Covid Safety Guidelines Detection

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Figure 1: Face Mask Detection

ABSTRACT

Safety and health being of utmost importance, COVID-19 has become an active research topic these days. Preventive measures against this pandemic can save the human race and increase the awareness among them. To put these measures into practise and to have surveillance systems for them in all public places to ensure its practise is the need of the hour. To help endure in this time, a system that helps take preventive measures against COVID-19, firstly by detecting whether or not a person is wearing a mask and secondly by checking his/her body temperature being normal or not. Only if the two conditions are met the door to these public places will be automatically unlocked or else will be left locked and entry will be prohibited. IoT devices are becoming used more frequently in the growing technological world we live in. These devices will play a large role in solving problems that humans deal with. The COVID Safety Guidelines Detection device will assist small schools in monitoring that students are wearing a mask and that they do not have a fever.

KEYWORDS

RFID code, Temperature data,Mask Detection, IR sensor, Body Temperature

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1 INTRODUCTION

One of the many severe pandemics that impacted the aspects of modern human society is undoubtedly the COVID-19. There is altogether a great difference between the world before and after this pandemic. This can be observed through the naked eye with the ongoing social distancing practices, the way our work environment got structured and the effect it brought to our economic activities. This pandemic has opened up several opportunities and challenges that require extensive scientific research and analysis.It has resulted

in a rapid response and action from the scientific community.The coronavirus pandemic created an urgent threat to global health causing disruption in daily livelihood all over the world. Despite Government lock downs and public health responses aimed at containing the disease and delaying the spread, several countries have been crippled with a critical care crisis, and many more following in future. Dynamic projections play a key role in conditions like COVID-19 where daily cases change rapidly based on government restrictions, test conditions, infection rate, etc.

Modern Businesses are forced by social distancing and hygiene protocols to embrace new-age digital technology solutions. Nevertheless they are clueless on how to be prepared for the new normal. The idea of this project is to aid schools in determining that individuals pass covid-19 guidelines. Users scan their id to determine if they have access to the room, and if they do, the device takes their temperature and checks if they have a mask using facial recognition software. Only authorized users who have passed the guidelines are granted access which is logged to a realtime database.

2 MOTIVATION

To assist in detecting the potential spreaders of coronavirus and to have a system that when installed in public places can help detect people without masks and the ones with high body temperature.

3 PROBLEM STATEMENT

To assist in installing a system that will help detect potential spreaders of coronavirus by detecting whether or not they have their masks on and checking their body temperature.

4 SYSTEM ARCHITECTURE

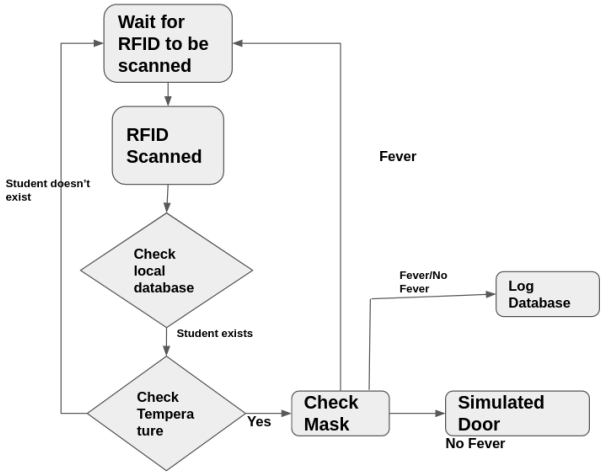

Figure 2: System Architecture and Data Flow Diagram

This product was designed to go through a few tests to determine if the user should be allowed into the room or building they are trying to enter [2]. When the device is on, it continuously waits for an RFID tag to be scanned. The value read from the tag is then checked against a local file which contains valid tag numbers which simulates id numbers that belong to a student or worker in the building. If the tag is found, the user has his temperature taken with the DHT22 sensor.[1] After the temperature is deemed to be lower than the allowed threshold, the devices' camera uses facial recognition software to determine if the user is wearing a mask. If no mask is found, the box opens and the user is to put on a mask and do this process again. The device logs all valid entries into the building or room into a real time database using firebase.

Figure 3: System Architecture Picture

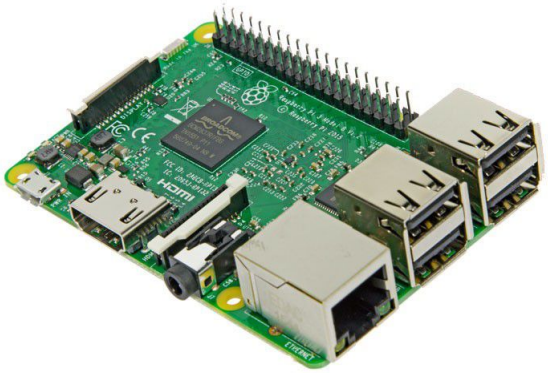

Figure 4: Raspberry Pi 3

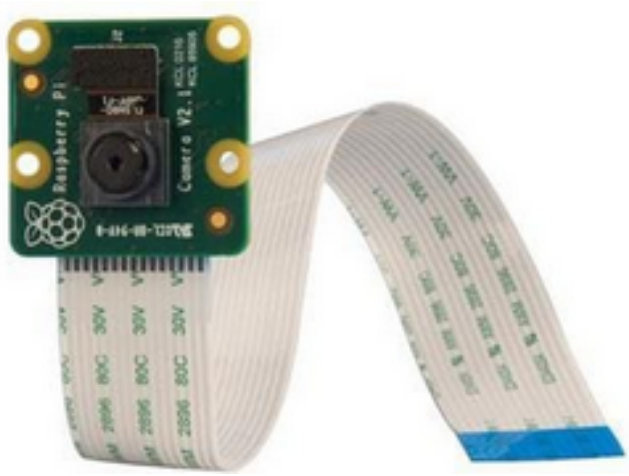

Figure 5: Raspberry Pi Camera

Figure 6: RFID RC552

Figure 7: SG90 Servo-motor

5 HARDWARE REQUIREMENTS

5.1 Raspberry Pi 3

5.2 Raspberry Pi Camera

5.3 RFID RC552

5.4 SG90 Servo-motor

5.5 DHT-22 Temperature Sensor

6 SOFTWARE REQUIREMENTS

6.1 OpenCV

For facial recognition, OpenCV had to be installed onto the pi. It took about 10 hours to install OpenCV onto the pi downloading it

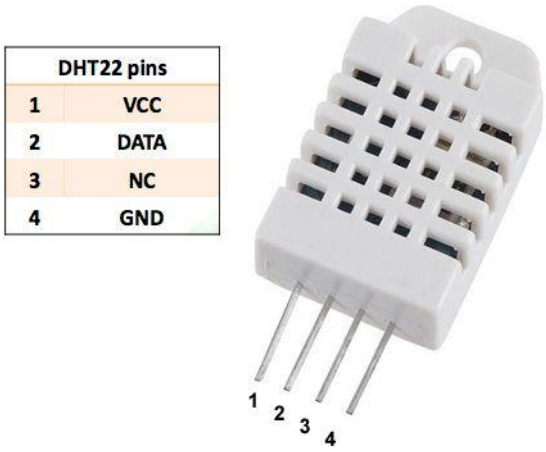

Figure 8: DHT-22 Temperature Sensor

onto an installed SD card. After OpenCV was installed, the picam had to be trained to recognize faces before it could move on and recognize masks. This was done using Caroline Dunn's github repository found at https://github.com/carolinedunn/facial-recognition. The steps were to take ten screenshots of a face and then run a model to train the pi to recognize that face.

6.2 TensorFlow

Installing tensorflow was straightforward and only took a few commands on the command line. Issues came from certain missing dependencies and getting it compatible with the pi. Once installed, tensorflow is the software that allows for the Pi to use a trained model that recognizes masks for our mask detection.

6.3 Firebase Realtime Database

This cloud-based real time database stores data in JSON format and synchronizes in real time to every connected client.

6.4 Python Language

The raspberry pi runs on python where we can power and control the functions of the hardware. Python is powerful in this project for the simplicity of the code to run the hardware that we used.

7 EVALUATION

The project works as expected. It is able to read RFID tags, detect ambient temperature, detect masks for a singular user, and log users into a realtime database which can be displayed on an HTML site. There are improvements that can be made on the device. Due to the pandemic, a contactless thermopile sensor was not available so the temperature device used only detects ambient temperature. Another issue with the design is the slow load-up speed of the mask recognition. It takes too long for the mask detection software to turn on the camera and have the model ready. A potential solution would be to start have the camera and model running at all times on a separate thread and then access it when it is needed so that the user does not have to wait. The mask distribution is a good part of this project as it only opens the box if a mask is not detected so it may stop people from taking extra masks that they do not need. It would be better if the masks were dispensed individually instead of the user having to reach into the box to grab one, but if the user only touches one mask they are going to use there should be no issue.

8 ADVANTAGES

- Automatic Mask Detection and Body Temperature
- Automatic Door Operation- prevents unnecessary contact with doors.

9 USAGE

- Universities Classrooms
- Dinning Halls
- Malls and Shops

10 CONCLUSION

The main aim of this project was to provide a tool for detecting temperature and mask detection for schools and businesses. This project was expanded to be used as potential contact tracing using the realtime database along with mask dispensing to those not wearing masks. The project taught us a lot of building products and the challenges that come along with designing and implementing features. It was encouraging to see how much documentation and support exists for microcomputers and products relating to the internet of things. It is powerful tool to create more connected world.

11 FUTURE SCOPE

A sanitizer dispenser box as well as a single mask dispenser can be installed connected in the system flow. Also with a full flourished database, if a particular person in the room is detected with the virus then all the people in the same room can be informed to stay in quarantine as they were in contact with that particular person.

12 ACKNOWLEDGMENTS

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REFERENCES

[1] [n.d.]. https://www.raspberrypi.org/
[2] Caroline Dunn. [n.d.]. How to Build a Face Mask Detector with Raspberry Pi.