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# QuickPost By



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December 9th, 2015

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# The Team



**Anmol Bhullar**  
Chief Executive Officer



**Jay Kim**  
Chief Technology Officer



**Jin Min**  
Chief Marketing Officer



**Lesley Gabo**  
Chief Financial Officer



**Paola Pilaspilas**  
Chief Operations Officer

# Overview

- Motivation
  - Existing/Proposed Solutions
  - Parcel box
  - Mailbox Device
  - Financials
  - Schedule
  - Team Dynamics & Workflow
  - Conclusion
  - Questions
-

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# Motivation



[YouTube](#) [1]

- Apartments and community mailboxes (seniors/disabled)
- Unknown arrival time of important mail and parcels
- Unknown contents of mailbox
- Inconvenient parcel delivery system
- Parcels left in the open
- Personal use

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# Existing Solutions

## Mail Notification Systems

- Senses when mailbox is opened
- Rings door bell and notifies recipient
- No existing solution for parcel deliveries



[2]



[3]

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# Our Proposed Solution

**A pair of devices that detects arrival of mail and parcels**

## Mailbox Device

- Sends email notification to recipient with an image of mailbox contents

## Parcel Box

- Force sensitive resistors in the parcel box to detect weight differences
- Voice instructions
- Security system (password required)

# Parcel Box

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## Parcel Box



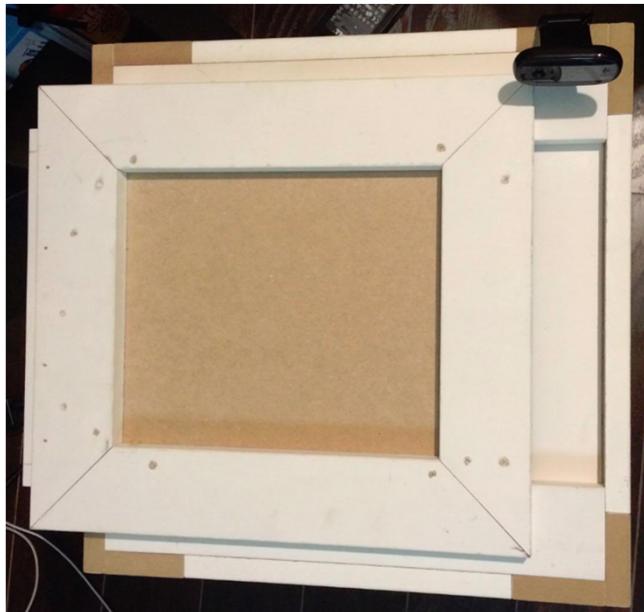
← Old design

New design →

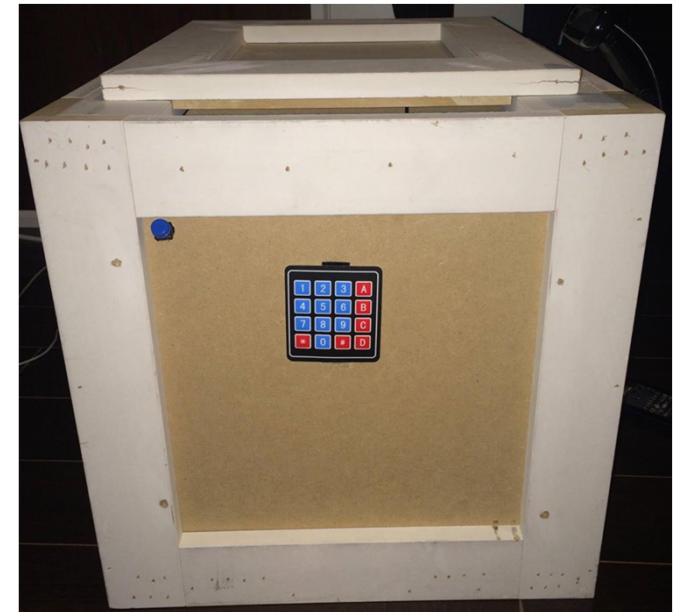


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# Parcel Box



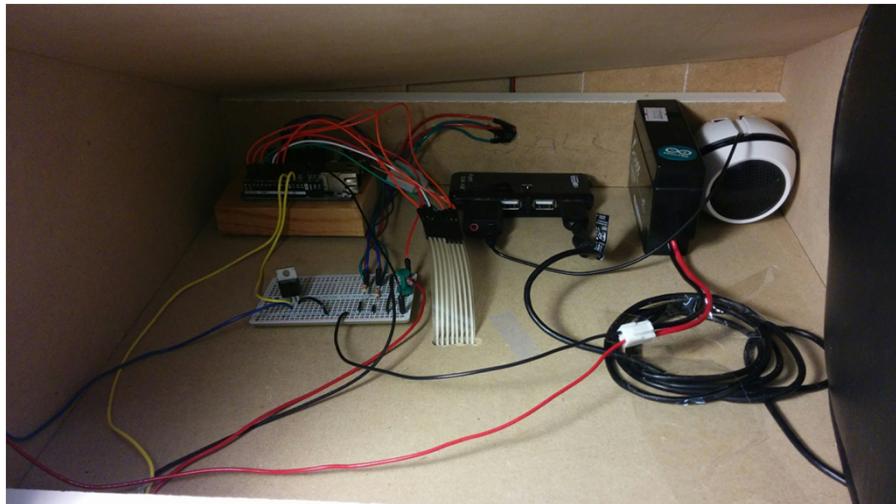
← Top view



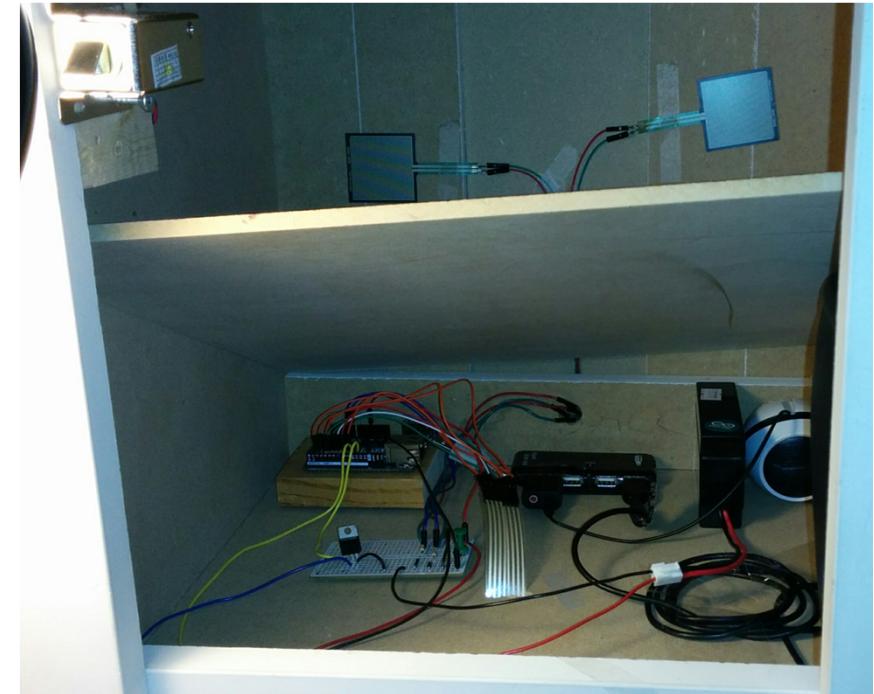
Front view →

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# Parcel Box

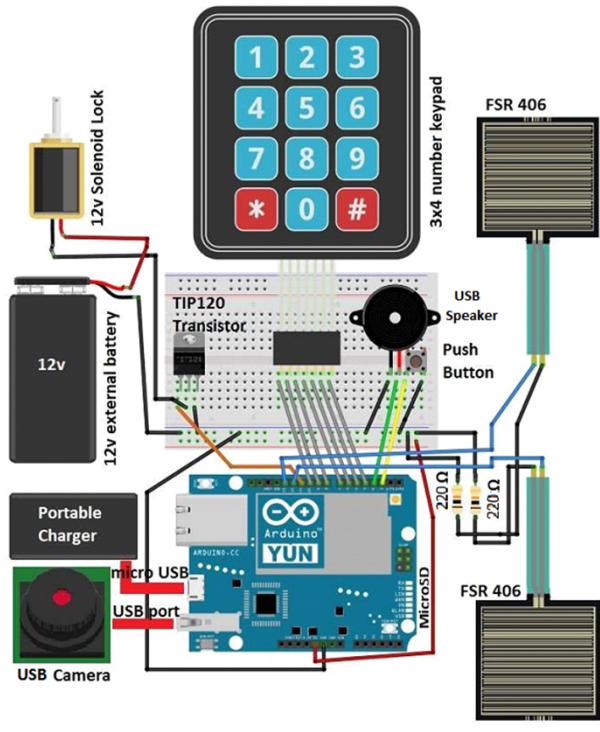


Inside view 1 ↑



Inside view 2 →

# Parcel Box Hardware



## Push Button

- Unlocks the container and enables cover to be opened

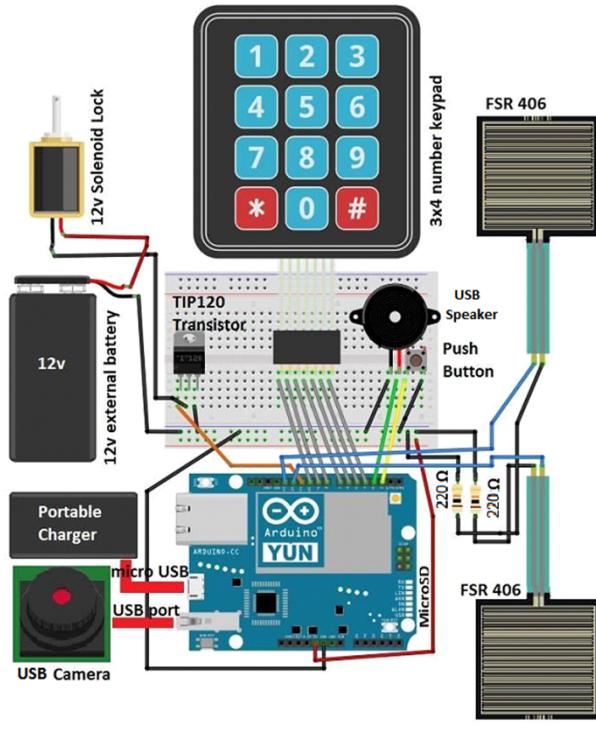
## Keypad

- Allows 4 character password input from recipient

## Force Sensitive Resistor

- Used to measure pressure applied by parcels

# Parcel Box Hardware Cont.



## Solenoid Lock

- Unlocks only when user inputs correct password from keypad and when the push button is pressed

## Speaker and Camera

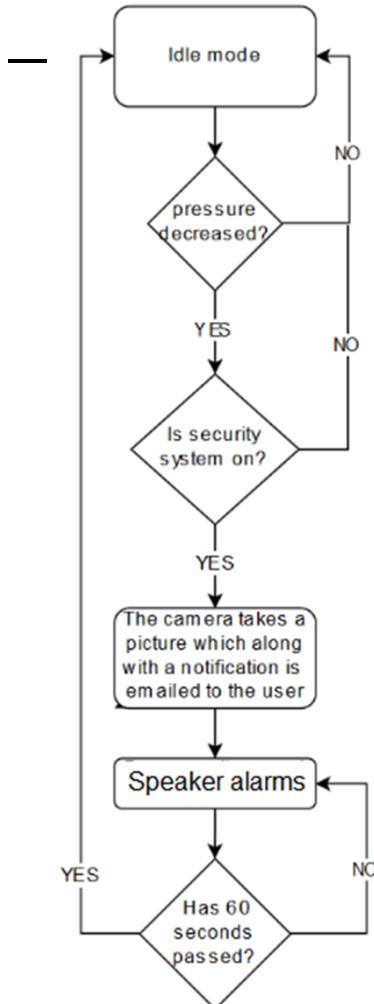
- Speaker plays audio files (pending scenarios)
- Camera takes a picture when the security system activates

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## Parcel Box Security System



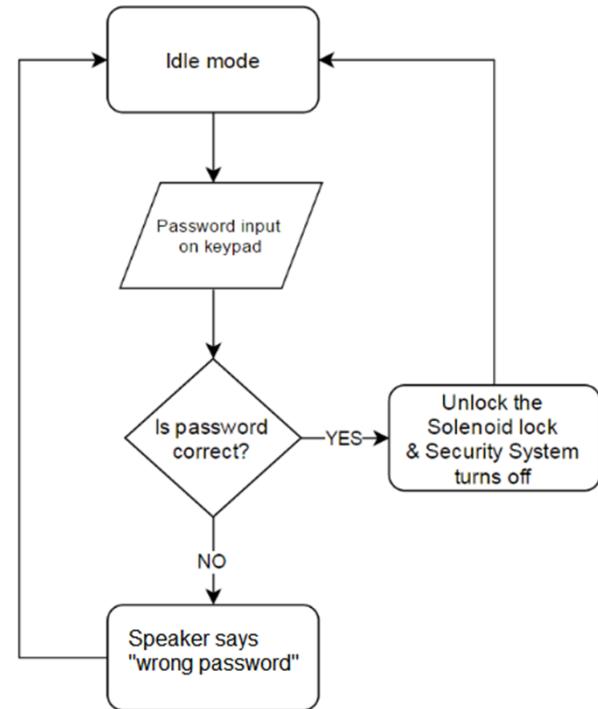
- Read FSR output when security system is enabled
- Speaker plays alarm and camera saves image to SD card
- If connected to network, owner of parcel box is emailed with image
- Security is disabled when correct password is provided



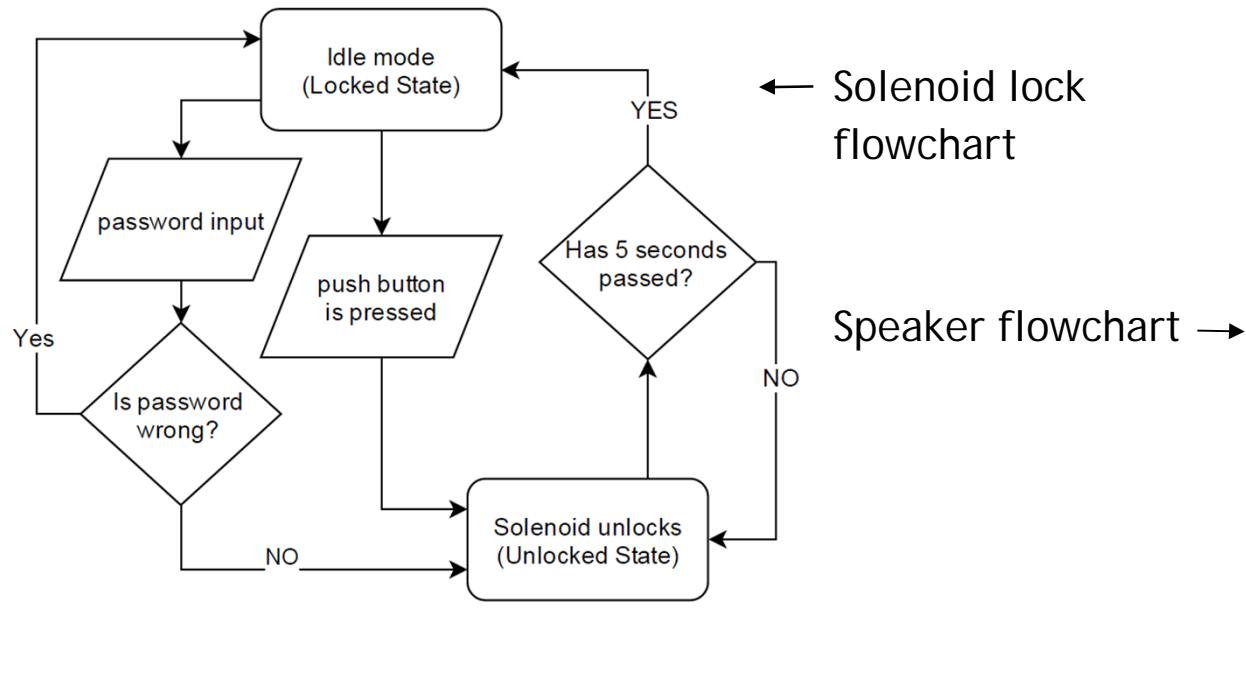
## Parcel Box Flowchart

← FSR flowchart

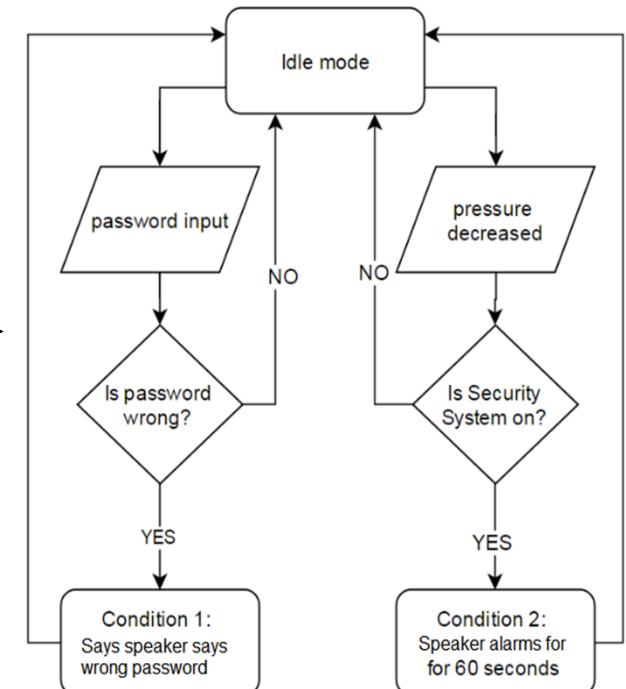
Keypad flowchart →



## Parcel Box Flowchart Cont.



Speaker flowchart →

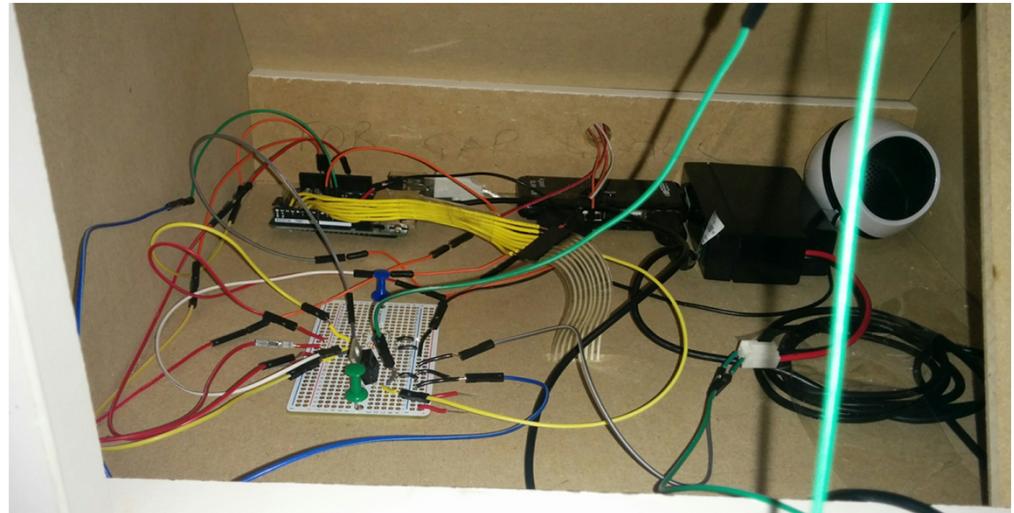


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# What We've Learned

## Things will go wrong

- Parcel box suddenly stopped functioning
- First iteration of the parcel box
- Keypad was reading some inputs (but not all) and push button was not functional
- The FSRs were not reading the proper pressures



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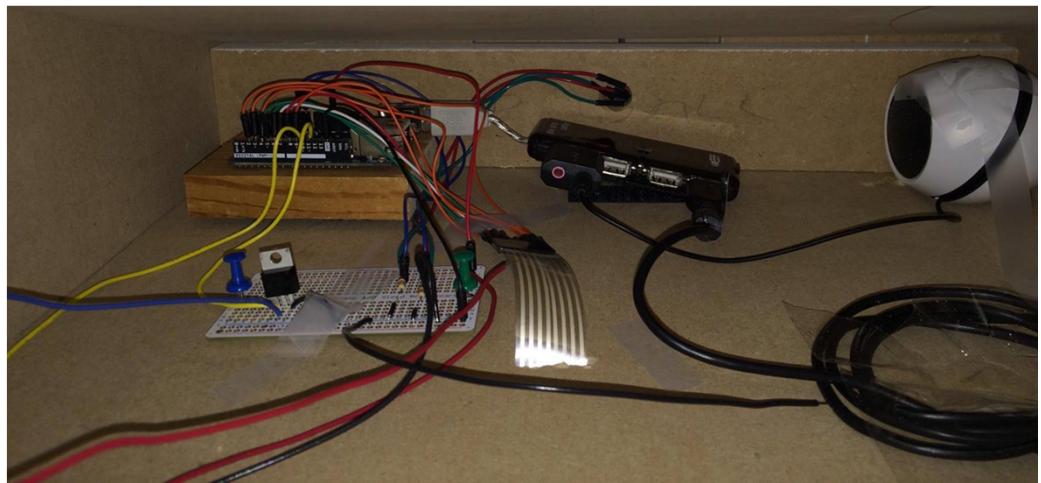
## What We've Learned Cont.



- Removed everything and rewired with better insulation

**Solved problem by just  
redoing everything**

- Not worth salvaging the mess



# Mailbox Device

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# Mailbox Hardware

## 1) Arduino Mega

## 2) PIR Sensors

## 3) VC0706 UART VGA Camera

- Snaps a picture when motion sensors are activated, saves JPEG to SD card

## 4) 1W High Power LED

- Acts as camera flash

## 5) Adafruit CC3000 WiFi Shield

- Uses SMPT/MIME protocol to send emails

## 6) Signal conversion circuit

- Allows VC0706 to be interfaced with Arduino

## 7) Constant current source

- Provides current to High Power LED

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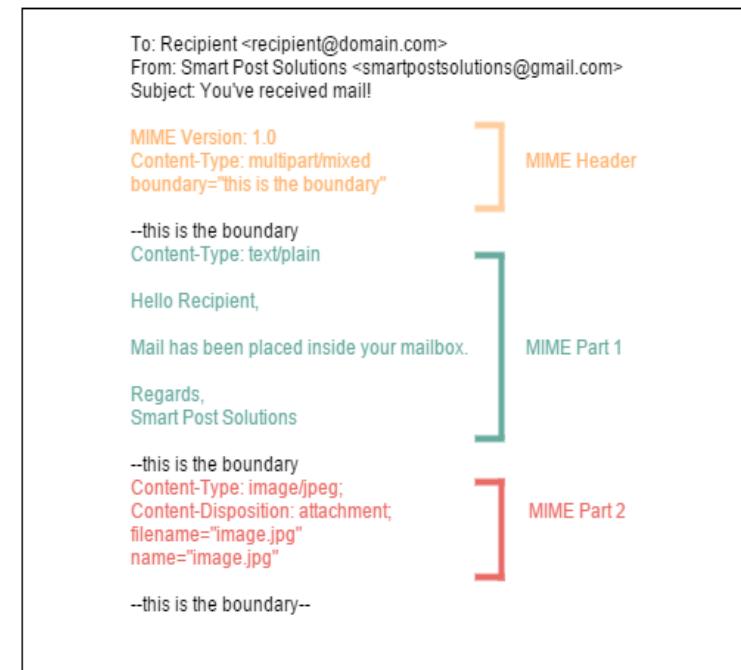
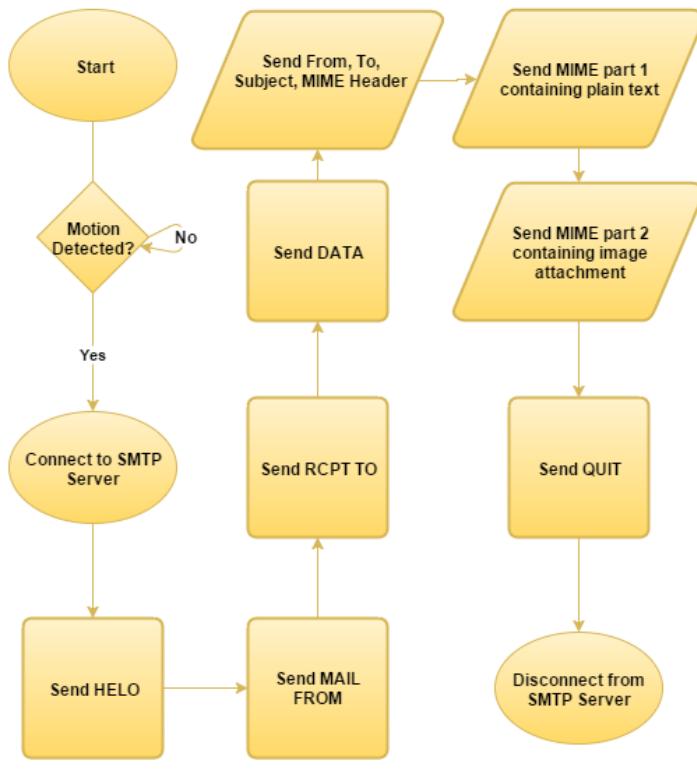
# Mailbox Software Execution

```
void setup()
{
    WiFiSetup();
}

void loop()
{
    if (ReadPIR())
    {
        CaptureImage();
        SendEmail();
        StartTakePhotoCmd();
    }
}
```

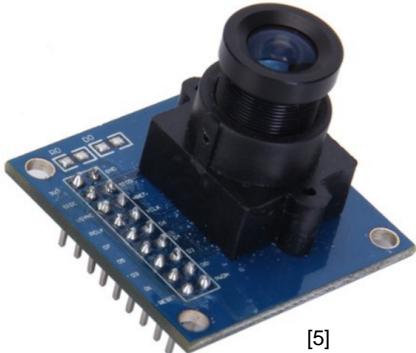
- 1) WiFi Shield connects to network
- 2) Read PIR output
- 3) If motion is detected, camera captures frame and saves to SD card of WiFi Shield
- 4) Image attached to email and sent to recipient
- 5) Resume frame capturing, go to 2)

# Mailbox SMTP/MIME Flowchart



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# What We've Learned



## Read all available documentation

### 1) Proper research (OV7670)

- Outputs raw image data, incapable of image processing, low level programming

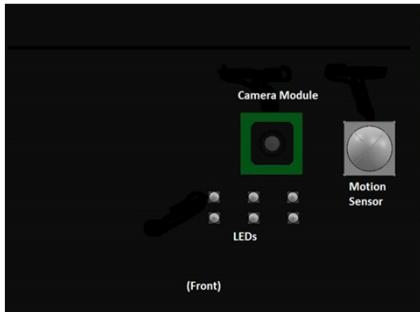
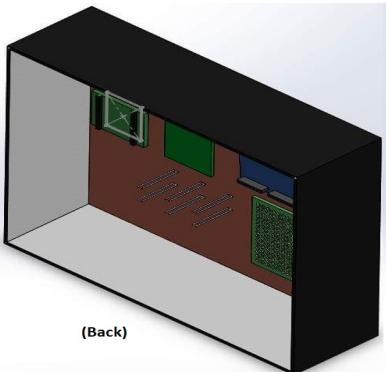
### 2) Refer to schematics/datasheets rather than website information (VC0706)

- Needed to convert RS-232 signal levels to TTL/CMOS and vice versa



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# Mailbox Enclosure



- Protect the components from any unexpected hazards
- Apply SolidWorks to draw the model
- Use 3D printer to produce enclosure (ABS Solution)

## Challenges:

- Requires detailed research on component dimensions
- Consider offsets

# Financials

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# Projected Costs

Equipment List	Amount	Price (Amazon.ca)
Arduino UNO R3 - Super Starter Kit	2	\$70
Sensor Kit for UNO R3	2	\$95
WiFi Shield for UNO R3	2	\$95
Camera Module for UNO R3	2	\$30
Parcel Container (lock mechanism, box contents, materials)	1	\$100
<b>Total</b>		<b>\$680</b>
<b>Total with contingency (10%)</b>		<b>\$748</b>

Item	Price (CDN)
VC0706 UART VGA Camera	\$76.84
OV7670 Camera	\$13.35
USB External Stereo	\$10.99
Arduino Yun	\$131.35
Force Sensitive Resistor	\$8.50x2 = \$17.00
Lock-style solenoid	\$20.00
12V Battery	\$30.00
Adafruit HUZZAH CC3000 Wifi Shield	\$53.50
Round Tactile Button Switch	\$7.80
9V Battery Holder	\$5.25
USB Cable A-B	\$5.25
4x4 Keypad	\$15.00
USB Camera	\$25.00
USB Speaker	\$25.00
USB HUB	\$10.00
Parcel container materials	\$50.00
Physical Mailbox	\$25.00
PIR sensor	\$25.00
Mailbox Enclosure	\$100.00
High Power LED, MAX232 IC	\$10.00
<b>Total:</b>	<b>\$656.33</b>
<b>Money Received From ESSEF:</b>	<b>\$400.00</b>
<b>Total Money Spent:</b>	<b>\$256.33</b>

## Actual Costs

- Less than projected costs
- Around \$50/member after funding

# Schedule

# Schedule

ID	Task Name	Duration	Start	Estimated Finish	Actual Finish	09-01	09-11	09-21	10-01	10-11	10-21	11-01	11-11	11-21	12-01	12-11
1	Research	31 days	Mon 15-09-07	Sun 15-10-18	Sun 15-10-18											
2	Mailbox Firmware	45 days	Mon 15-10-05	Mon 15-11-16	Fri 15-12-04											
3	Parcel Container Firmware	31 days	Mon 15-10-05	Mon 15-11-16	Mon 15-11-16											
4	Mailbox Device Enclosure Model	40 days	Mon 15-10-05	Fri 15-10-16	Fri 15-11-27											
5	Parcel Container Model	10 days	Mon 15-10-05	Fri 15-10-16	Fri 15-10-16											
6	Mailbox Device Enclosure Built	31 days	Sat 15-10-17	Mon 15-11-16	Fri 15-11-27											
7	Parcel Container Built	26 days	Sat 15-10-17	Mon 15-11-16	Fri 15-11-20											
8	Parcel Locking Mechanism	17 days	Sat 15-10-24	Mon 15-11-16	Mon 15-11-16											
9	System Testing/Debugging	16 days	Mon 15-11-16	Mon 15-11-30	Sun 15-12-06											
10	Documentation	56 days	Wed 15-09-23	Wed 15-12-09	Wed 15-12-09											
11	Project Proposal	4 days	Wed 15-09-23	Mon 15-09-28	Mon 15-09-28											
12	Functional Specification	16 days	Mon 15-09-28	Mon 15-10-19	Mon 15-10-19											
13	Design Specification	16 days	Mon 15-10-19	Mon 15-11-09	Mon 15-11-09											
14	Progress Report	16 days	Mon 15-11-09	Sun 15-11-29	Sun 15-11-29											
15	Presentation/Demo	9 days	Fri 15-11-27	Wed 15-12-09	Wed 15-12-09											
16	Post-Mortem	9 days	Fri 15-11-27	Wed 15-12-09	Wed 15-12-09											

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# Team Dynamics & Workflow

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# Division of tasks

Task	Anmol Bhullar	Lestley Gabo	Jay Kim	Paola Pilaspilas	Jin Min
Documentation	X	X	X	XX	X
Administration				XX	
Financials		XX			
Parts Sourcing	X	XX	X		X
Mailbox					
Software			XX	X	
Hardware			XX		X
Integration			XX		X
Testing/Debugging			XX	X	
Enclosure					XX
Parcel Container					
Software	XX	X			
Hardware	X	XX			
Integration	XX	XX			
Testing/Debugging	XX	XX			
Design & Manufacturing	XX	X			

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# Communication

## Quick Messaging

- Facebook
- SFU Webmail
- Text message

## Documents

- Google Doc
- Email

## Weekly Meetings in Library

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# Conclusion

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## Summary

- Motivation comes from the need for security and convenience regarding mail and package delivery
- We have a proof of concept by using Arduinos to handle the I/O processing
- The mailbox device provides email notifications with image attachments for convenience towards apartment residents
- The parcel box provides a convenient and secure way of receiving delivery parcels

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## Future Plans

- Work on the project to make it better
- Use a custom microcontroller
- Fingerprint scanner instead of keypad
- Movable image detection camera
- Automatic door
- Better design

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# Acknowledgements

## Special thanks to:

**Jamal Bahari, TA** - Assisted in debugging camera module issues

**Lukas-Karim Merhi, TA** - Provided suggestions regarding project

**Steve Whitmore and Andrew Rawicz, Instructors** - Operating  
ENSC 305/440W

**Gary Shum, Lab Technician** - Provided feedback on enclosure  
design

**ESSEF** - Funding

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# Any Questions?



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# References

- [1] YouTube, "Motivation for QuickPost," [Online]. Available: <https://www.youtube.com/watch?v=5o7kxtzYzyU&feature=youtu.be>. [Accessed 8 December 2015].
  - [2] Amazon, "Mail Chime Wireless Mail Alert System," [Online]. Available: [http://www.amazon.ca/Mail-Chime-Wireless-Alert-System/dp/B00103FDDU/ref=sr\\_1\\_1?ie=UTF8&qid=1449618482&sr=8-1&keywords=mail+chime](http://www.amazon.ca/Mail-Chime-Wireless-Alert-System/dp/B00103FDDU/ref=sr_1_1?ie=UTF8&qid=1449618482&sr=8-1&keywords=mail+chime). [Accessed 7 December 2015].
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  - [4] YouTube, "Package stolen off porch 7/16/2015," [Online]. Available: <https://www.youtube.com/watch?v=BSqMBwMy5oc>. [Accessed 8 December 2015].
  - [5] Amazon, "640 x 480 CMOS OV7670 Camera Module with High Quality Lens," [Online]. Available: [http://www.amazon.ca/CMOS-OV7670-Camera-Module-Quality/dp/B008D8PMA4/ref=sr\\_1\\_1?ie=UTF8&qid=1449625642&sr=8-1&keywords=ov7670](http://www.amazon.ca/CMOS-OV7670-Camera-Module-Quality/dp/B008D8PMA4/ref=sr_1_1?ie=UTF8&qid=1449625642&sr=8-1&keywords=ov7670). [Accessed 8 December 2015].
  - [6] ITEAD STUDIO, "VC0706 UART Camera (Supports JPEG)," [Online]. Available: <https://www.itead.cc/vc0706-uart-camera-supports-jpeg.html>. [Accessed 8 December 2015].
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