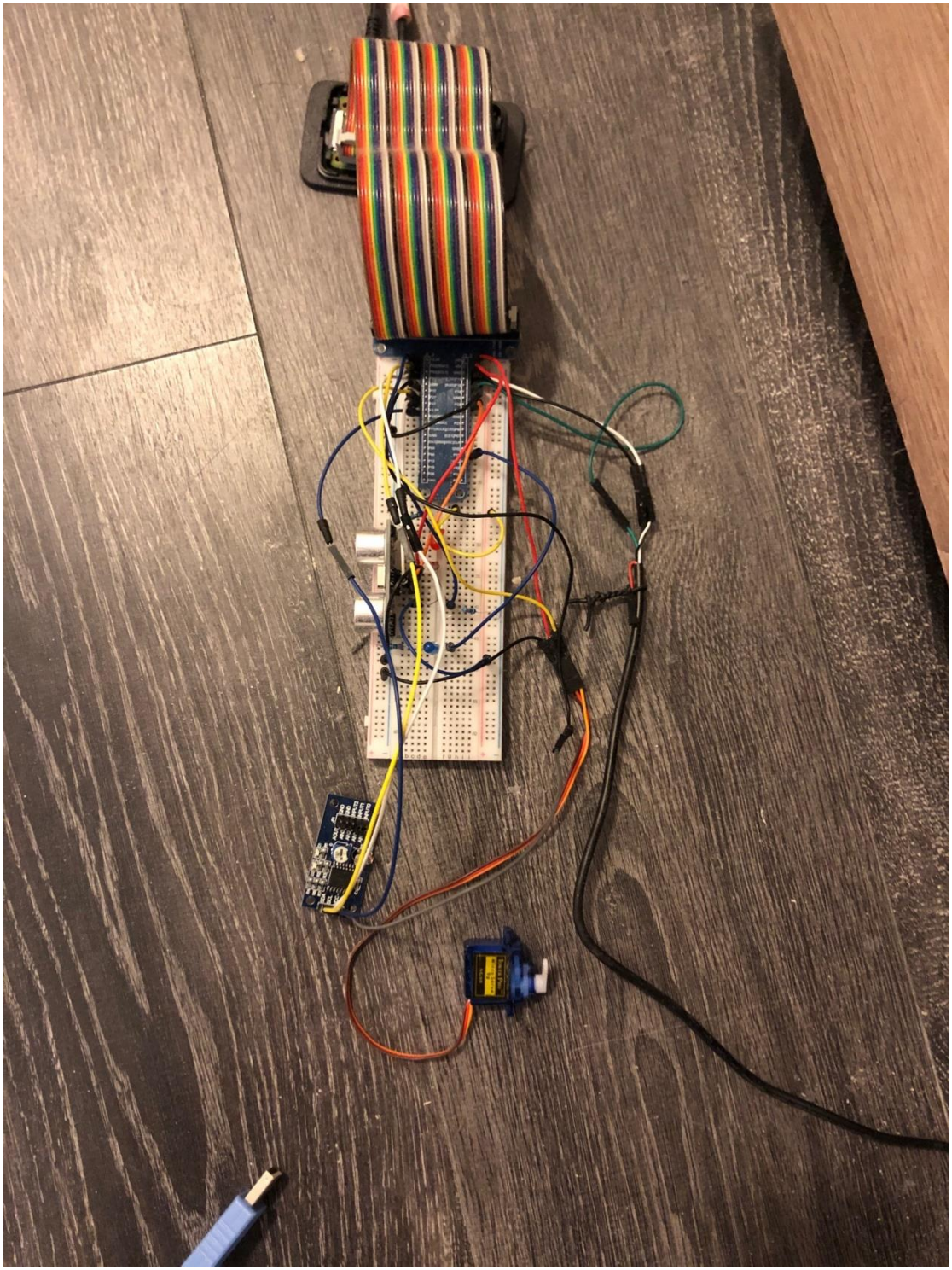
Integration Project

Name: Pan Zhang
Student ID:180108960

Date: 11/24/2020

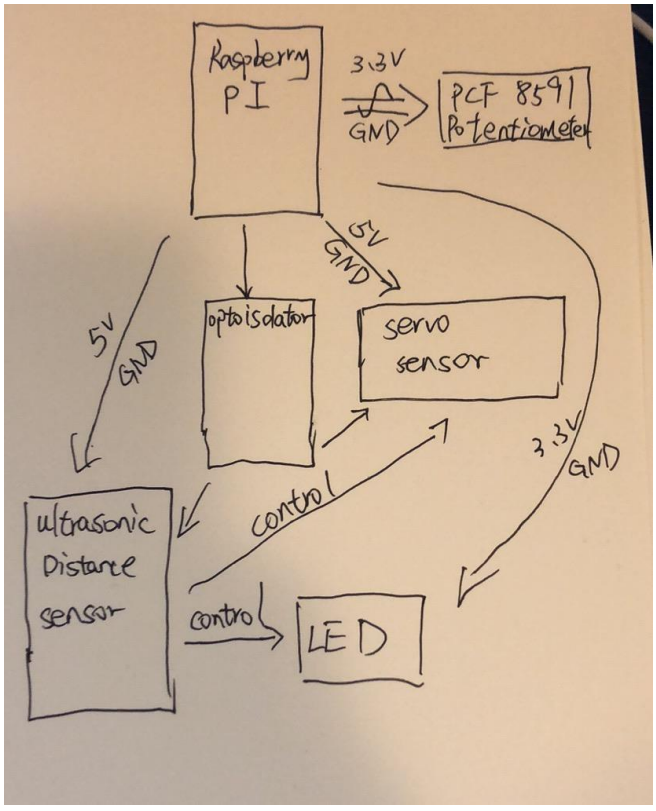
Circuit Overview:



Background Information:
There are mainly four devices that I used to contribute the integration project which are ultrasonic distance sensor, servo sensor, LED, and potentiometer based on PCF8591 AD/DA module. Here is the pin number where I placed them on Raspberry Pi.

| Device Name | Pin number (GPIO.BCM) |
|---|---|
| Ultrasonic distance sensor | Trigger pin = 23<br>Echo pin = 22<br>5V |
| Servo sensor | Control signal = 27<br>5V |
| LED | Control signal = 12 |
| Potentiometer (PCF8591) | SDA1<br>SDL1<br>3.3V |

Block diagram:



Explanation:
Basically, the theme of project is about covid-19. Social distance is quite important to prevent yourself. The main point of my project is to use the ultrasonic distance sensor to measure the distance between you and others. Then based on the distance, LED and servo sensor will respond differently.

opt isolator: It is important to use it as auxiliary tools because the power supply of ultrasonic distance sensor and servo sensor is 5V which means more than 3.3V, and I need to use it to not damage the Rasberry Pi.

Potentiometer (RCF8591): Monitor voltage situation.

Ultrasonic Distance Sensor: Measure the distance between you and others.

LED: If you do not maintain good social distance with others which is 2 meters, LED will start flashing.

Servo Sensor: The changeable distance between you and others, the servo sensor will keep changing and point at the exact distance.

Testing:

Run the inter.py and there are 5 choices for us. The top four choices are to make sure each device works well. And the option 5 is for the social distance check which means all devices work at the same time.

```
pi@raspberrypi:~$ cd /mnt/usb
pi@raspberrypi:/mnt/usb$ sudo python inter.py
1.distance sensor
2.servo sensor
3.led
4.PCF8591 AD/DA module
5:Social Distance Check
ENTER A NUMBER according to the list above(or quit):
```

Option 1:

It will show the distance between the sensor and the stuff.

```
ENTER A NUMBER according to the list above(or quit): 1
1.50579
0.193215
0.20196
0.1914
0.159885
0.16698
0.29205
0.287265
0.29931
0.304425
0.29436
```

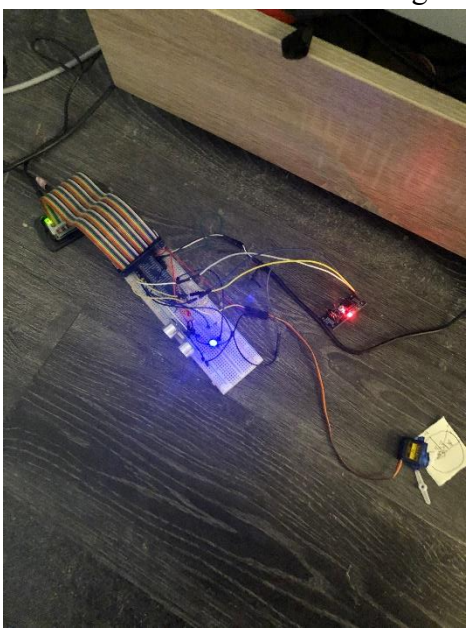
Option 2:

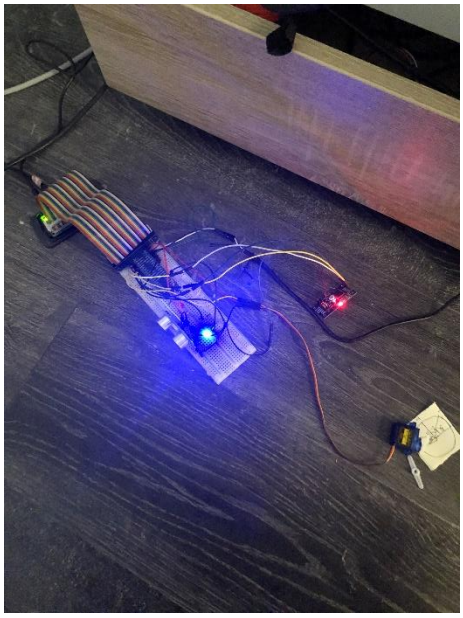
It requires an input degree, and the servo sensor will turn this degree.

```
ENTER A NUMBER according to the list above(or quit): 2
Enter angle between 0 to 180: 90
Enter angle between 0 to 180: 0
```

Option 3:

LED will be on from dark to bright.





Option 4:
It will print some values and make sure that when you twist the potentiometer, the value changes rapidly.

```
112
110
108
102
95
91
90
87
```

Option 5:
The first two lines demonstrates the voltage situation for RCP8591. Then, it will give you the distance between you and others. Like the image below shows, the distance is lower than 2 meters, it will warn you to watch out social distance. Meanwhile, the servo sensor will point at the exact distance with my pie chart.

```
0.919545
SOCIAL DISTANCE!!
The distance between these two people is:
0.93456
SOCIAL DISTANCE!!
The distance between these two people is:
```