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Automated Non-Contact Body Temperature Monitoring

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Abstract — ***Till now of 21 million COVID-19 confirmed cases in the INDIA, the country continues to implement strict precautionary measures especially with the re-opening of business and government establishments in areas under red zone. This paper proposes body temperature detection sensor that uses, ultrasonic, & IR thermometer sensors to maximize efficiency and minimize cost. The ultrasonic & IR sensors are connected with a speaker to check and maintain the social distancing between people. A non-contact, body temperature sensor is fitted at the entrance to check the temperature of individuals before finally entering the Room/Area. A buzzer alarms when the detected body temperature is above normal to signal the authority for immediate action. ARDUINO UNO R3 runs the sensors, speaker and buzzer.***

I. ***KEYWORDS*** — *COVID, ARDUINO UNO R3, SOCIAL DISTANCING, ULTRASONIC SENSOR, IR THERMOMETER SENSOR*

II. INTRODUCTION

The COVID19 pandemic which started in Wuhan, China in December 2019 has brought on a new era and new way of life, a new reality wherein social distancing has become a must for survival. With a markedly high worldwide infection of 118,161,913[1] confirmed cases as well as markedly increasing national infections and deaths, MINISTRY OF HEALTH DEPARTMENT of INDIA for COVID-19 control and prevention demands the wearing of masks and a social distancing of 2 feet between individuals as the virus can spread through the saliva and through human contact.

We have come up with an automated body temperature machine using ARDUINO UNO R3, ultrasonic, IR and IR thermometer sensors for COVID prevention.

III. LITERATURE REVIEW

1. BY CLEMSON UNIVRSITY VEHICULAR ELECTRONICS LABORATORY

Automotive temperature sensors are used to measure temperature at many places in an automobile, and usually consist of a thermostat (thermally sensitive resistor), thermocouple, resistance temperature detector (RTD), or IR device. Thermocouples are usually used for temperature measurements and IR sensors are used where direct contact with the object being sensed is undesirable.
Thermocouples are used when fast response times are needed. RTDs rely on certain metals thermo-resistive behavior to detect changes in temperature. RTDs respond to temperature changes linearly and can achieve good accuracy.**[7]**

2. BY MACHINESENSE

Almost all IR scanners, including handheld versions operated by others. In addition, they cannot be used where there is direct sunlight whether indoors or not. **[7]**

IV. METHODOLOGY/EXPERIMENTAL

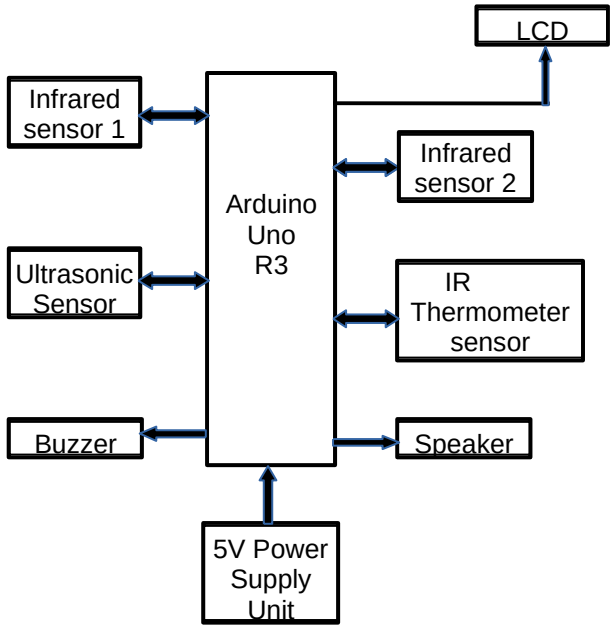

Figure 1: Block diagram for social distancing and body temperature monitoring

Figure 1 shows block diagram for the social distancing and body temperature monitoring. The main blocks are the ARDUINO R3, IR sensors, buzzers, sensors, IR thermometer sensor, power supply and LCD display.

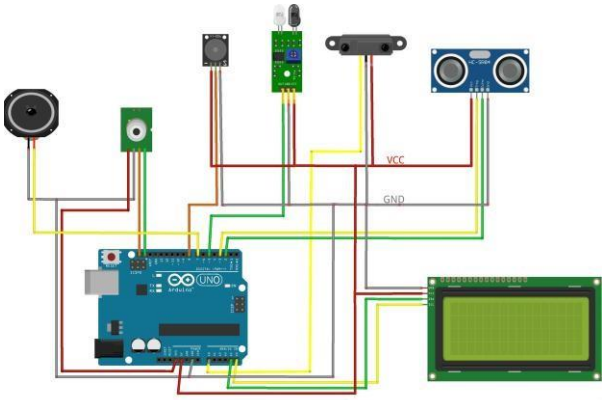

Figure 2: social distancing gate with temperature monitoring prototype. **[7]**

The prototype of social distancing gate with non-contact thermometer is represented in Figure 2.

A. Arduino UNO R3

Figure 3: Arduino UNO **[8]**

Classified as an atmega series microcontroller, ARDUINO UNO R3 has 14 input and output pins, specifically analog and digital inputs. It is programmed using an IDE environment with C or C++.

B. Long range IR proximity sensor

Figure 4: IR distance sensor

An IR distance sensor, with a sensing distance of up to 1.5 m, is used to detect the presence of person at the social distancing gate's point of entry. The width of the gate is designed to allow one person at a time at the entrance.

C. Ultrasonic sensor

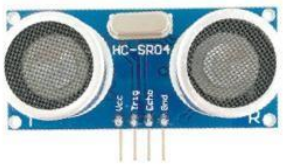

Figure 5: ultrasonic sensor **[8]**

Coupled with the long-range, IR sensor, the ultrasonic sensor is primarily utilized for monitoring the social distancing of 2 feet between the people inside the gate. It emits a sound wave at a high frequency not heard by human ears. Functioning as radar, it determines the object distance through frequency hits, returning as an echo.

D. Speaker

Figure 6: speaker **[7]**

A 0.5-Watt, 8 Ohm speaker is used to send an alarm when the social distancing is prohibited.

E. IR proximity sensor

Figure 7: IR proximity sensor **[8]**

The IR proximity sensor is placed below the thermometer sensor to detect the presence of an individual to start the temperature reading.

F. IR thermometer sensor

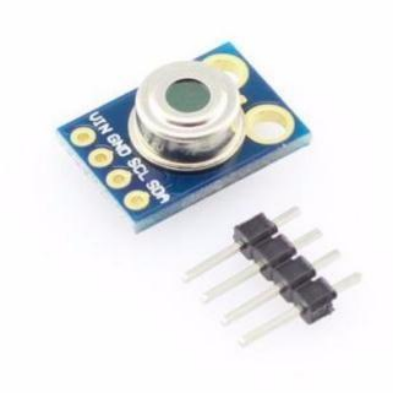

Figure 8: IR thermometer sensor **[8]**

A non-contact IR thermometer sensor that is used to measure the body temperature with an accuracy of (+-)0.5 degree C and a sensing distance within the Field of view of the sensor.

G. LCD module

Figure 9: LCD module **[8]**

A 4x20 blue LCD is used to display the person's body temperature detected by the IR thermometer sensor.

H. Buzzer

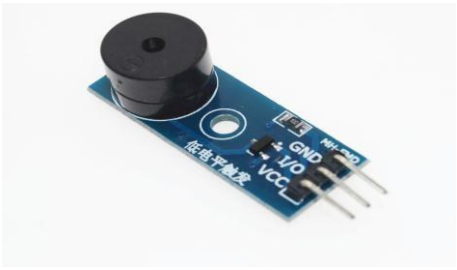

Figure 10: buzzer **[7]**

The buzzer is used to know the assigned gate

Personnel by the alarm it makes the moment social distancing is prohibited and the adult's temperature detected is above normal.

V. MODEL

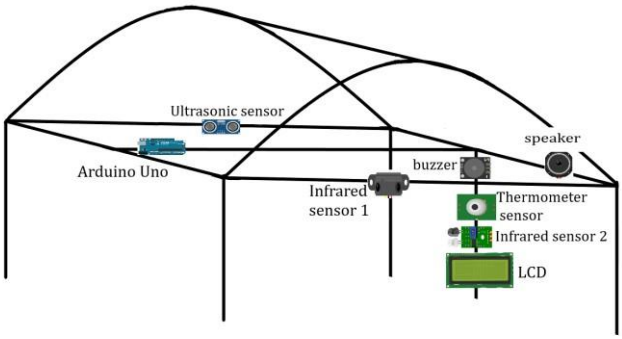

Figure 11: circuit for social distancing gate with body temperature monitoring **[7]**

In Figure 11, a long range-IR sensor points to the ground to detect an incoming person, at the social distancing gate's entrance. An ultrasonic sensor then detects this person after the person enters. The speaker sends a tone when another person, person 2, enters within the social distancing limit of 2 ft after the point of entry, directly behind the first person.

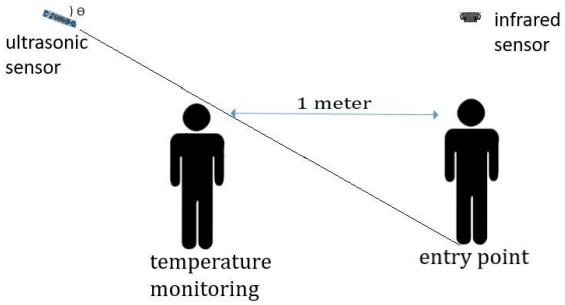

Figure 12: 1-meter social distancing **[7]**

In Figure 12, the speaker sounds to notify person 2 and the gate personnel that the social distancing of 1m be maintained. Here, due to minimum memory of the ARDUINO UNO R3, the speaker is capable of alarm and not some warning in the form of words. The ultrasonic sensor is placed at angle θ to the horizontal.

In the mid of the social distancing gate, a body temperature machine measures and displays on an LCD the person temperature as soon as they place their forehead within the field of view (0.01m) of the IR thermometer sensor. The reading starts as soon as the IR sensor 2, which is placed directly below the IR thermometer sensor, detects the presence of an individual.

The buzzer alarms to know the assigned gate personnel when the temperature reading is beyond that of an adult's forehead normal temperature, that is, 37.5 degrees C or above for one who has a fever.

Both speaker and buzzer give alarms when both social distancing and normal body temperature are violated.

VI. RESULTS

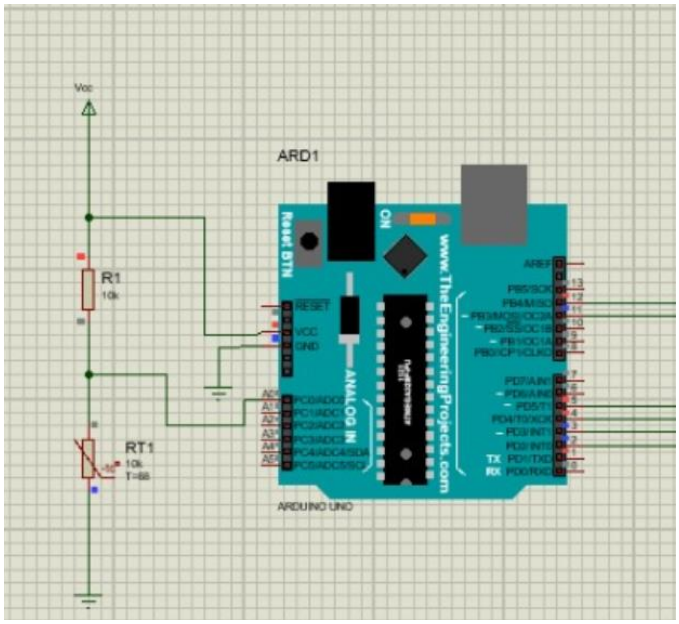

Figure 13: System simulation on the ARDUINO IDE

The simulation for the social distance monitoring using the ultrasonic and long-range IR sensor with automatic body thermometer on the IDE is shown in Figure 13.**[5]**

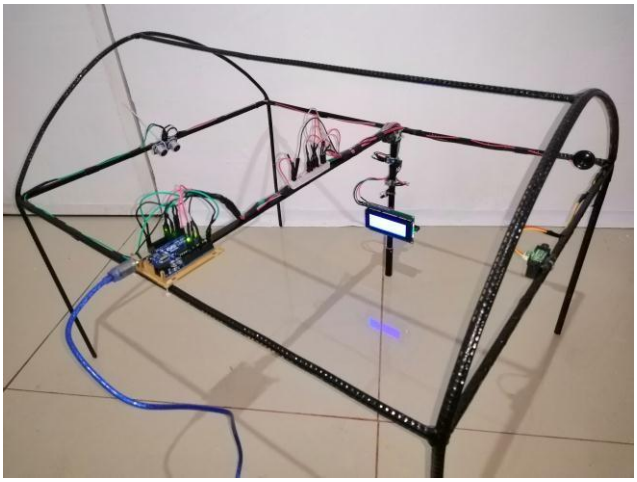

Figure 14: built system **[7]**

Figure 14 is the working system for the proposed social distancing gate with non-contact thermometer.

VII. FUTURE SCOPE

This system can be used in future to check social distancing, which we think is a necessity from now onwards. Maintaining social distancing should be compulsory for avoiding future pandemics.

In this project we can make a software that prevents entry in a room when the number of people entered the room has exceeded the limit.

The circuit used in this project can be made power efficient by technologies beyond our reach and with high level engineering.

VIII. CONCLUSION

Using this system, social distancing is maintained inside the gate and the temperature of each individual entering is monitored. The features of both social distancing and non-contact, body temperature sensing minimize person to person contact thereby preventing the spread of the COVID19 virus.

It is recommended that we also use this kind of system at all public exits with a system of using the social distancing feature only. Moreover, the speaker can also be connected to an amplifier to increase its volume. A long range, higher accuracy, MLX90614ESF-DCx versions of the IR thermometer sensor can be used.

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[8] Google Images