the homeowner that their package was delivered. At this point, the package receiver has peace of mind that when they are able to retrieve their package, it will be there waiting for them.

During the pandemic, keeping your family safe is a top priority and we understand that delivered packages are also a foreign bacteria vehicle. For this reason, a priority feature of S.M.A.C will be to disinfect your packages every time a new one is delivered in a contactless manner. Studies show that COVID-19 can remain in the air for up to three hours [2], and it can remain on cardboard for up to 24 hours [3]. From the mobile app, the user may enable or disable the cleansing of packages so when they retrieve it, they have peace of mind they have taken necessary precautions to protect their family.

The mobile application will be the brains of the project as it will allow the user to have complete control of all the smart features of S.M.A.C. Along with unlocking, locking, and spraying, we plan to incorporate a camera as a stretch goal. The camera will stream / take pictures when the lid of the box has been lifted. This will provide the user a way to quickly see which service provider has opened the box. If the user loses access to their smartphone, but still wants access to the box, we will look into both NFC and fingerprint access as a secondary way to get into the box.

S.M.A.C will plug into a standard 120v outlet. We explored the option of having it run on a rechargeable LiPo battery in case of power loss for critical functions, but having the user move the box around to charge it would be cumbersome. As the box will be stationary, installation will include bolting the box directly on the house, or on the cement of a sidewalk or driveway. This will prevent the user from getting both their package and their S.M.A.C stolen in one swoop. Another stretch goal will be to include a GPS chip so that if the device is stolen, it will be able to be tracked.

S.M.A.C is designed to provide peace of mind for homeowners from package thieves. As designers, we hope to create such a product at a reasonable cost to the consumer. The stretch goals we have listed within our specifications provide additional security, but at an added design cost through both time and money. The current design has many challenges within connecting the pieces, and research is still needed in order to figure out what is best. Let's dive into some of the known requirements, specifications, and constraints.

Project Requirements and Specifications

- Box will open when a verified package is scanned through a bar-code reader.
    - Ability to store ordered packages into its database.
    - Barcode Reader which determines if a package is in the database.
    - Unlock with approved barcodes/tracking numbers.
    - Ability to protect your digital media and sensitive documents.
    - Box will auto-close after being open for 30 seconds.

- Box will not open if a delivery driver scans the incorrect package.
    - Camera will take a picture / record upon a failed unlock attempt.
    - A unique beep will sound off when a package is either correctly / incorrectly scanned.
    - After three bombed endeavors to examine a package, a message will be sent to a client to inform them about the endeavors.
    - Users will be able to log into their personal Fedex, UPS, and Amazon accounts to verify the details of their delivery.
    - After 5 attempts, the smart lock will transition into lock-down mood.

- A user will be able to open their box from a mobile device.
    - Ability to transmit data to a mobile device via Bluetooth or Wi-fi.
    - Can unlock the box through your mobile device.
    - A mobile app will inform a user when their packages have been delivered.
    - UV light will be implemented to kill any form of bacteria on a package.
    - The main focus for the app will include app response time, load performance, data security, user access and authentication.

- A non-user will not be able to open the box's smart lock via the different unlock features.
    - Fingerprint Scanner
    - NFC access
    - Barcode Reader
    - Number Keypad
    - Unlocked via a mobile app.

Project requirements are conditions or assignments that must be finished to guarantee the achievement or culmination of the undertaking. They give away from the work that should be finished. They're intended to adjust the venture's assets to the targets of the association. The advantages of successfully assembling venture necessities incorporate cost decrease, higher task achievement rates, increasingly powerful change of executives, and improved correspondence among partners.

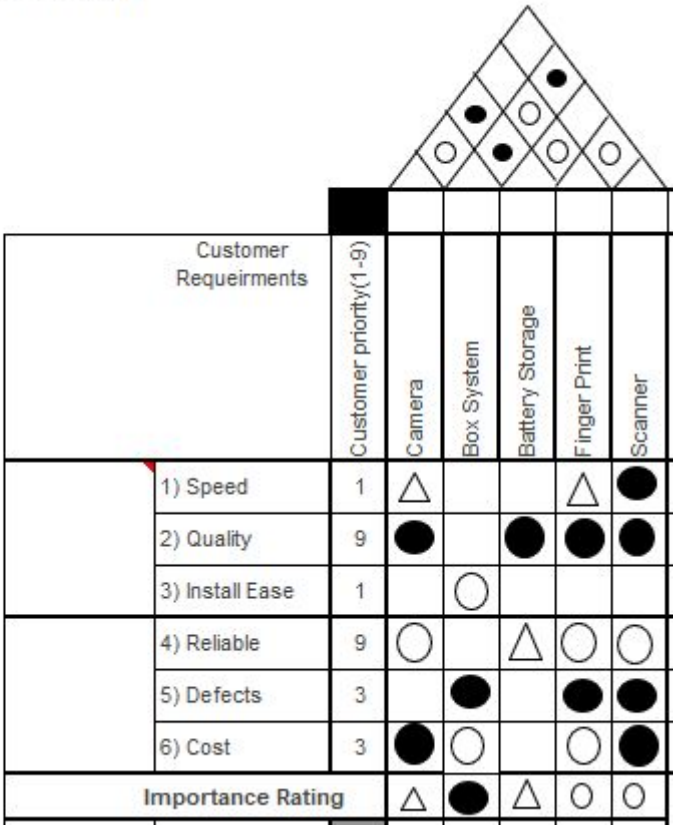
Project Constraints

- Our design consists of a lot of technology which will be hard to connect together. We must consider which features are most important during the research phase, and focus on incorporating those into our project.

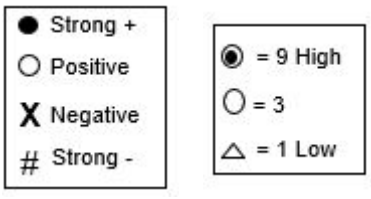
- Time is a similar limitation due to all of the project features. We must get the base of the project completed (Box which can be locked / unlocked remotely from a phone application) before venturing on to accessory features such as GPS, Fingerprint, NFC, and Disinfecting Spray.

- The size of the box. Moving a large rugged box around as a prototype will prove difficult as our members are located in different parts of Florida (Miami, Orlando, and Kissimme)

House of Quality



Customer Requeirments	Customer priority(1-9)	Camera	Box System	Battery Storage	Finger Print	Scanner
1) Speed	1	△			△	●
2) Quality	9	●		●	●	●
3) Install Ease	1		○			
4) Reliable	9	○		△	○	○
5) Defects	3		●		●	●
6) Cost	3	●	○		○	●
Importance Rating		△	●	△	○	○



Block Diagram

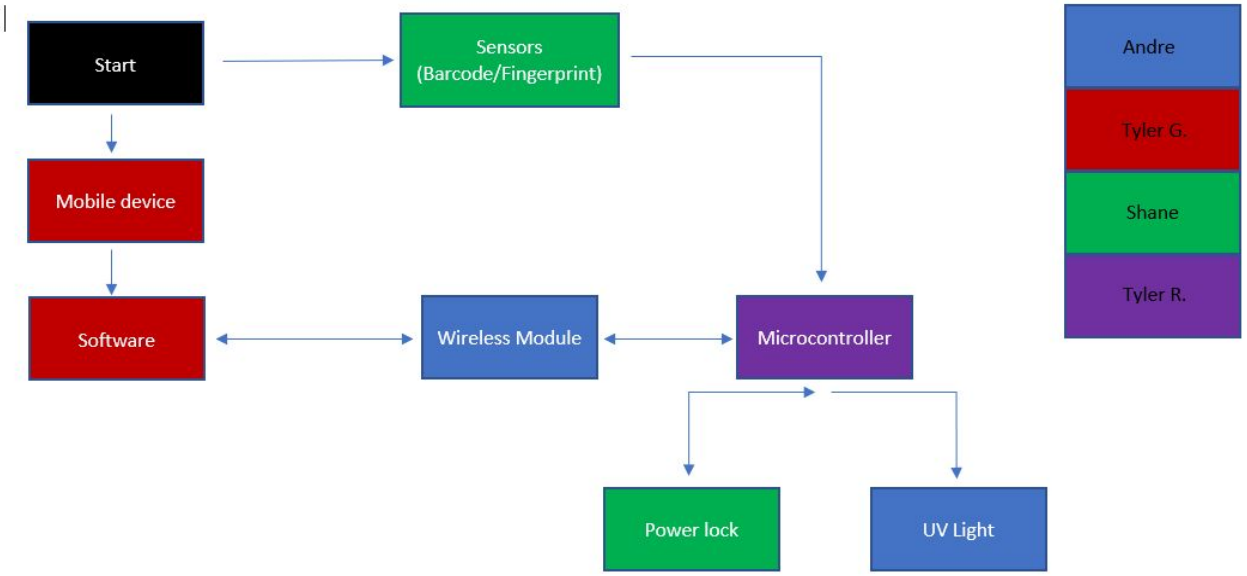


Figure 2: Block Diagram Group 9

Block Diagram Status (In progress):

- Each square is right now being explored
- All squares are right now in the configuration process.
- Currently, we have not purchased any parts or components that are illustrated in the block diagram.

A block diagram is a graph of a framework where the chief parts or capacities are spoken to by squares associated by lines that show the connections of the blocks. They are vigorously utilized in building equipment plans, electronic structure, programming structure, and procedure stream outlines.

Block diagrams are ordinarily utilized for more significant level, less itemized portrayals that are proposed to explain generally speaking ideas without worry for the subtleties of usage. Balance this with the schematic outlines and design graphs utilized in electrical building, which show the execution subtleties of electrical parts and physical development.

Project Budget

Our budget for this project will be self-funded and based on estimates from online resources. The items chosen are supposed to give us a rough estimate of expected costs. Excluding any form of malfunctions, the list below estimates the cost for each component. The costs recorded are gauges from online resources and statements from direct manufacturers. Along these lines, the costs might be changed later on once the project is designed and all components needed are revised.

S.M.A.C Parts List

Part Number	Description	Vendor	Price Per Unit	Amount	Total Estimated Price ($)
LHLP1106G	Safe	Amazon	$64.99	1	$69.21
N/A	Lock	Newegg	$15.96	1	$17.00
MSP430FR6989	MCU	TI	$6.42	1	$6.84
N/A	PCB	7PCB	$100	1	$107
CC3135MOD	Wi-Fi Module	TI	$7.56	1	$8.05
N/A	Fingerprint Sensor	Adafruit	$50	1	$53
N/A	Camera	Robotshop	$64.99	1	$69.21
N/A	UV Light	Amazon	$41.99	1	$43.00
N660:USB	Barcode scanner	Alibaba	$29.00	1	$50.00
				Total:	**$423.91**

Project Milestones

Weeks	Task	Status	Dates
1	Brainstorm Ideas	Completed	May 10 - May 16
2	Project Selection & Role Assignments	Completed	May 17 - May 23
	Senior Design Boot-camp	Completed	May 17 - May 23
3	Initial Document - Divide & Conquer	In Progress	May 24 - May 30

4	Table of Contents	In Progress	May 31 - June 6
	Updated Divide and Conquer document (D&C V2)	In Progress	May 31 - June 6
5-7	Research and documentation	In Progress	June7- June 27
	Writing		
8	First Draft (60 Page)	In Progress	June 28 - July 4
9	Writing and Designing	In Progress	July 5 -July 11
10	Page Report Submission Updated (100 Page)	In Progress	July 12 -July 18
11	Finalizing the paper	In Progress	July 19 -July 25
12	Final Document Due	In Progress	July 26 -July 28

Senior Design 2

13-17	Build prototype	In Progress	Aug 23- Sep 19
18-20	Testing & Redesign	In Progress	Sep 20- Oct 3
21-23	Peer presentation	In Progress	Oct 4 - Oct 17
24	Final report	In Progress	Oct 18 - Nov 21
24	Final presentation	In Progress	Nov 22 - Dec 5

Table 1: Project Milestones

Conclusion

To conclude, S.M.A.C is expected to help clients in securing and sanitizing their deliveries as they show up at their doorstep. With the utilization of S.M.A.C, we can foresee that numerous package burglaries in the US will decay and put our grain of salt in the fight against COVID-19. Clients will have the option to gather their packages safely and in a secure manner. The fundamental objective for S.M.A.C is to evacuate the entirety of the pressure of getting package conveyances and to stop the spread of the disease at the expense of others. The outside of S.M.A.C will be covered in a waterproof and climate confirmation packaging to improve life span. Our group will concentrate on redoing the innovation, making an easy to understand interface, and propelling the structure and activity of S.M.A.C. The crate will naturally bolt itself and inform the package holder that their package was conveyed. Now, the package collector has genuine feelings of serenity that when they can recover their bundle, it will be there sitting tight for them.

Sources

- Automatic Lysol Sprayer Idea (COVID-2019)
  - https://www.youtube.com/watch?v=xoxhDk-hwuo&feature=youtu.be&t=154
- Automatic Nozzles
  - https://www.spray.com/Products/Nozzles/Automatic-Nozzles
- Microcontroller Technical Documentation
  - https://www.ti.com/lit/ds/symlink/msp430fr6989.pdf?ts=1590438921159
- The camera to record
  - https://www.robotshop.com/en/arducam-8mp-sony-imx219-camera-module-cs-lens-2718-raspberry-pi.html
- How To Solder: A Beginner's Guide
  - https://www.makerspaces.com/how-to-solder/
- Fingerprint Scanner (Documentation & Resources)
  - https://github.com/adafruit/Adafruit-Fingerprint-Sensor-Library
  - https://www.youtube.com/watch?v=1diFaa5OsFg
- El-Pro-Cus, How does Bluetooth Work?, Mar. 3, 2019. URL:
  - https://www.elprocus.com/how-does-bluetooth-work/
- Soldering Safety
  - https://safety.eng.cam.ac.uk/safe-working/copy_of_soldering-safety