Automatic Temperature Taking Kiosk

Group ID: 9-15

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1. Introduction

1.1 Background

During the current COVID-19 global pandemic, 756 thousand people have died due to COVID-19, with another 20.9 million people infected with COVID-19 as of 14 August 2020. According to an article published by the Raffles Medical Group [1], most methods of transmission require close physical contact to occur. By reducing physical contact between people, transmission of the virus can be slowed significantly.

1.2 Rationale and Objectives

We hope to limit physical contact between the healthcare workers and the patients or between staff and the general public, thus reducing chances for transmission and lowers the infection rate for COVID-19. This also helps conserve manpower as instead of multiple workers monitoring each entry point of a building, one worker can now monitor many entry points at the same time, hence reducing overall manpower required to perform this task of monitoring entrances of a building or facility. The manpower can then be diverted to other tasks, such as ensuring safe distancing, mask-wearing, etc.

1.3 Significance of project

This project will be able to help to relieve some of the stress on the healthcare systems. As this gadget will allow for less manpower to be required and also limit the amount of contact between people, as there is no need for someone to stand there and take the temperature of people.

1.4 Target Audience and Project Scope

The target audience of this project is very wide, as this gadget can be used in many different places. For example, hospitals, clinics, schools, shopping malls etc. This is because all of these places have a large amount of human traffic and thus checking their temperatures is a measure that has to be taken. Thus, our gadget will be able to help with that.

2. Literature Review

Although thermometer guns and ear thermometers already exist, there are a few problems with these temperature taking devices. There still needs to be somebody helping to take the temperature which will require additional manpower. Furthermore, the person using the thermometer will still be close to the patient and there is still a high risk of being infected by the patient. The price of similar existing products are quite high, with most of them costing more than a hundred dollars. There are also many products on the market which are similar to our gadget.(See pictures below) However, these products are expensive and would not be affordable for small schools to purchase them. While our gadget is cheap and reliable, allowing it to be used for long periods of time as it runs on electricity from the wall socket instead of batteries.

Figure 2.1: Examples of similar products

3. Study and Methodology

3.1 Timeline

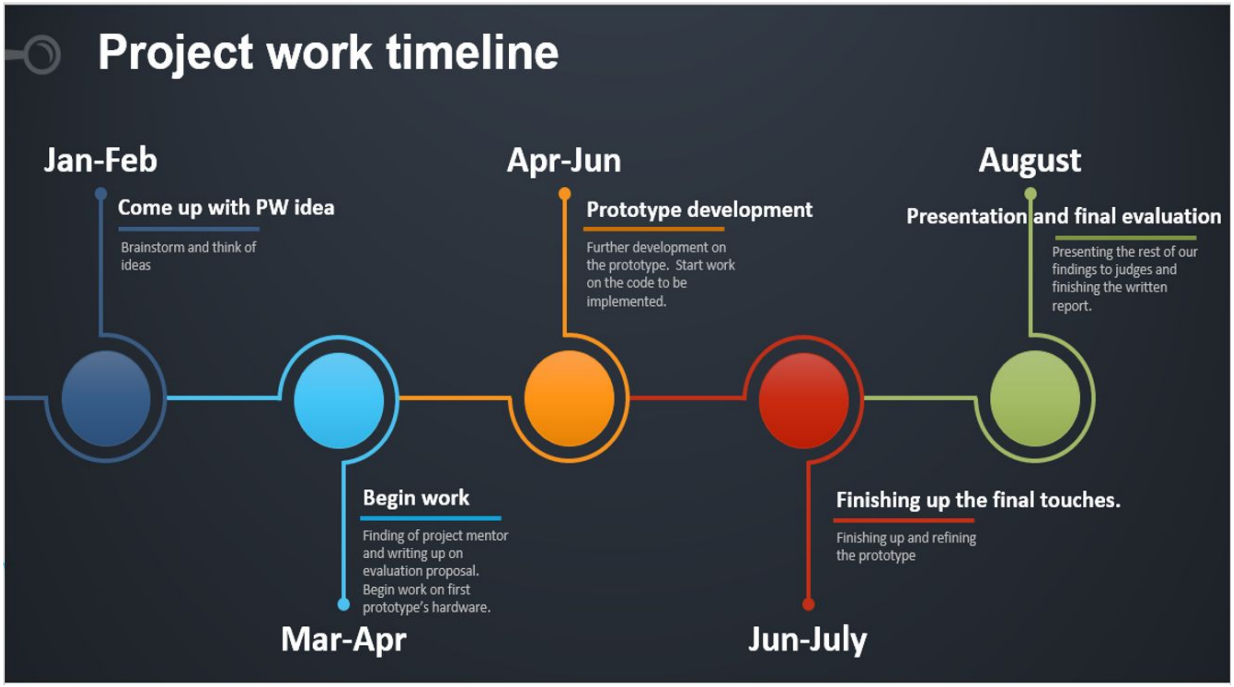

Figure 3.1: Timeline

3.2 Survey

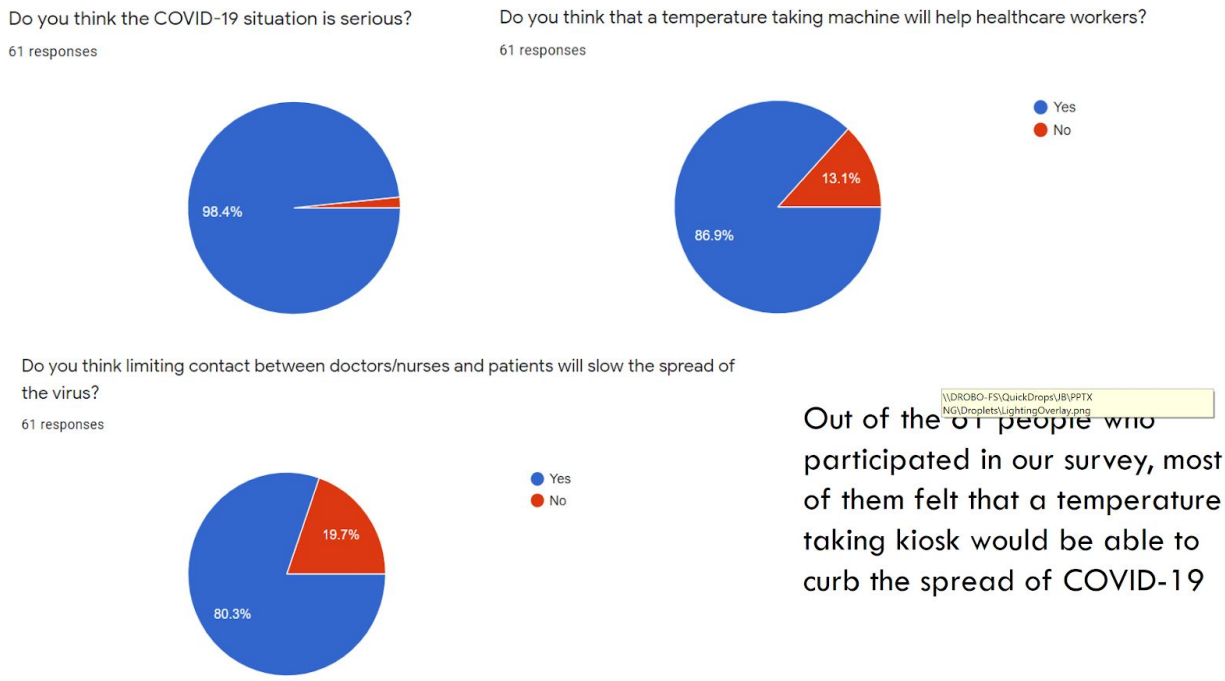

Figure 3.1

3.3 Equipment Used

- 1 Raspberry Pi Model 3B
- 1 Keyes RGB LED
- 1 Soldering Board
- Wires
- Omron D6T-1A-01 thermal temperature sensor
- Buzzer
- 1 LCD Screen
- 1 Barcode Scanner
- 1 four-digit display
- HC-SR04 Ultrasonic distance sensor

- USB power supply
- Adaptor
- Plastic Boards
- Screws

3.4 Work distribution

Jianxiang: Main programmer and builder

Jason: Research and slides

David: Research and assistant programmer

4. Outcomes, Analysis & Discussion

4.1 System Design

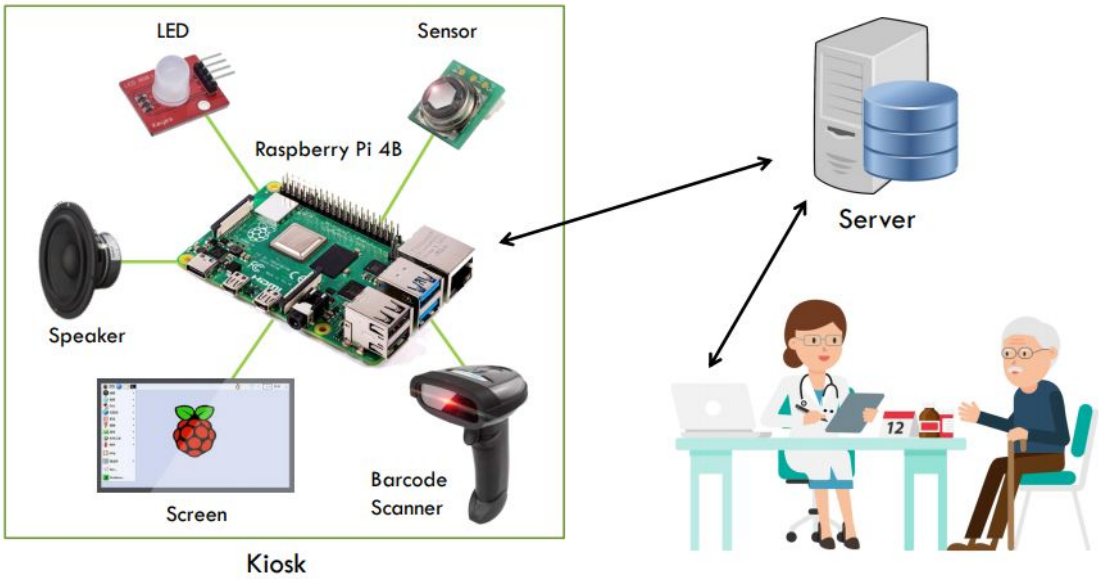

Figure 4.1: System Architecture

*server is for future development

Table 4.1: Pin Connections

Device	Pin	GPIO on Raspberry Pi (BCM mode)
Light Bulb	R	21
	G	16
	B	20
4-Digit display	CLK (orange)	17
	DIO (red)	27
Distance Sensor	Trigger (blue)	22
	Echo (white to blue)	26
Thermal Sensor	SDA1 I2C (gpio 2)	2
	SCL1 I2C (gpio 3)	3
Buzzer	Purple	19

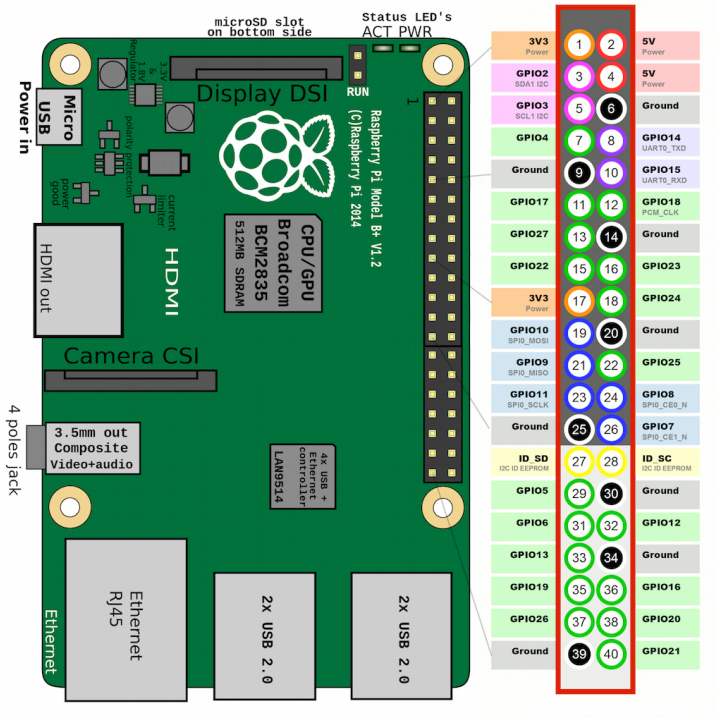

Figure 4.2: Raspberry Pi Pinout

4.2 System Implementation

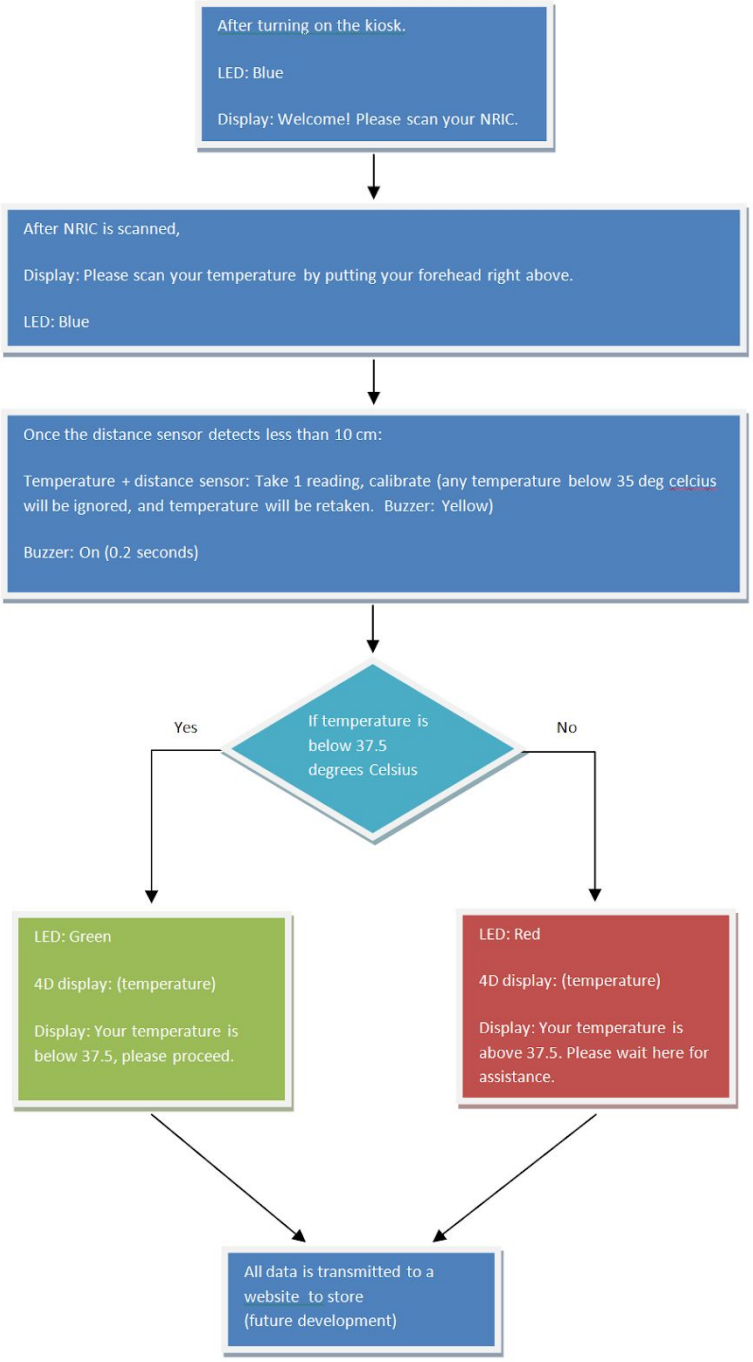

Figure 4.3: Steps in Program

```python

try:
    # Set up pin connections
    setup()

    # infinite loop
    while True:
        turn_on_blue_led()
        turn_off_buzzer()

        #Remove all extra IC scan
        remove_extra_ic_scan()

        update_text('Welcome! Please scan your NRIC.')

        id = scan_ic()

        update_text('Please measure your temperature.')

        temperature = read_temperature()

        #debug
        #print("Temperature:", temperature)

        if temperature <= TEMPERATURE_HIGH_LIMIT:
            turn_on_green_led()
            update_text("Your temperature is below 37.5, please proceed.")
        else:
            turn_on_red_led()
            update_text("Your temperature is above 37.5, please wait here for assistance.")

        #submit_temperature(id, temperature)

        time.sleep(10)

except KeyboardInterrupt:
    end_program()

finally:
    end_program()

```

Figure 4.4: Main Program

Figure 4.5:

Figure 4.5 shows the kiosk when it is turned on. The LED turns blue, and the large text display shows “Welcome! Please scan your NRIC.”

Figure 4.6:

Figure 4.6 shows the kiosk after the NRIC is scanned, the LED remains blue while the display shows “Please measure your temperature.” The buzzer will sound when the temperature is being taken.

Figure 4.7

If the temperature taken is valid and below the temperature limit (between 35 - 37.5 degrees celsius), the LED will turn green, the 4-digit display will show the temperature taken, and the text display will show “Your temperature is below 35 degrees, please proceed.”

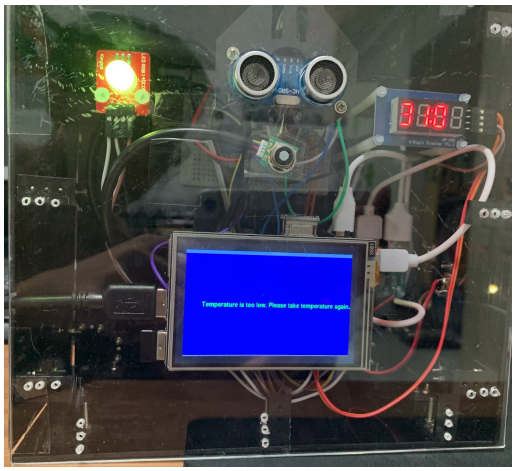

Figure 4.8

If the temperature taken is below 35.0 degrees celsius, the LED will turn yellow, the 4-digit display will show the temperature, and the large text display will show “ Temperature is too low, please take your temperature again.”, until the temperature taken is valid.

Figure 4.9

If the temperature taken is above 37.5 degrees celsius, the LED will turn red, the 4-digit display will show the temperature, and the text display will show “Your temperature is above 37.5 degrees, please wait here for assistance.”

5. Future Developments

We plan to add many improvements to our gadget in the future which we were not able to implement due to a lack of time, and also due to the Covid-19 pandemic.

The first addition that we hope to add to the gadget soon is an online portal to store information such as the temperature of the user, the time at which the temperature was taken, the date and the NRIC number of the user. This data would be useful in tracking the attendance of a person and would also aid in contact tracing.

The next addition that we hope to make is to attach it to the gantries of our school. For example, when the temperature of the user is too high, the gadget will lock the gantries and thus not allow the user to enter the place.

6. Conclusion

6.1 Difficulties faced

Due to the COVID-19 situation, our group faced difficulties in communications with each other and our mentor. It took a long time for us to seek advice and collaborate as we could not meet face to face. Therefore, we took a longer time to complete our project, and we did not manage to finish making the website part.

6.2 Reflections and Learning points

The learning point that we took away was that we needed to adapt quickly to changes. We learnt that change was the only constant, and that being able to adapt to these changes quickly was crucial in us being able to get things done on time. We were not able to meet up in person with our groupmates and mentor to build the gadget and discuss issues. Instead we had to communicate through texting which caused delays between responses as we do not check our messages that often. Another example, due to the Covid-19 pandemic, the parts for the gadget which we ordered were delayed and arrived late. This meant that we had to build the gadget on a time constraint.

6.3 Summary

We have successfully managed to build a kiosk that can help with the COVID-19 situation despite the difficulties we faced. The only part which we were unable to finish was the website, due to time constraints caused by the COVID-19 situation. We will continue to try to improve and learn along the way.

Bibliography

[1] https://www.rafflesmedicalgroup.com/covid-19-advisory/about-covid-19

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[6] http://www.pibits.net/code/tm1637-7-segment-display-example-on-a-raspberry-pi.php

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[8]https://github.com/sneidig/RPi-HC-SR05-sensor-poc/blob/master/RPi-HC-SR05-sensor-poc.py