SMART COVID-19 PRECAUTIONARY SAFETY SYSTEM

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Abstract— The main vision of the project is to provide safety due to the issue of infection of coronavirus. From 2019 through 2020 COVID-19 has become a pandemic among the whole world. The way is to prevent infection is to maintain a safe distance, use hand sanitizer frequently, maintain distance from unknown people. So, the system is built to provide safety to home and commercial places. The system protects by notifying that the person is a member of that family or not. The system also measures the temperature of any person and decides to let the person come into the building or commercial places. The system runs on a direct power supply but it can be featured to run also with the alternating power source. The system consists of temperature detection, automatic disinfection spray, automatic hand sanitizer, and face detection with lock. The temperature detector determines the temperature of any person and the algorithm decides to let any person go inside. An ESP-32 is used to detect any person who is employed in that specific commercial area or building. Also, a disinfection spray and automatic hand sanitizer are used for sanitizes the person. Throughout the total process of analysis, the solenoid lock provides a proper locking system and it runs at very low power input. This project is a hybrid system that can provide the measurements very efficiently at a very low power supply and low cost. It is designed in such a way that it can be used in every residential and commercial area. Hence it is cheap and efficient. Thus, in this COVID-19 pandemic situation, it is a very helpful and new solution.

Index Terms— Covid-19, safety system, temperature detection, automatic disinfection spray, automatic hand sanitizer, face detection

1 INTRODUCTION

Recently, COVID-19 has become a great concern for the world. In January, it was subsequently declared as pandemic all over the world [1]. Coronavirus appeared in December 2019. About 97.5 million people are infected and about 2.1 million people have died from the infection till now [2]. But after a certain period, people had to work for livelihood. For this pandemic situation, it is not safe to work outside. As coronavirus has an infectious characteristic, it is needed to provide safety to home and commercial places. The devices that are used in this system are used before in different systems previously.

The combined home security system over the traditional system has some advantages. The home and commercial home security system are very simple and cost-efficient. The system works very efficiently. It is very simple. The electric consumption of the system is very low. It can be run from two power systems. One can be direct power and the other is alternating power from the grid. So, it is very convenient to use. The devices which are used in this system are used separately.

To construct this safety system ESP32 CAM, relay module, solenoid lock, Arduino UNO, ultrasonic sensor, temperature detector GY-906, 5V motor, proximity sensor, mini dc pump, TIP32c PNP transistor, are used. These types of equipment are straightforward to use.

Implementation of the system over the traditional system is different. The system is combined and reliable. The devices should also be available so that when unwanted problems will occur, the devices can be changed and it can be manipulated again.

2 PROPOSED SYSTEM ARCHITECTURE

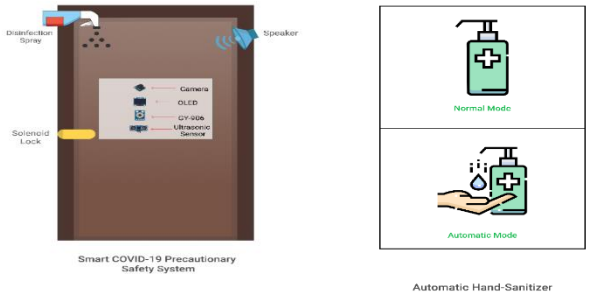

Figure 1: Architecture of the proposed model

The pic above illustrates the total architecture of the proposed project. It consists of Arduino Uno which will control whole the system, temperature sensor GY-906 is used for temperature detection and ESP32 CAM is used for face detection. In this COVID-19 pandemic situation, everyone needs to keep social distance, avoid social gatherings, cleaning their hands often to

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prevent the coronavirus. With the help of this COVID-19 precautionary safety system, people can avoid social gatherings with unknown persons, can clean their hands and body often when they are going outside or coming home, and can measure their body temperature.
After the end of the COVID-19 pandemic, this system can be used as a security system.

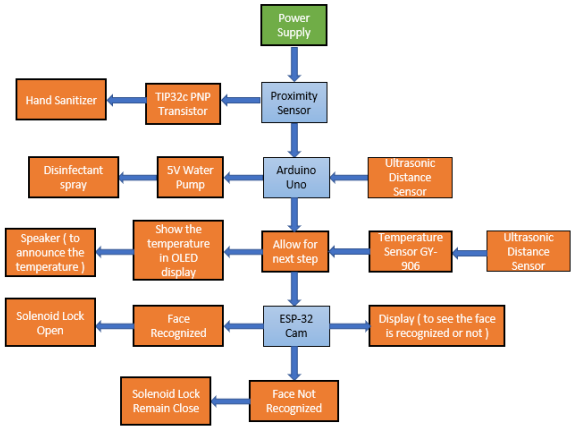

Figure 2: Block diagram of the system architecture

The above block diagram shows the total working procedure of the proposed project. It shows the connections and also the procedure to work from the first to last of the project consecutively. It illustrates the power and how the components will work combinedly.

3 METHODOLOGY

Every hardware is implemented separately. It is necessary to observe the characteristics and outputs of the system. Results are drawn from the simulations. The total implementation is done on the basis of the simulation results of each device. The devices are combined to complement the total hardware system of the project. All the simulations of the individual devices are given below:

Temperature detector:

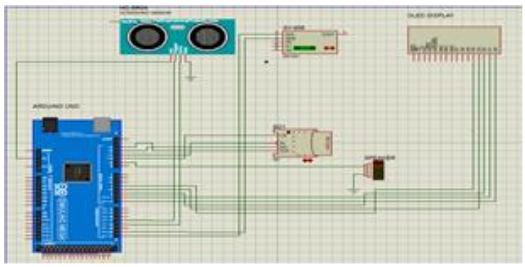

Figure 3: Temperature detector simulation.

This simulation is used to observe the temperature measurement of the human body surface at a distance. The Arduino would sense the distance with the help of an ultrasonic sensor and then the display showed the temperature. Parallelly the speaker also declared the temperature. The declaration sound would be in wav format which would be reserved by an SD card. Then the pin for the SD card module is configured. After that, the temperature sensor GY-906 is configured. The display would not rest until it gets another surface to measure next. Nine wav formats declared nine separate sounds through the speaker.

Face recognition:

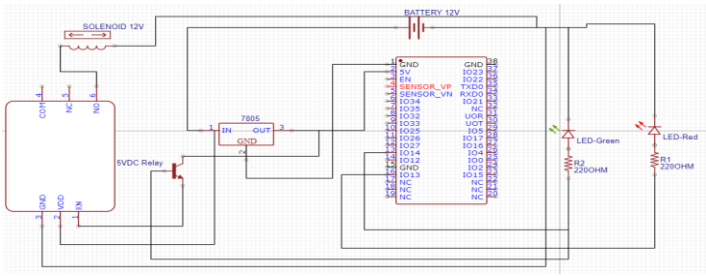

Figure 4: Face Recognition simulation

The system helped to identify a specific person. The system was enrolled with jpg and gif format of the members at different positions and it matched the face when the specific person stood in the range, the system matched it with the enrolled picture and give its output and take a decision to open the solenoid lock or not.
Sanitizer spray:

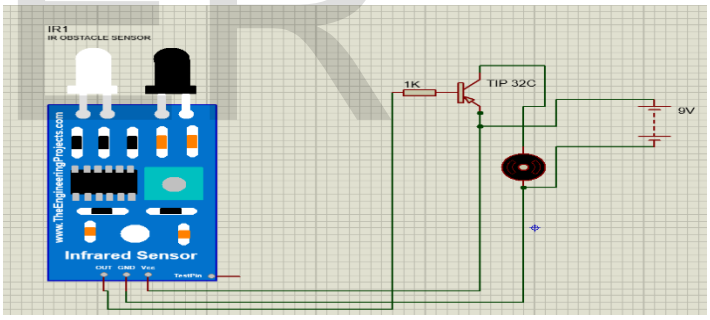

Figure 5: Sanitizer spray simulation.

With the help of the proximity sensor, the automatic hand sanitizer spray was operated by a DC motor. If any person put his hands in front of the sensor, it would sense the hands at a certain distance of a specific person and the DC motor helped to pump out the sanitizer.
Disinfection spray:

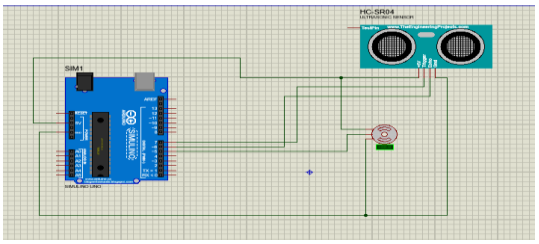

Figure 6: Disinfection spray simulation

The ultrasonic sensor measured the distance when any

person was standing in the range of the sensor. Then the sensor sent a signal to Arduino Uno then the Arduino Uno turned ON the motor to ejects the disinfectant liquid with the helped of a pipe and a nozzle spray.

After the simulation, the hardware implementation was done and the physical structure of the project is given below:

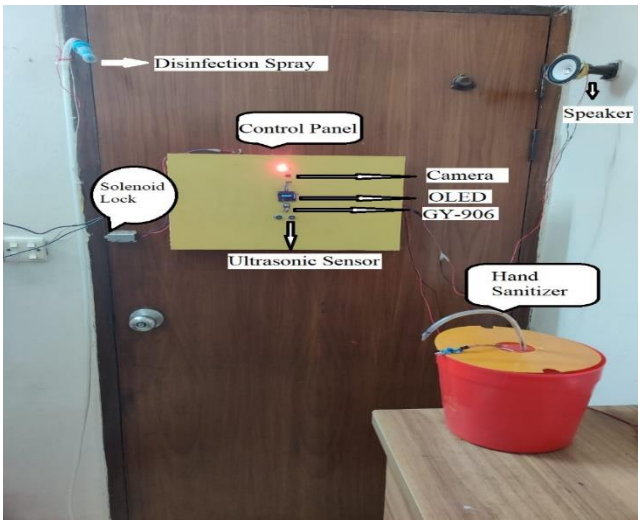

Figure 7: Proposed Project Hardware

4 Cost Analysis

Costing is a very important issue for affording any system. If the system is cost-effective it can be affordable for homes and commercial places. During implementing the system, many faulty devices were found after buying them. Keeping the unnecessary costs of faulty devices, the net actual cost of the system is given below:

Temperature Detector:

Components	Quantity	Per quantity price	Total (BDT)
Arduino Uno R3 SMD	1	350	350
SD card module	1	200	200
PAM8403	1	30	30
Speaker 3W	1	50	50
HC- SR04 Ultrasonic sensor	1	70	70
OLED 128*64	1	500	500
GY 906 Infrared Temperature Sensor	1	1500	1500
SD Card (8GB)	1	250	250

Face Detection:

ESP32-CAM	1	800	800
L7805 5V voltage Regulator	1	10	10
FTDI USB to TTL Serial converter Adapter FT232RL	1	450	450
DC 12 Solenoid Electric Door lock	1	750	750
5V Relay module	1	70	70

Disinfectant Spray and hand sanitizer:

5V water pump	1	140	140
Mini Dc pump	1	120	120
IR Proximity Sensor	1	70	70
Arduino Uno R3 SMD	1	350	350
HC- SR04 Ultrasonic sensor	1	70	70

Table 1: Project finance

Development cost:

Components	Quantity	Per unit Quantity price	Total (BDT)
Power supply 12V	1	150	150
LED	2	2	4
Jumper Wire 40 pcs Set	3	50	150
Bread Board	2	80	160
Resistors 10k	4	2	8
Capacitor 100 µf	2	5	10
Glue Gun	1	300	300
Card Board	1	100	100
Switch	1	5	5
Spray bottle	1	20	20
Anti-Cutter	1	20	20
		Total	927

Table 2: Development cost

5 Conclusion

This paper represents the project of the COVID-19 Precautionary safety system. The main vision of this project is to provide safety due to the issue of infection of coronavirus. The goal was achieved through hardware implementation. This project works as a Precautionary safety system which is important to reduce COVID-19 patient. This system provides safety to commercial places and residential areas. The system cost is affordable so that it could be used by every sector people and can utilize it properly to be safe.

Acknowledgment

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