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Automatic temperature sensing with detail collection system using LabVIEW

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ABSTRACT

In this situation of Covid-19 pandemic, it is advised by the government to check the body temperature as well as collection of details of every person before entering the building. The conventional method for doing so is by manually checking the temperature using an Infrared thermometer and the details are collected on a register. This system involves the risk of transmission of infection. In order to overcome the above-mentioned problem this paper proposes the way in which the temperature and the details are collected automatically without any physical contact. MLX90614 is an infrared temperature sensor which is connected to the gate of the building in order to grant access or denial of entry. The details of people are collected using LabVIEW software. This paper comprises of three sections: Data collection using LabVIEW, Temperature sensing using MLX90614 and Door access control using DC Motor and driver unit.

Keywords— *Covid-19, Infrared thermometer, Arduino UNO, MLX90614, DC Motor, LabVIEW*

1. INTRODUCTION

Covid-19 or novel coronavirus has affected the lives of almost all the people across the globe in one way or the other. It has raised the standards of living in a society in a different level which was way out of our expectations. As per the WHO guidelines all the people are advised to wear a mask and undergo social distancing as the virus can transmit through human contact and airborne. Social distancing and proper care are the only thing that can be done until cure to this virus is made. A total of 15.9 Cr cases has been reported with 33 Lakh deaths around the world. Infection and death are increasing day by day and proper precautionary measures has to be taken so as to tackle this situation. Virus can be transmitted from an infected person's mouth, nose etc to another person, if he/she comes in close contact with each other. A new study suggest that the virus can also be airborne. The most preferable way is by imposing social distancing in public places. So proper screening and maintenance of register is mandatory. In order to overcome such situations, this paper comes up with a contactless temperature sensor along with detail collection system using LabVIEW and Arduino UNO.

2. LITERATURE SURVEY

In this Covid-19 pandemic there are lots of health monitoring systems like infrared thermometer are easily available in the market. These thermometers are accurate in measuring the temperature and showing the results.

Gadgets are also available in order to undergo social distancing but the cost of purchasing it is quite high. Therefore, a system was proposed based on Raspberry Pi, OpenCV for maintaining social distancing.

Arduino UNO can be used in various health and environmental matters. LM35 temperature sensor has been widely used for measuring the body temperature but since it requires direct contact it is not preferred to use in this situation as it can be a possible path for virus transmission.

Apart from all the above, a complete system which comprises of collection of details and temperature checking with door access has not been yet established. So, this paper comes with a solution for collection of details along with temperature checking with door access thereby providing social distancing in agreement with WHO.

3. METHODOLOGY

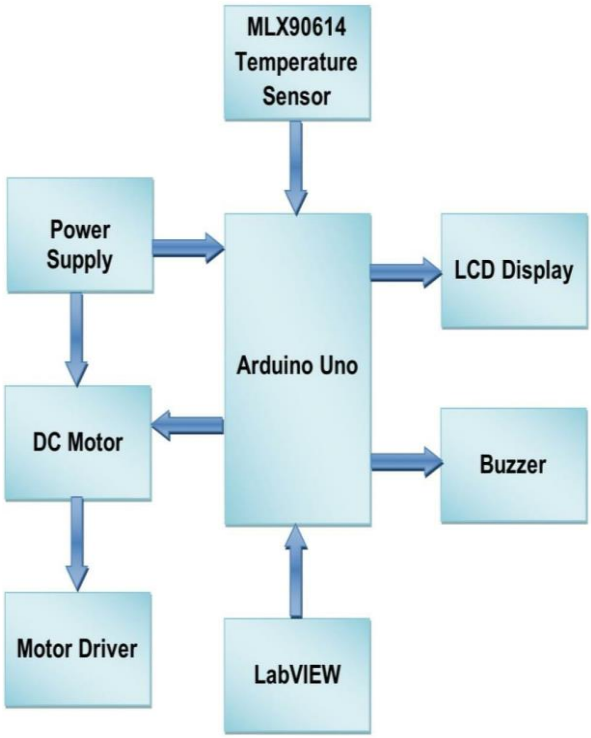

Fig. 1: Block diagram

3.1 DATA COLLECTION SYSTEM

This system consists of a software called LabVIEW for collection of data. LabVIEW software is a graphical interface system that helps to visualize every aspects of the application that we are developing. Different programming tools and drivers are present in the software which helps in reducing time and effort in writing programs. The short form of Laboratory Virtual Instrument Engineering Workbench is LabVIEW. Since it provides a graphical interface, LabVIEW is used for virtual appearance. Image processing is the sub technique used in this system where the barcode or QR code of the ID cards are decoded and it is stored in a database.

When a person enters a particular building, he/she will be asked to scan their respective identity card to the camera connected to the LabVIEW software. Then the software decodes the respective codes available in the ID card and stores it in a separate database.

3.2 TEMPERATURE MONITORING SYSTEM

This system involves the use of MLX90614 contactless infrared temperature sensor for measurement of the body temperature. It works on the principle of Stefan-Boltzmann law, which states that "all objects and living beings emit IR energy and the intensity of this emitted IR energy will be directly proportional to the temperature of that object or that living being".

It basically consists of two devices comprising of a sensing element and a processing unit. Sensing element determines the amount of IR transmitted by the sensor, on the other hand processing unit converts this into its equivalent temperature value and get the result by I2C communication protocol.

In the proposed system, after collecting the data the person will undergo temperature checking. The temperature sensor is placed near to the door and it is advised to show their hand on to the sensor. LCD display(16x2) and buzzer are also connected with the Arduino UNO along with the temperature sensor which shows the temperature at that instance and a warning indication will be provided if the temperature rises above the normal body temperature. MLX90614 temperature sensor works on 3.3V to 5V power supply. It has an object range of -70°C to 380°C and ambient temperature ranges from -40°C to 125°C.Accuracy and resolution are 0.5°C and 0.02°C respectively.

3.3 I2C COMMUNICATION PROTOCOL

I2C means inter integrated circuits and it is a communication protocol developed by Philips semiconductor. It is used to transfer data between central processor and multiple IC's using two common wires on the same circuit board. The wires are SDL (serial data line) and SCL (serial clock line) where SDL issued for data transmission and SCL is for clock. It supports both 7-bit or 10-bit address frame. The next bit is for read or write operation. It can be used for short distance communication and otherwise known as Two Wired Interface.

In this system the SDL and SCL pins are connected to the respective pins provided in the Arduino UNO. Temperature reading of the person is taken by the microcontroller by sending a write command in front of the sensor. The measured value is stored in RAM (random access memory). Since RAM can only be read therefore the microcontroller sends a read signal to read the measured value. In order to set the operating mode of MLX90614 temperature sensor, the EEPROM address is written by the microcontroller.

3.4 DOOR ACCESS CONTROL SYSTEM

Brushed DC electric motor and driver unit is used for door access control system. Brushed DC electric motor can convert electrical energy into mechanical energy. It has advantages like high efficiency, excellent controllability and power saving capability. L293D driver is a sixteen-pin driver used for driving motors and is capable of running two DC motors at a time independently.

In this system, DC motor is chosen because of low cost and high starting torque. It operates at 12V power supply, in order to accommodate in Arduino UNO, L293D motor driver is selected. Arduino UNO does the calculations with the temperature sensor and determines the access or denial of entry. If the temperature of the person exceeds normal temperature, then the access will not be granted thereby displaying a message on the LCD display "access denied" along with an indication provided by the buzzer.

4. CIRCUIT DIAGRAM

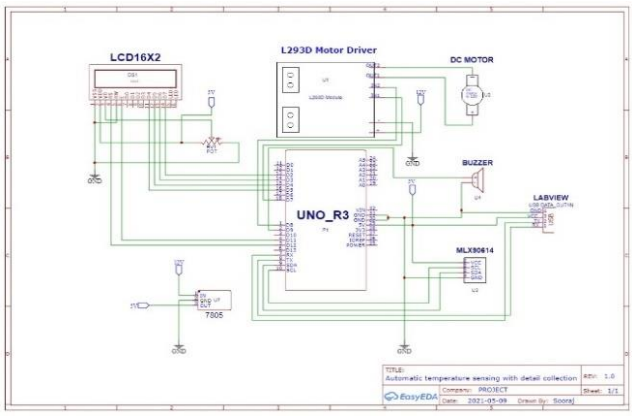

Fig. 2: Circuit diagram of the system

5. COMPONENTS REQUIRED

5.1 Arduino UNO R3

Fig. 3: Arduino UNO

Arduino UNO is a microcontroller based on ATmega328P. Various other components like voltage regulator, serial communication etc is also supported by Arduino UNO. A total of 14 digital pins (input/output) are available in which six are PWM pins, six analog input pins, USB connection port, power barrel jack, ICSP header and a reset button. The programming is done in Arduino IDE using C or CPP.

5.2 MLX90614 Temperature sensor

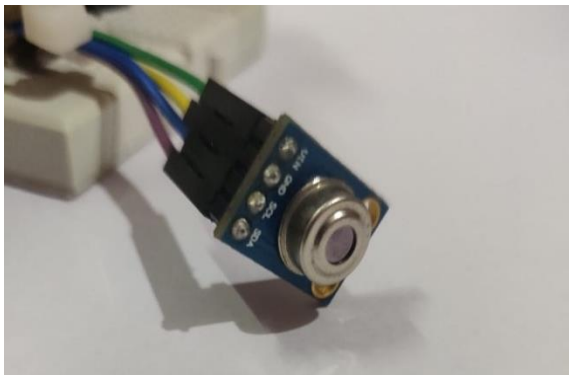

Fig. 4: MLX90614

It is a sensor which is used for measuring the temperature without any contact with the help of infrared. It can be used for variety of applications including body/ambient temperature measurement as well as movement detection. The high accuracy and resolution of this sensor is as a result of a powerful DSP and an internal 17-bit ADC.

5.3 DC Motor and driver unit

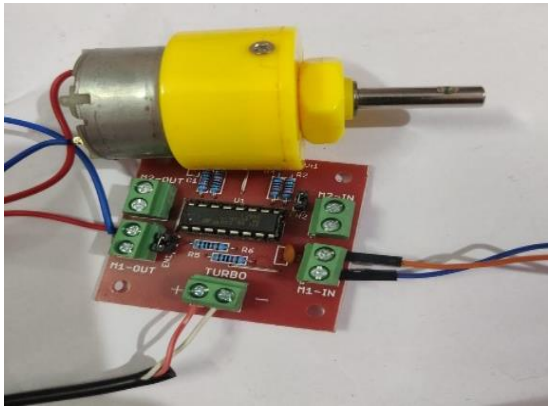

Fig. 5: DC motor and driver unit

DC motor is used for the access/denial of entry through the door. It converts electrical to mechanical energy. The driver for driving the DC motor used is L293D. It compensates for the power requirement when motor is connected to the Arduino UNO. It provides a supply voltage of 12V for driving the motor.

5.4 LCD Display

Fig. 6: LCD Display

16x2 LCD display is used for showing the temperature reading. It also shows “access granted” when the temperature is in the normal range and “access denied” when the temperature exceeds the threshold level thereby giving access to the door.

5.5 Buzzer

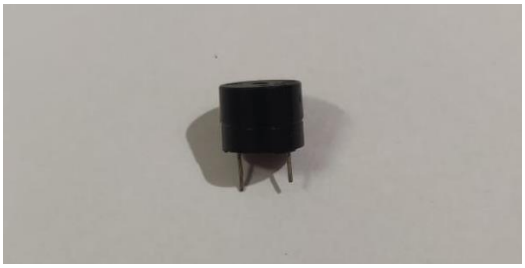

Fig. 7: Buzzer

A buzzer is used as a warning signal to the authorities as well as the concerned person that the temperature is beyond the normal range and will not be allowed to enter inside the building.

5.6 POT

Fig. 8: Potentiometer

The Potentiometer is used to regulate the contrast/brightness of the LCD display. It is a having a configuration of 12V.

6. RESULT

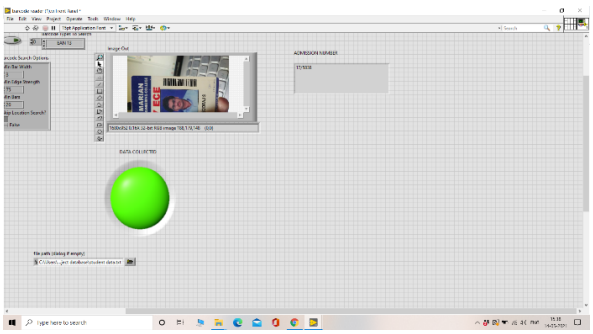

Fig. 9: Front end display

The front-end panel to decode the ID card which is connected to the web camera/external camera is shown in the fig 9. The ID card gets detected and the respective code in it is decoded and stored in a database.

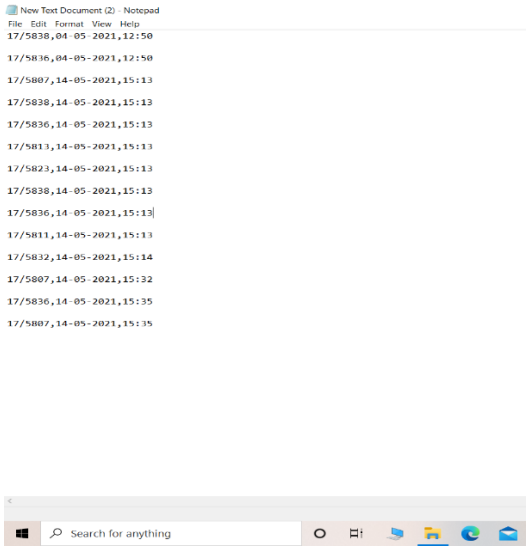

Fig. 10: Database

The result of the decoded data with the date and time of showing the ID card gets stored in the database as shown in fig 10.

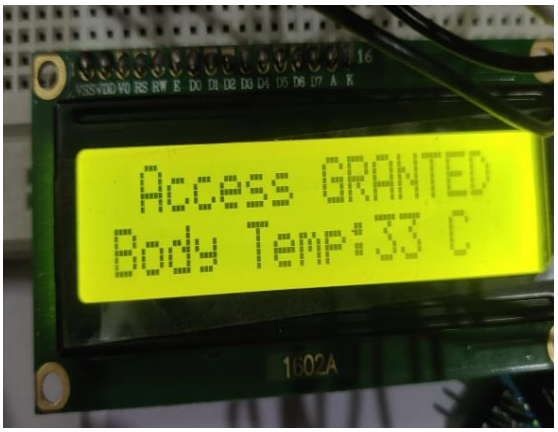

Fig. 11: Access granted case

The temperature reading of the person is detected by the MLX90614 infrared temperature sensor and is shown in the LCD display as shown in fig 11.

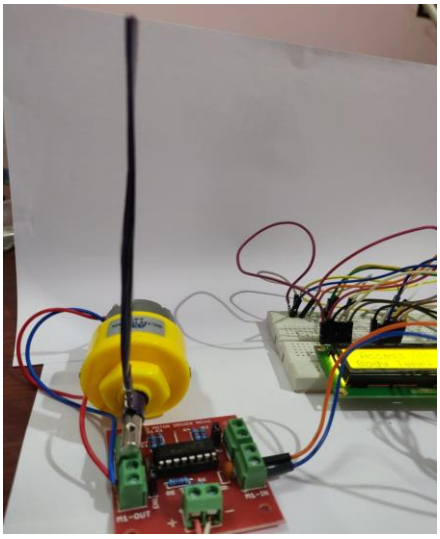

Fig. 12: Door open

Since the temperature is in the normal range, the door opens stimulated by DC motor as shown in fig 12.

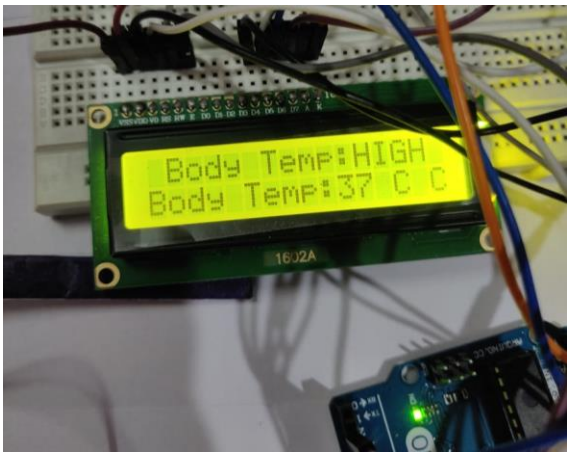

Fig. 13: High temperature case

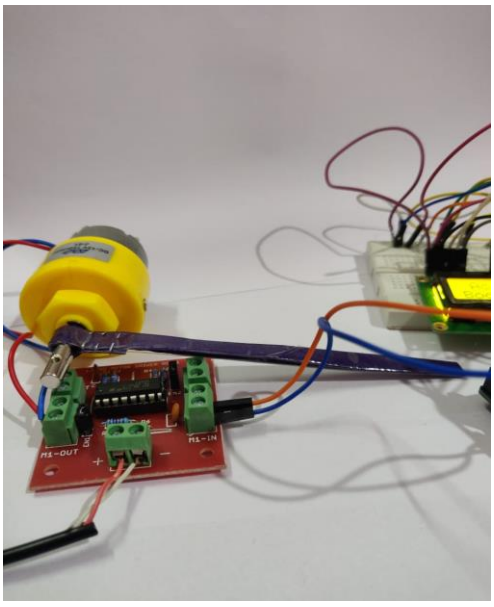

Fig. 14: Door close

When the temperature exceeds the normal threshold range, it gets displayed on the LCD display and the door will not be open as shown in fig 13 and 14 respectively.

7. CONCLUSION

The situation like Covid-19 arises unexpectedly, therefore proper precautionary measures has to be taken and some of them has to be made mandatory. This system comes up with automatic temperature screening and door access technique along with detail collection which is fully contactless thus helps to prevent spreading of infections. In places like railway station, airport, malls etc usually the thermal screening and collection of details are done manually so there is a high chance of spreading of infection. This system comes into effect in these places were crowding up of people occurs on a large scale. Implementing it will reduce the spread of infections and the system can further be modified to restrict the number of people entering the building to maintain social distancing, used to record the attendance of the people already in the building and so on. The current method of doing this not only involves human interaction but also is considerably expensive but using the above-mentioned system we can reduce both the cost and human interaction.

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