"AUTO TEMPERATURE DETECTOR FOR ENTRANCE FOR COVID SAFETY"

A project report submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY
IN
ELECTRICAL AND ELECTRONICS ENGINEERING

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CERTIFICATE

Certified that this is a Bonafide record of the dissertation work entitled, **"AUTO TEMPERATURE DETECTOR FOR ENTRANCE FOR COVID SAFETY"** done by **Thirunagaru Deekshith, K S Saketh, Revanth Thakore, Kothapally Benny** under the guidance of **Mr. P Prasanth Kumar** submitted to the faculty of Electrical and Electronics Engineering, in partial fulfillment of requirements for the Degree of **BACHELOR OF TECHNOLOGY IN ELECTRICAL AND ELECTRONICS ENGINEERING** from Jawaharlal Nehru Technological University, Hyderabad.

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INDEX

ABSTRACT

This project is about one of the restrictions rules imposed by Government for Covid safety. Restrictions are as in temperature check at entrances of malls, offices along with social distancing and limit on number of persons allowed in a particular area or room. In this project we stimulate a room where the necessary precautions are taken following the guidelines, when the person enters the entrance area, the temperature of the person is detected by the sensor and if temperature of the person is within the limit of set temperature then the person is allowed entry into the area else the entry is denied. The set temperature is pre-determined as per guidelines and the number of persons to be allowed can be determined on the type of area i.e., malls, offices, etc. This helps in more safety as it is automated and there is no risk for any worker at entrance due to contact less checking. The project is developed using Microcontroller and Temperature sensor.

CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS

LDR: Light Dependent Resistor
LCD: Liquid Crystal Display
LED: Light Emitting Diode
IR: Infrared
MIT: Massachusetts Institute of Technology
USB: Universal Serial Bus

Chapter 1

1.1 Introduction:

One of the symptoms of corona virus is fever, which means having body temperature over 100°F. As the virus is contagious it is difficult to measure the temperature at the entrances. It is important to know that even when the temperature is checked it has only limited impact on reducing the spread of virus. Having high temperature is one of the ways to identify a person with corona virus, despite the fact that an infected person may be contagious without high temperature.

Detection of temperature quickly and without any contact is very important. As most of the establishments like businesses, institutions, and offices are resuming to work normally. It is very important to find the people who are infectious to minimize the spread of corona virus. One of the methods to measure the body temperature is the use of contact less sensors. Since the use of other temperature devices requires physical contact which may increase the spread of virus.

1.2 Problem Statement:

As we know how deadly the Corona virus is and how rapidly it is spreading across the world. To reduce the spread of Corona virus we need to find out the infected people. As the symptoms are many the only noticeable symptoms is high temperature of human body when they are in public places. To check the temperature of every person there will be a security guard/watchman but as the virus is contagious it can spread to them as well. Our project is to have an automatic temperature sensor and to allow certain number of people to maintain social distance in the rooms. If we check the temperature of every person at all the entrances like offices, institutions, shops then it can help in reducing the spread of Corona virus.

1.3 Aim and Objective:

Corona virus has shown how unsafe our society will be, when we have to face a pandemic. As new rules were implemented for safety as in no of persons allowed in a room in schools, offices, stores and to keep social distance and temperature checks at different places have become mandatory.

Our main aim is to check the temperature and allow a certain number of people in a room without any human interference.

In this project we stimulate a room with all the necessary precautions, to detect the entry of a person we use laser diode and receiver, when the laser diode detects the person it will check the temperature and if the temperature is below the fixed value then the gate will open for the person to pass through it and there will be another sensor which detects whether the person has passed through it or not, then only another person temperature will be checked, so people

can maintain social distance. Only a certain number of people will be allowed inside the room as per the capacity to maintain social distance.

Chapter 2

2.1 Block Diagram:

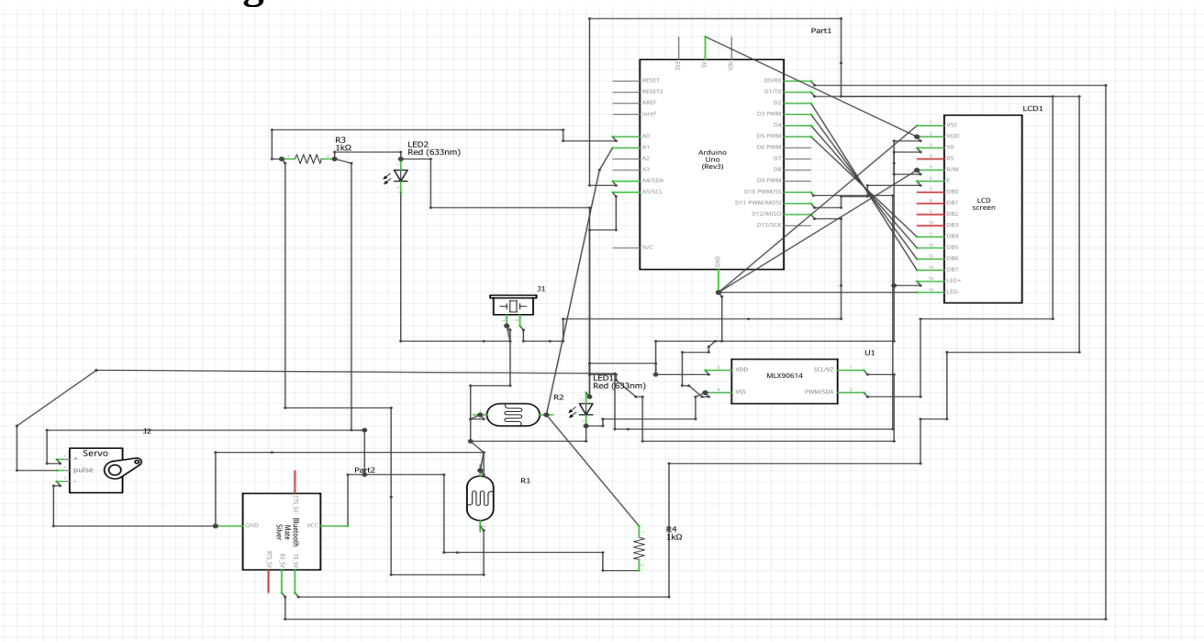

Fig 2.1.1 Block Diagram

2.2 Component Details:

2.2.1 ATmega328P:

Atmega328p is a high performance and the power consumption is very less. It is an 8-bit microcontroller. As the microcontrollers are readily available and are cheap it has become difficult to find a good microcontroller. However, Atmega328p is one of the best microcontrollers available. This microcontroller is able to achieve the most single clock cycle execution. In Arduino boards it is found as a processor such as Arduino Fio and Arduino Uno.

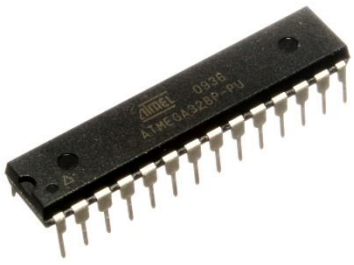

Fig 2.2.1.1 ATmega328P Microcontroller

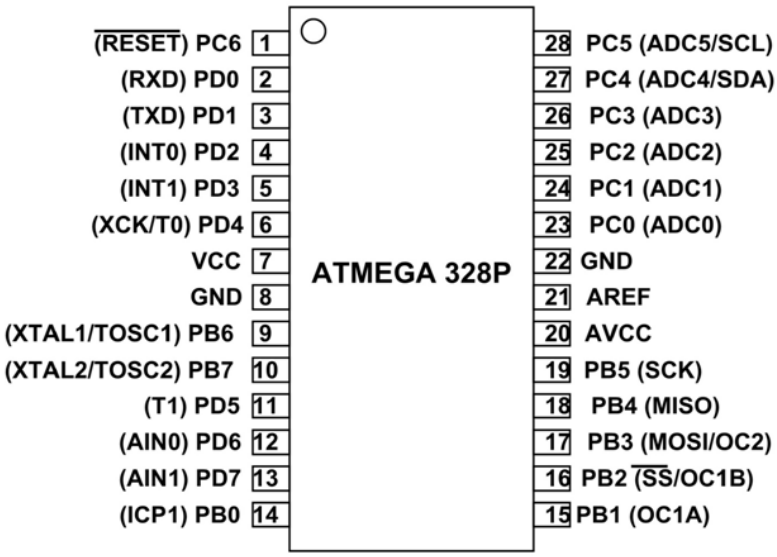

Fig 2.2.1.2 ATmega328P Pinout

2.2.2 7805 Voltage Regulator:

7805 Voltage Regulator is commonly found in electronic circuits. It is a 5V Voltage Regulator. Constant output voltage for a varied input voltage can be obtained by the voltage regulator. In most of the projects this voltage regulator has many applications. The minimum input voltage is 7Vand maximum input voltage if 25V.

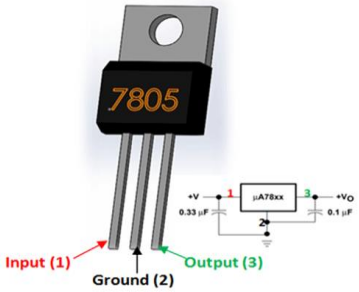

Fig 2.2.2.1 7805 Voltage Regulator Pinout

2.2.3 Non-Contact Temperature Sensor MLX90614:

MLX90614 is a non-contact infrared temperature sensor which are used to measure the temperature ranging from -70°C to 382°C. To measure the temperature of an object without human contact the sensor uses IR rays.

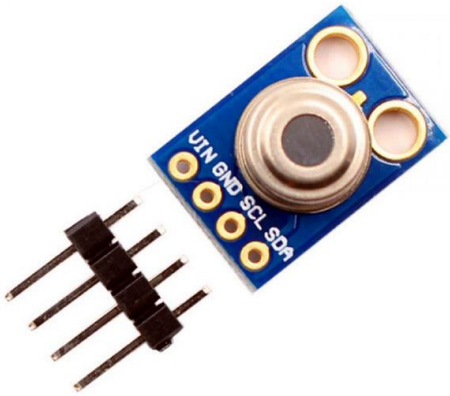

Fig 2.2.3.1 MLX90614 Non-Contact IR Temperature Sensor

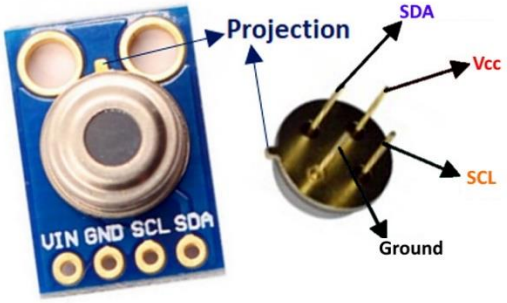

Fig 2.2.3.2 MLX90614 Pinout

2.2.4 HC-05 Bluetooth Module:

HC-05 is a Bluetooth module designed to communicate wirelessly. This module may be used to communicate between two microcontrollers. It has a range up to 100m. It communicates with microcontroller using serial port. It has red LED which indicates connection status.

Fig 2.2.4.1 HC-05 Bluetooth Module

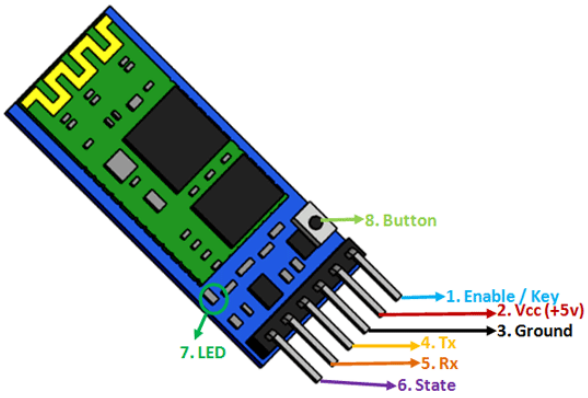

Fig 2.2.4.2 HC-05 Pinout

2.2.5 Servo Motor:

Servo motor is an electronic device which can rotate with great precision. It is a rotary or linear actuator. A servo motor uses closed loop control-system i.e., it uses position feedback to regulate its motion. It consists of a control circuit which provides feedback of the present position of the motor shaft, this feedback helps the servo motor to rotate with great precision. To rotate an object to a certain angle we use servo motor. Servo motors are controlled by sending electrical pulses.

Fig 2.2.5.1 Servo Motor

2.2.6 LCD Display:

LCD is a flat panel display that uses liquid crystals to operate so they are called liquid crystal display. It is a kind of dot matrix module it displays numbers, letters, characters. Lcd has parallel ports so that it would control several pins at a time.

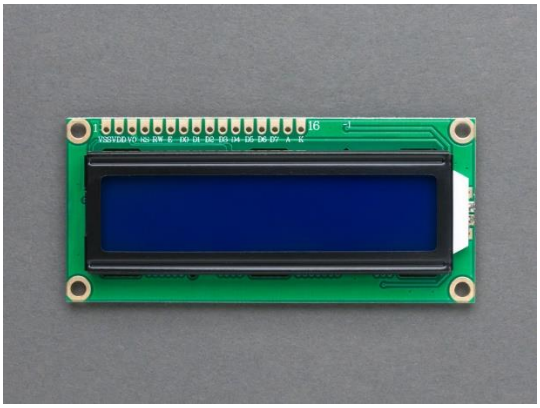

Fig 2.2.6.1 LCD Display 16×2

2.2.7 Laser Diode:

A laser diode is also a semiconductor device which is similar to led. It can directly convert electrical energy to light. A laser diode is a diode in which a diode pumped directly with electric current can create lasing conditions at diode junctions. All laser diode is a pin diode electrically.

Fig 2.2.7.1 Laser Diode

2.2.8 LDR:

LDR is a light dependent resistor. It is also called Photoresistor or Photoconductor. It is an electronic component which is sensitive to light. LDR's made up of a semiconductor which have high resistance. It used in circuits where it is necessary to detect intensity of light. When the light falls on the surface of the LDR then its resistance changes. If intensity of light is high then resistance of LDR decreases and vice versa. In the dark resistance of the LDR is very high.

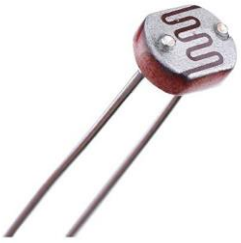

Fig 2.2.8.1 LDR

2.2.9 Battery:

A battery is an electrochemical cell which stores chemical energy and converts it to electrical energy. They are made up of one or more electrochemical cells. The chemical reaction in a battery involves the flow of electrons from one electrode to another, through external circuit.

2.2.10 LED:

Light Emitting Diode (LED) defined as light source which uses semiconductor and electroluminescence to produce light. It emits light when current flows through it. When current passes through it, the electrons recombine with holes emitting light in the process. Led is one of the most energy efficient. It is a special sort of PN junction diode.

2.2.11 Buzzer:

A piezo buzzer is a small electronic device which is used to make sound using an Arduino. It works on the principle of piezoelectricity. It produces same sound irrespective of variation of voltage. It consists of piezo crystals between to conductors.

Fig 2.2.11.1 Buzzer

Chapter-3

3.1 Circuit Diagram:

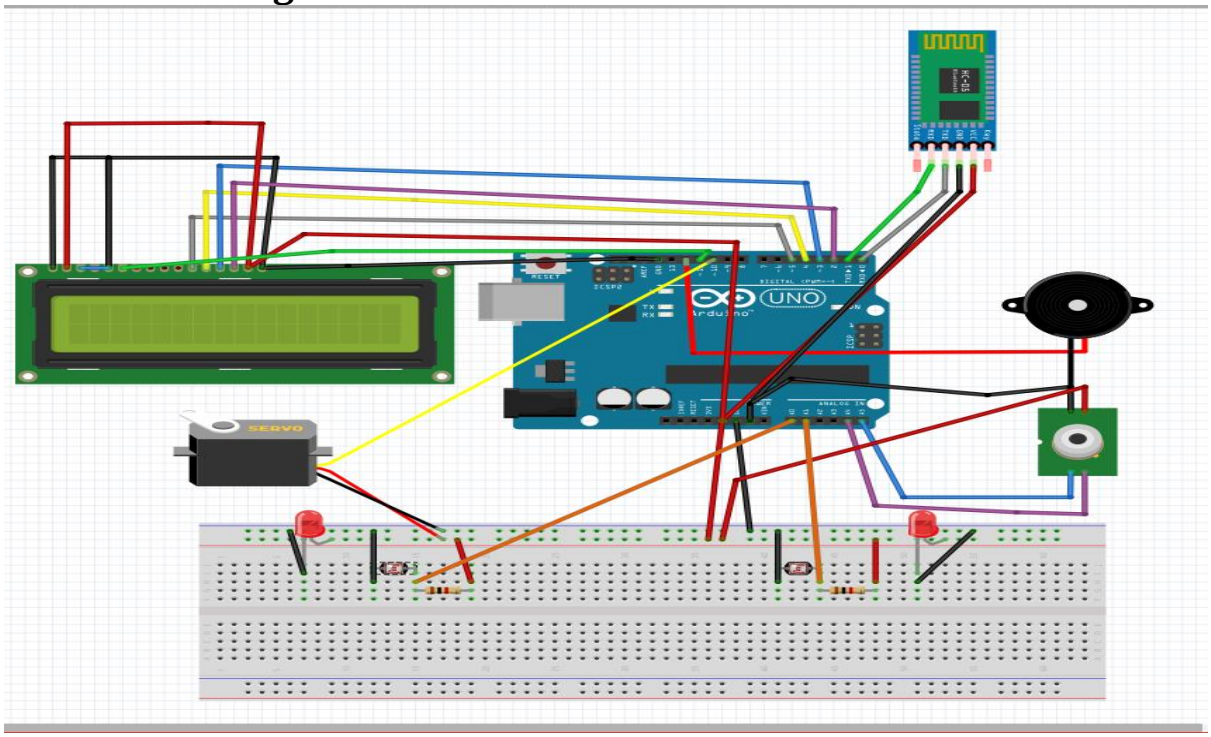

Fig 3.1.1 Circuit Diagram

3.2 Description:

In this project a contact less temperature sensor i.e., MLX96014 sensor is interfaced with a microcontroller to measure the temperature of a person at entrances. An LCD display with I2C communicator is used for displaying the necessary information in different stages of operation. A HC05 Bluetooth module is used with a mobile application which is build using MIT app inventor. For controlling the opening and closing of the gate we used a servo motor for making a practical reference. Opto couple mechanism formed by laser led diodes and LDR modules at both ends of gate for counting persons those are entering and leaving. A piezo buzzer is used for giving alarm if there is more than one person and if the person has high temperature.

3.3 Operation:

When a person is at the entrance, he first comes near to the first sensor. The first sensor detects the person by using LDR sensor as he touches the laser light. The MLX90614 contactless temperature sensor measures the temperature of the person. If the temperature is in limit then it allows the person by opening the gate. When the person passes through the second sensor then the gate closes and also increases the person count and displays on the LCD screen. In this process it continuously increments the person count as people enter the room. If the person with high temperature is near the temperature sensor then the buzzer

sounds and the gate remains close. If a person is leaving the room then he comes to the second sensor and the gate opens and as he passes the second sensor then the person count is decremented and displayed on LCD. The temperature limit and the maximum person count can be changed by using mobile application that is connected to HC05 Bluetooth module. If the number of people in the room exceeds the limit then buzzer continuously sounds and shows on the display.

Chapter-4

4.1 Program Code:

Arduino Software Program:

```
#include <Servo.h>

#include <Wire.h>

#include <LiquidCrystal_I2C.h>

#include <Adafruit_MLX90614.h> //headers

const int ldr1 = A0;

bool ldr1state;

const int ldr2 = 8; //ldr pins

const int buzz = 10; //buzzer pin

int pc = 0;

int pmax = 5;

int tmax = 40; //limits for number of people and temperature

String BT_input; //bluetooth input

Servo myservo;  // create servo object to regulate a servo position

// twelve servo objects can be created on most number of boards

int pos = 0;    // variable employed to store the servo position

LiquidCrystal_I2C lcd(0x27, 20, 4); // setting the LCD address to 0x27 for a 16 chars and 2 line display

Adafruit_MLX90614 mlx = Adafruit_MLX90614();

void setup() {
```

```
// Place your setup code here, to run once:
lcd.init();
// Print a message to the LCD.
lcd.backlight();
lcd.setCursor(1, 0);
lcd.begin (16, 2);
lcd.setBacklight(HIGH); //Lighting backlight
lcd.home ();
mlx.begin();
myservo.attach(9);
Serial.begin(9600);
pinMode(buzz, OUTPUT);

lcd.setCursor(0, 0);
lcd.print("Auto Temperature");
lcd.setCursor(0, 1);
lcd.print("Detector");
delay(1000);
lcd.clear();
lcd.setCursor(0, 0);
lcd.print("By Batch 07");
delay(1000);
```

```
  lcd.clear();
  lcd.print("start ");
}
void bluetooth() {
  unsigned long time1 = millis() + 2000;
  while (millis() < time1)
  {
    if (Serial.available()) {
      BT_input = Serial.readString();   // read input string from Bluetooth Module


      // Serial.println(BT_input);
      tmax = (BT_input[0] - 48) * 10 + (BT_input[1] - 48);
      pmax = (BT_input[2] - 48) * 10 + (BT_input[3] - 48);
      lcd.clear();
      lcd.setCursor(0, 0);
      lcd.print("values set");
      break;
    }
  }
}
void buzzer() {
```

```
  tone(buzz, 1000); // Send 1KHz sound signal...
  delay(1000);        // ...for 1 sec
  noTone(buzz);


}
//void scroll(){
//for (int positionCounter = 0; positionCounter < 6; positionCounter++) {
// scroll one position left:
//lcd.scrollDisplayLeft();
//wait a bit:
//delay(200);
//}
//}
void gate() {
  for (pos = 0; pos <= 100; pos += 1) { // goes from 0 degrees to 180 degrees
    // in steps of 1 degree
    myservo.write(pos);          // Telling servo to move to position in variable' pos'
    delay(15);                       // Telling to wait for 5ms for the servo to reach the
position
  }
  delay(1000);
  for (pos = 100; pos >= 0; pos -= 1) { // going from 180 degrees to 0 degrees
```

```
    myservo.write(pos);              // Telling servo to go to position in variable 'pos'
    delay(15);                       // Telling to wait for 15ms for the servo to reach the
position
  }
}
void tcheck() {
  lcd.setCursor(0, 0);
  lcd.print("Ambient ");
  lcd.print(mlx.readAmbientTempC());
  lcd.print(" C");
  lcd.setCursor(0, 1);
  lcd.print("Target  ");
  lcd.print(mlx.readObjectTempC());
  lcd.print(" C");
  if (mlx.readObjectTempC() >= tmax)
  { lcd.clear();
    lcd.setCursor(0, 0); lcd.print("temperature");
    lcd.setCursor(0, 1);
    lcd.print("exceeded");
    // scroll();
    buzzer();
    loop();
```

```
  }
  else
  {
    delay(1000);
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("please Enter");
    myservo.write(0);
    delay(100);
    gate();
  }

}
void ldr_1() {
  int ldrStatus = analogRead(ldr1);
  Serial.println(ldrStatus);
  if (ldrStatus <= 700) {
    ldr1state = LOW;
    Serial.println(ldr1state);
  }
  else {
    ldr1state = HIGH;
```

```
    Serial.println(ldr1state);
  }
}

void loop() {
  // put your main code here, to run repeatedly:
  bluetooth();
  Serial.println(pmax);
  Serial.println(tmax);
  ldr_1();
  if (ldr1state == HIGH && digitalRead(ldr2) == LOW )
  { tcheck();
    Serial.println("inc");
    unsigned long int time = millis() + 3000;
    while (millis() < time)
    {
      if (digitalRead(ldr2) == HIGH ) {
        pc = pc + 1;
        Serial.println(pc);
        lcd.clear();
        lcd.setCursor(0, 0);
```

```
      lcd.print("People inroom:" + (String)pc);
      // scroll();
      break;
    }
  }

}
else {
  ldr_1();
  if (digitalRead(ldr2) == HIGH && ldr1state == LOW )
  {
    Serial.println("dec");
    lcd.clear();
  lcd.setCursor(0, 0);
    lcd.print("Thank You");
    gate();
    unsigned long int time = millis() + 3000;
    while (millis() <= time) {
      ldr_1();
      if (ldr1state == HIGH ) {
        pc == 0 ? 0 : pc = pc - 1;
        Serial.println(pc);
```

```
          lcd.clear();
          lcd.setCursor(0, 0);
          lcd.print("People inroom: "+(String)pc);
          //   scroll();
          break;
        }
      }
    }
  }
  if (pc >= pmax)
  { lcd.clear();
    lcd.setCursor(0, 0);
    lcd.println("room is full:"+(String)pc);
    lcd.setCursor(0, 1);
    lcd.println("please wait..,");
    //scroll();
    buzzer();
  }
}
```

4.2 Procedure for Compilation and Dumping:

- Make sure all the components mentioned in the components list are present.
- Install the latest Arduino Software in the PC.
- Take a sketch file and copy the above code and paste it in the sketch file.
- Install the necessary header files in the software.
- Save, compile and upload the code in the Arduino board which is connected through USB port and make sure to select UNO in settings.
- Make the connections as per the circuit with atmega328p microcontroller (boot loaded).
- If the microcontroller is not boot loaded, follow the steps in official website of Arduino to boot load.
- After uploading the code to the microcontroller, fit it on the prepared circuit board.
- Give the power supply to the circuit.
- Now we can check the operation.

Simulation Diagram:

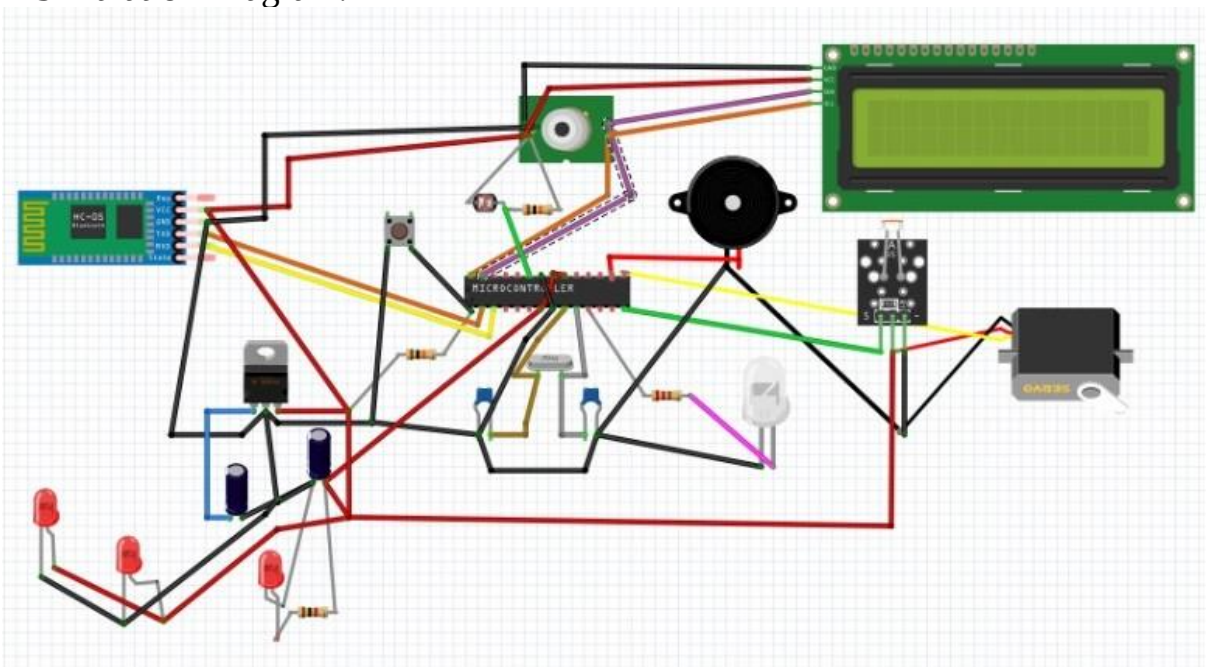

Fig 4.2.1 Simulation Circuit

4.3 Hardware Result:

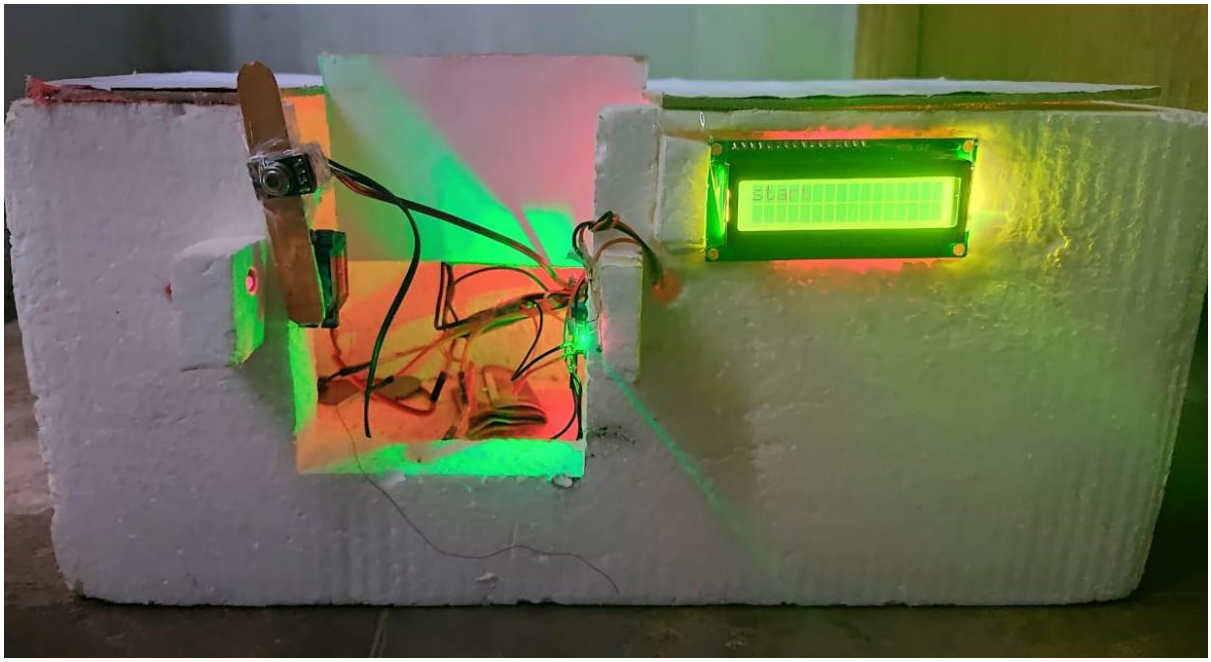

Fig 4.3.1 Hardware result

Chapter-5

5.1 Conclusion:

An effective solution to ensure COVID-19 safety compliance is presented in this work. This project is for automation of temperature detection at entrances, public places, and offices as per the guidelines proposed by government. In this project an efficient and effective technique is used for the automation with a microcontroller-based system. This project is helpful for present pandemic corona situation and as well as in many industrial areas. As the project is automated, human labor effort is reduced, thereby the system is much more effective.

5.2 Future Scope:

- With the addition of fingerprint scanner and face detector to this project, it can be used in all the institutions and offices for safety.
- As different mutations of corona virus are developing this system can detect the infected people.
- In case if there is another virus which has a symptom of fever this system can be used.
- If there is any small gathering with limited no.of people then it can be used to monitor the people in the room.

Reference:

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2. https://create.arduino.cc
3. https://ieeexplore.ieee.org
4. https://www.electronics-tutorials.ws/io/io_3.html

Article:

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2. Methodx, Volume 6