

Auto Temperature Detector for Entrance for Covid Safety

Anand V. Sutar¹, Shradniksha Devlekar², Abhishek Khilari³, Shreya Nagre⁴, Anushka Pashte⁵

¹Electronics and Telecommunication Engineering & Bharati Vidyapeeth College of Engineering

²Electronics and Telecommunication Engineering & Bharati Vidyapeeth College of Engineering

³Electronics and Telecommunication Engineering & Bharati Vidyapeeth College of Engineering

⁴Electronics and Telecommunication Engineering & Bharati Vidyapeeth College of Engineering

⁵Electronics and Telecommunication Engineering & Bharati Vidyapeeth College of Engineering

Abstract - COVID 19 has made a huge impact on the society; the new restrictions has been imposed as in the number of users allowed in a particular room in offices, shops, etc. to maintain social distancing, along with social distancing regular temperature check at entrances of malls, the office is mandatory. In this project we simulate a room where such necessary precautions are taken, we make use of a PIR sensor to detect the entrance of a person, when the project detect entrance it will check the temperature of the person if the temperature is within the set temperature range the person is allowed entry otherwise the entry is denied. Only a predefined number of people are allowed in the room. The number of people present in the room as well as the temperature will be displayed on the lcd display. The paper mainly introduces a system with the function of non-contact temperature measurement. This non-contact device can quickly measure and display temperature reading so a large number of people can be evaluated individually at points of entry.

Key Words: Non-contact device, PIR sensor, Temperature sensor

1. INTRODUCTION

Nowadays, health monitoring is a global challenge in people's lifetime. The comfort of life lies in healthy conditions which are affected by environmental and surgical facts. With the advancement of sensors and technology the size of electronics components is reducing day by day, so embedded system can be used in many applications. One such application is the use of embedded systems in automation of temperature scanning and door opening. Now people are looking forward to automation in all simple tasks they need to do. Since the last days of the 2020 year, the occurrence of novel infectious flu-like respiratory disease Covid-19 caused by SARS-Cov-2 virus (also known as coronavirus) has affected almost every aspect of people's lives globally. Common symptoms of coronavirus disease include fever, tiredness, sore throat, nasal congestion, loss of taste and smell. In most cases, it is transmitted directly (person to person) through respiratory droplets, but also indirectly via surfaces. Therefore, the usage of face masks and sanitizers has shown positive results when it comes to disease spread reduction. In the present scenario due to Covid-19, the need for face mask detection applications, temperature detection and hand sanitizing are now in high demand for Railway Entrance, Airport Entrance, Office Entrance, Museums and Amusement Parks, Other Public Places and

enterprises to ensure safety. These steps are now done in a manual way by which the personnel may get in contact with the other personnel while sanitizing and checking temperature might not be accurate. Body temperature detector is very helpful for early detection of potential infected persons pandemic and blocking the spread of the pandemic. The paper mainly introduces the body temperature detection and a system with the function of non-contact temperature measurement. We simulate a room where such precautions are taken, we make use of a PIR sensor to detect the entrance of a person. When detector detects entrance it will check the temperature of the person using a contactless temperature sensor. If the temperature is within the set temperature limit the person is allowed to enter the room otherwise entry is denied. The normal body temperature ranges by 36.5°C to 37.5°C. The status of health below is stated as hypothermia and the status above is referred to as fever and hyperthermia conditions. Using a non-contact temperature measurement device will help reduce the risk of spreading Covid-19 infection.

This non-contact device can quickly measure and display temperature reading so a large number of people can be evaluated individually at points of entry. No person will be provided entry without a temperature scan. An integrated platform combining multiple sensors for the simultaneous non-contact measurement of body temperature has been presented in this paper. This is particularly useful for detecting fevers and therefore possible infections of COVID -19 and other illnesses.

2. PROPOSED SYSTEM

The proposed system is divided into two parts: hardware part and software; the block diagram is shown in figure[1]. The whole system works on 5V DC power supply. A Passive Infrared sensor (PIR) is used to sense the presence of a person at the entrance of a room. Then the temperature-sensor MLX90614, which a contactless temperature sensor will detect the temperature of a human body. The temperature range is pre-defined. A 16x2 LCD displays the temperature of a person and the number of people present in a room at that time. The Servo SG90 will open the door for a specific time and then the door will close. An IR sensor is implemented inside the room, if a person wants to leave the room that person has to pass near the IR sensor then the door will open and the number of people present in the room will decrease by one. If the temperature is within a set limit then the buzzer will beep for once and if temperature is high, it will beep for 3 times, indicating the person has high temperature.

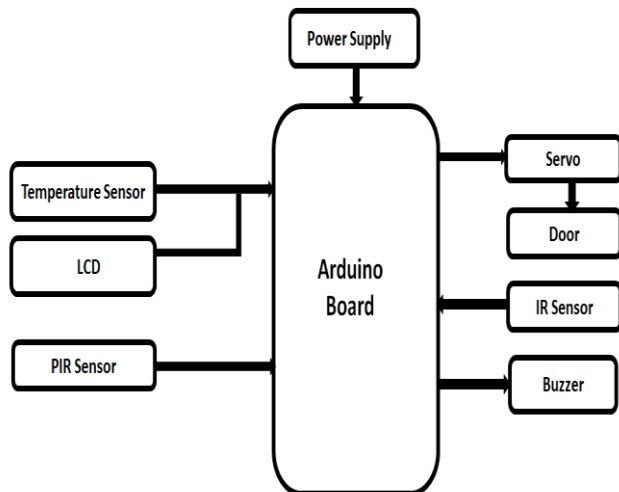


Fig. 1: Block Diagram

A. Arduino Board

A microcontroller board contains on-board power supply, USB port to communicate with PC, and an Atmel microcontroller chip. It simplifies the process of creating any control system by providing the standard board that can be programmed and connected to the system without the need for any sophisticated PCB design and implementation. The operating voltage of the board is 5V. The Arduino board contains an ATmega328P microcontroller. It has 14 digital input pins (of which 6 can be used as PWM output), 6 analog inputs, a USB connection, a power jack and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. It is open source hardware; anyone can get the details of its design and modify it or make his own one himself. The Arduino board is programmed using Arduino IDE (Integrated Development Environment) software. It is an open source software program which allows users to write and upload code in an Arduino board. It simplifies the process of creating any control system providing the standard board that can be programmed and connected to the system without the need of any sophisticated PCB design.

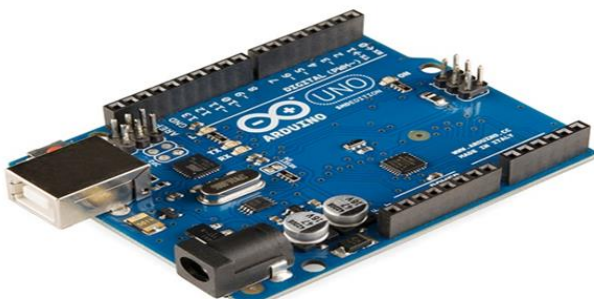


Fig. 2: Arduino Board

B. PIR Sensor

A Passive Infrared Sensor (PIR) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications. When a person walks past

the sensor, it detects a rapid change of infrared energy and sends a signal. PIR sensors are used for applications such as automatically turning on lights when someone enters a room or causing a video camera to begin operating. The PIR sensor consists of 3 pins, Pin1 corresponds to the drain terminal of the device which is connected to the positive supply of 5V DC. The Pin2 is the output pin of the sensor. Pin3 of the sensor is connected to the ground.



Fig. 3: PIR Sensor

C. Temperature Sensor

The MLX90614 is a Contactless Infrared (IR) Digital Temperature Sensor that can be used to measure the temperature of a particular object ranging from -70°C to 382.2°C . The sensor uses IR rays to measure the temperature of the object without any physical contact and communicates to the microcontroller using the I2C protocol. The sensor has four pins namely Vdd (power supply), Ground, SDA (Serial data) and SCL (Serial Clock). The Vdd can be used to power the sensor, typically using 5V. Operating voltage of the MLX90614 sensor is 3.6V to 5V with accuracy of 0.02°C . And the field of view is 80°C . Distance between the object and sensor should be approximately 2cm-5cm. The key feature of MLX90614 is that it is a contactless IR temperature sensor with high accuracy. Due to its high accuracy and precision, it is also used in a wide range of commercial, health care, and household applications like room temperature monitoring, body temperature measurement, etc.

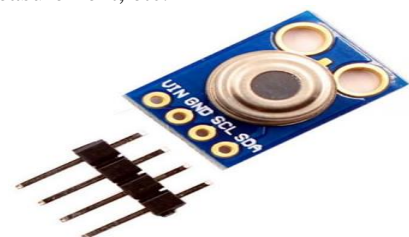


Fig. 3: MLX90614 Temperature Sensor

D. Servo SG90 Motor

A servo motor is a DC motor that instead of turning around continuously, it is designed to turn around an specific angle indicated by a control signal, and it will remain in that position. The brown cable corresponds to the servomotor's GND, Red cable corresponds to the 5V power supply and Orange cable corresponds to the signal.



Fig 4: Servo SG90

E. IR Sensor

An IR sensor can measure the heat of an object as well as detect the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor. The IR sensor module includes five essential parts like IR Tx, Rx, Operational amplifier, Trimmer pot(variable resistor) and output LED. The pin configuration of the IR sensor consists of three pins. VCC Pin is power supply input, GND Pin is power supply ground and OUT Pin is an active-high output. The operating voltage of the IR sensor is 5V DC. The range is upto 20 centimeters. IR sensors do not need to get in touch with objects for detection and it provides high reliability.

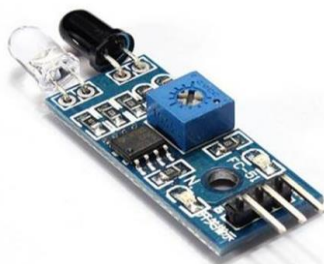


Fig. 5: IR Sensor

F. 16x2 LCD Display

The LCD 16x2 working principle is, it blocks the light dissipation.. The term LCD stands for Liquid Crystal Display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, Tv sets, etc. The 16x2 display is a very basic module commonly used in DIYs and circuits. In this LCD each character is displayed in a pixel matrix. The command register stores the control directions given to the LCD. A command is an instruction given to LCD to perform a predefined task like initializing it, clearing display, placing the cursor position, controlling screen etc. The data register stores the data to be displayed on the LCD. The information is the ASCII value of the character to be shown.

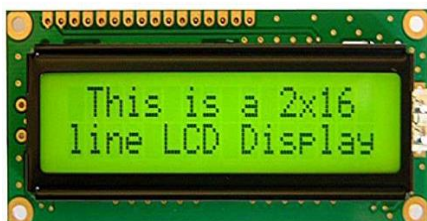


Fig 6 : 16x2 LCD Display

3. OPERATION OF CIRCUIT

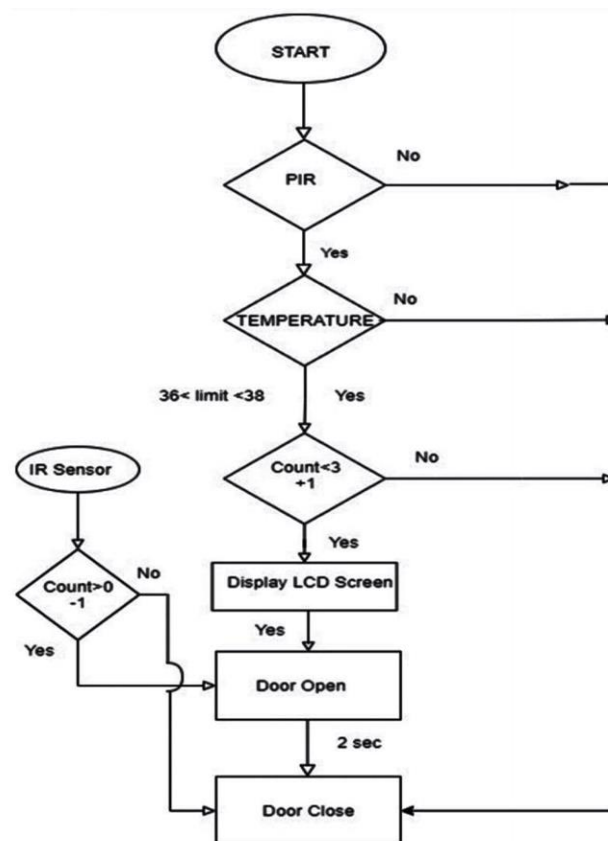


Fig. 7: Flow Chart of proposed system

The flow chart of the proposed system is shown in the fig. [6]. The system will first check for human presence, the PIR sensor will check the entry of a person. If a person is detected then the output of the PIR sensor will go high i.e. 3V otherwise it will remain 0V. If presence is detected then the temperature sensor MLX90614 will check the temperature and will compare the obtained temperature reading with the pre-programmed temperature value which is $36^{\circ}\text{C} < \text{limit} < 38^{\circ}\text{C}$. Then the system will check for the number of people present in a room as we have a pre-defined number of people that can be present in a room at a time. If it is already three then the door will remain closed and the room is full message will be displayed on the LCD screen. And if it is less than three the door will open and the count of number of people present in the room will increase by one. The scanned temperature and available people in the room will be displayed on an LCD display. If a person wants to leave the room then that person has to pass near the IR sensor as Ir sensor is implemented inside the room near the door. The IR sensor will detect the infrared energy radiated by a human being. If infrared energy is detected by the IR sensor then the system will go for the door opening part. The door mechanism is controlled by a servo motor .Door will open automatically for some time and will close automatically.

4. CONCLUSIONS

This project is a useful tool for contactless automatic temperature scanning at the entrance of various offices, buildings, etc. With this project people will be aware of their temperature and if their temperature is above the set limit the gate will not open for them. This project aims to lower the manual errors. Hence this project is an attempt to make it easy to automatically scan the temperature of people. This is particularly useful for detecting fevers and therefore possible infections of COVID-19 and other illnesses. Thus for safety purposes and in future this automatic temperature detector will be very helpful for people because of contactless service and can automatically measure their temperatures using this detector. We can increase the number of temperature scanning units for multiple scanning at a time.

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8. BIOGRAPHIES



Author 1
Prof. Anand V. Sutar
Assistant Professor



Author 2
Shradniksha Devlekar



Author 3
Abhishek Khilari



Author 4
Shreya Nagre



Author 5
Anushka Pashte