

Contactless Auto Temperature Detector and Door Opener System for COVID-19 Safety

Mahananda Molsom¹ and Rajib Biswas²

¹⁻²Tripura Institute of Technology/Department of Electronics and Communication Engineering, Agartala, India
Email: mahanandamolsom7628@gmail.com, erajib.biswas@gmail.com

Abstract—It is observed that the situation arising due to covid-19 pandemic since 2020 has an impact on people's livelihoods, their health and life style. To make a room or hall free from infection and to avoid the gathering beyond the capacity it is very essential to put restriction at the entrance. So, in this article it is tried to find out the covid-19 safety detection, by the use of contactless auto temperature detection and automatic door opener system to maintain covid-19 safety zone/Area or identify the Covid-19 Symptoms by the temperature detection. Here the IR system and receiver has been used for detection of person's temperature in the entrance. If the measured temperature is within the range i.e. from 84°F to 100°F then the system will allow to enter through the gate otherwise the entry will be denied. The number of people allowed for the room as well as the number of people activity present in the room can be viewed using a blue-tooth application. So, there are some sensor has been used such as MLX90614 and DHT11 humidity sensor with ESP8266 node MCU, Digital Locker, 16*2 LCD display and I2C connector.

Index Terms— Covid19, Contactless, ESP8266 node MCU, DHT11.

I. INTRODUCTION

IOT has change the world scenario and it helps us to make people easier to connect from different part of the world and it makes an easy human living standard through IOT, IOT has created many things including medical equipment and make physically to operate any device without any kind of trouble [1] in this project we implemented of IOT base monitoring system for the automatic temperature detector and door opener system and also shows the weather temperature by the helps of electronics device such as MLX90614 and DHT11 sensor [2] basically in this project we fixed up the temperature in Fahrenheit is from 84°F up to 99°F for the door opener while human temperature detecting, if the temperature below the 84°F then the door will not open automatic and if the temperature is above the 99°F temperature then the door will not be open but it must be temperature within the range which has mentioned [3] to overcome from pandemic like covid-19 is an huge responsibility for each and every one of the nation and global, it is the main purpose to make a device for covid-19 safety to stop spreading the virus across areas the world [4] while monitoring the system the results shown in BLYNK APP with body temperature reading along with room and humidity temperature [5] thermopile sensor consist of N no. Of thermopile there are two main junctions had released one is hot temperature and another one is cold temperature [6] In this system many automated temperature detection machines have used such as Contactless temp sensor, PIR sensor has used to identify the person by their motion of the object, a message sent by a WI-FI (ESP8266) then it gives the output to the microcontroller device, we focus on most effective IOT

based system for non-Touching detector device between object and sensor distance should be at least 10-20 cm. The ESP8266 Node MCU working as a microcontroller device and ESP WI-FI module in the system. In this system ESP 8266 node MCU has installed in a hardware connection of the circuit, it is an Open-source platform of a WI-FI module and act as a microcontroller device such as TENS1LiCAXTENZA 32-bit LX106 RISC microcontroller device and all the informative data can be easily transfer to the display using WI-FI protocol through hotspot connection on mobile and other device with an ARDUINO IDE in embedded C programming and afterwards all the code has been initialized and programs. This ESP8266 microcontroller can control frequency from 80 to 160 Mhz and it support RTOS also there are 128 kb RAM and 4 Mb flash Memory, it can Stored the data and programs later on it has connect to the WI-FI module through transceiver. There are two switches Bottom in ESP8266 one is RST (RESET) and another one is Flash mode. In ESP8266 there are two Microcontroller's in it so it's not required ARDUINO/raspberry pi. The device within the very low cost we can purchases or used and assemble all required device in one platform. It is very easy to used and connect all the electronics device with jumper wires while connecting the circuits through Vero board instead of using breadboard caused it is very cheap and suitable to make circuits connectivity easily by simple soldering machine.

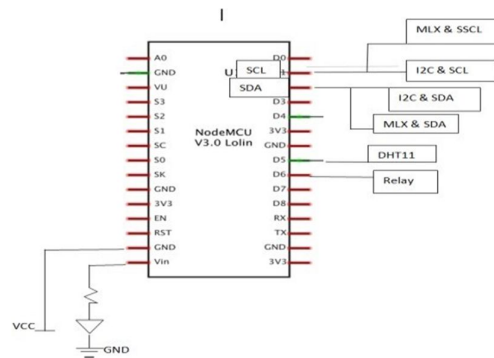


Figure 1: ESP8266 node MCU connection

II. SYSTEM OVERVIEW AFTER SENSING THE HUMAN TEMPERATURE

In the above LCD display we can clearly see the temperature reading or value of a person has shown the 94.25° F then the locker got automatically open the door or gate when a person hand or any other body part is falls on the infrared thermopile then it got alert and hence sensing a person temperature from the distance 10cm of the infrared sensor. In this system has fixed the temperature values from 84°F to 100° F within these ranges any person can go inside and outside if the person temperature is higher than these range then it will not open the door as shown in the figure2.



Figure 2: Temperature shown 94.25°F below the range which have been fixed up to 100°F



Figure 3: Temperature shown above the range of temperature (155.17°)

We can see the above figure there are different temperature reading has shown in the display, our system is fixed temperature reading we coded in it for the range from 84°F to 100°F so we mention earlier that if the temperature within these range then the person can enter into the room or gate or object can enter into the room or door so after measuring normal temperature human body are seen there are 94.25 only so that person can enter easily into room without any trouble and another figure in this case we tested that the our system is doing proper works that what we think so we decided to do a test in the system. There are one temperature sensor MLX90614 which is indicating by error symbol so we putted a hot soldering machine near to that temperature sensor then

the door didn't open cause the temperature is above the range of fixing range in the system. i.e 155.17°F highly above the range so the person tried to enter into the room couldn't enter when temperature was above the measuring range and below the range then it has started again testing another reading for better confirming figure hence we see that your temperature is 155.17° F (HIGH) so it has clearly we got to know that the temperature reading is properly working on it, after taken In that flow chart clearly shows the working systems step by step, once a circuit design completing initialized both the sensor MLX90614 & DHT11 sensor and then detect the Temperature accordingly one is for human temperature & an another one is for Room & humidity temperature while initializing both the temperature then it has initialized for ESP Wi-Fi then the systems can be Operate. The system has fixing for three (3) seconds to open the Door and then closed it up after reading from both the sensors before it sends to display the temp values it has first transfers from electrical signal to digital signal after data receiving from s1 & s2. It can Retrieved data from server and finally display.

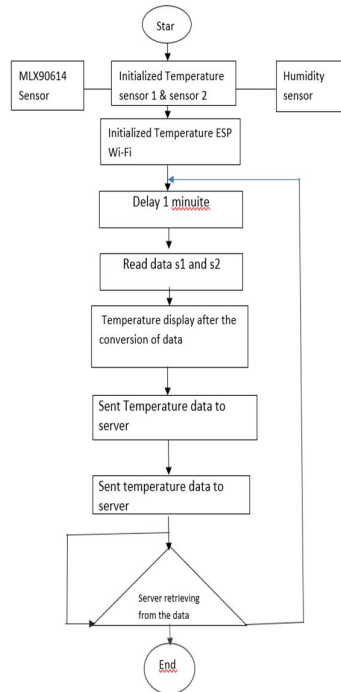


Figure 4: Flow chart of a system

III. REQUIREMENTS OF POWER SUPPLY WHILE CONNECTING TO ESP8266 NODE MCU

A. *ESP OPERATES 3V TO 3.6V of USB power supply.*

B. *On board 3.3v 600mA.*

C. *12v power supply is required to demonstrate the machine.*

D. *During the sleeping mode 20micro amp.*

E. *Temperature & humidity measurements by using MLX90614 and DHT11 sensor with ESP8266*

Without connecting directly to one another person can be measured by contactless temp sensor and humidity sensor (DHT11). There is a DSP functional in embedded C programming in it. One is infrared thermopile detector (sensing unit) and the system bank based on Stefan- Boltzmann's law which states that all the object emitted IR sensor and the intensity of this signal will be directly proportional to the temp of that object. The sensing unit measures how much IR energy is emitted by a target object and the computational unit convert it into temp value using a built in ADC and output data through I2C connection with the integration ADC chip required minimum external circuitry and VERO Board. The sensor has both object temp and ambient temp to calibrate the temp object values it has Operate 5v power supply it can measure the temp range from -70°C to 380°C and ambient -40°C to 125°C with accuracy of 0.5°C and 0.02°C.

F. Electronics locker (RELAY 5V)

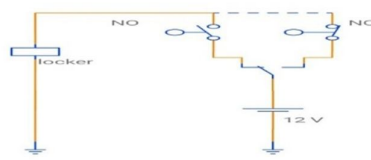


Figure 5: Relay

NC stands for normal closed.

NO stand for normal open,

The relay is performing as a switch. whenever we are trying to connect the 12V power supply then the moveable elements automatically move to another element by magnetic attraction and then the driver locker automatic open for few seconds after measuring the person temperature there is a coding 1 & 0. 1 input indicate the power supply is connected and ready to open a Locker and 0 Input Indicates the power is not connected that's why coding cannot pass through ESP8266 Wi-Fi module.

G. Using the 16* 2 LCD Display in the circuit connections



Figure 6: 16* 2 LCD Display

This LCD is used for to display temperature values in on time it has shown on display When someone's measures the temperature, the temp values whatever shown in the display it has shown in mobile phone too. by in the mobile phone there is switch button which is ON/OFF button by that button we can control whether the person temp is high or not it's up to the operator with security convenience. There are total 32 Characters have been used. The LCD is Mainly We use for the Display the temperature object or a person this LCD is connected with the I2C for SCL & SDA, power supply and ground. For the LCD display any things in the screen display the values is only needed for serial data communications and serial clock port.

H. I2C connector

It is a multi-controller Device that having SDA & SCL pins connector. The line that clock signal I2C is basically for serial Communication when the SDA & SCL wire's is connected to

A LCD Display and ESP8266 to fixed communication between two or more IC to support each other. We have connected with to devices for the data transfer bit after synchronized to the sampling.



Figure 7: I2C connector

I. MLX90614 Temperature

We knew that MLX-90614 is a thermal temperature sensor that detect the human temperature and measure temperature without touching the object or person and the electrical signal is converted to 17-bit data to digital signal after noise amplifier by operational amplifier and low noise through digital signal processing and FIR programmable device and send the data which have been detected through sensor and transfer to the LCD display.

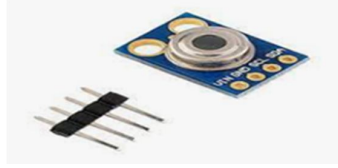


Figure 8: MLX90614 temperature sensor

It gives a standard accuracy with $\pm 0.5^\circ\text{C}$ when detect the object like hot materials, high temperature, hot iron, flame etc. So that any microcontroller can use by this device to measure any hot particles including human temperature, it has connected to I2C through microcontroller device, there are two devices in it one is infrared sensor and another one is signal application system so that it is more suitable to use for non-contact temperature detector systems for covid-19 safety and secure for the person.

J. DHT11



Figure 9: DHT11 Sensor and Humidity sensor

DHT11 is a weather and humidity sensor to measure air and spits. This temperature basically ranges from -40 to $+125$ Degree Celsius with ± 0.5 Degree accuracy and also temperature range from 0 to 150 Degree Celsius with ± 2 degrees accuracy. For the communication protocol is a single bus data has been used for synchronization and communication in MCU and DHT11 devices its take about 4ms in one communication process. When MCU short sending signal DHT11 change at low power to running mode, once it is completed them DHT11 sent a response to a signal it will not give response to MCU.

IV. CIRCUIT DIAGRAM

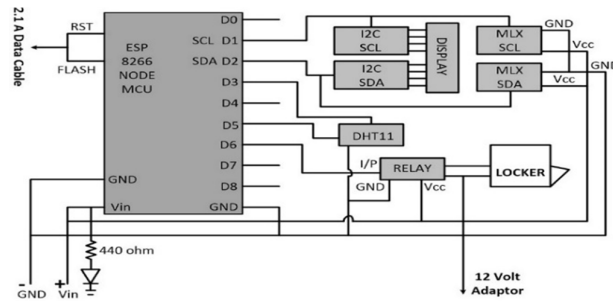


Figure 10: Shown in circuit diagram of a contactless auto Temperature detector and door opener for covid-19 safety

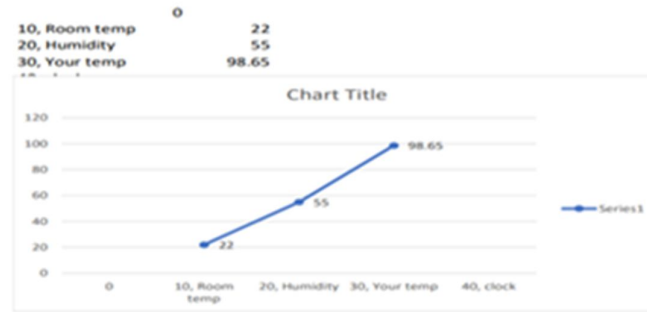
A. Circuit Operations

This ESP8266 node MCU is open sources platform base on Wi-Fi module & acts as n microcontroller devise system. It is Connect to objects and using data transfer protocol, in this ESP 8266 node connected with different devices electronic sensor, Relay, I2C connector, DHT11 human temperature sensor, pin D1 is connected with the I2C through SDA & SCL connector. Again, connected with D1 is connected for the other sensor such as MLX90614 sensor & SCL and D2 is connected with the I2C & SDA, again D5 we have connected with DHT11 humidity sensor and lastly, we are connected input voltage with 440 Ohm's . This resistor is for understanding weather light is coming into circuit or not then we can understand while power is connected to the circuit and this resistor is connected with ESP8266 module and GND (ground). Relay 1 pin is connected with ESP8266 and another one is connected with VCC & GND. Locker has two input pins are connected via jumper wires to relay and power supply which operating voltage is 12v through adapted. USB cable (2.1 Amp) is connected to ESP

microcontroller connector. After wards needs to ON internet connection, check proper connection and then ON hotspot protocol then we need to open BLYNK APPS from mobile phone.

V. RESULTS AND DISCUSSION

Graph I: This curve is shown after detecting human temperature along with room temperature.



This curve has shown to us that our temperature measurements in different degree temp shown in different scales, there is a one controller or Button known as ON/OFF switch has been shown. For evaluation, the following device were used a laptop require with intel(R)Core(TM)i5-7200U CPU @ 2.50GHz 2.70GHz with install memory 4GB and 64 – operating system, x64-based processor and 1TB HDD acting as Edge server, ESP8266 node MCU and Arduino IDE with DHT11 & MLX90614 sensors, on the other hand, regarding the contactless temperature measurement, we can see that thermal camera is less accurate for more demanding for computation, however its main advantages is accurate and less time consumer and ability to measure several temperature. We can see clearly there are ON/OFF button controller over there.

TABLE I: COMPARISON PARAMETER OF PREVIOUS WORKS

Components	[1]	[2]	[3]	Tools
Temperature sensor	LM-35(S1) & MLX90614(S2)	MLX90614	MLX90614	MLX90614, DHT11 sensor
Microcontroller	Arduino CT microcontroller	Arduino microcontroller	Arduino microcontroller	ESP8266 Node MCU
Software/Hardware	Raspberry Pi	Raspberry Pi	Raspberry pi 3	Vero Board
Wi-Fi Module	ESP wi-fi	ESP wi-fi	BCM43143	ESP8266 wi-fi

VI. CONCLUSIONS

We have simply done our project on contactless auto temperature detector and auto door opener system for COVID-19 Safety. We have included many electronics materials for to design a project and test successfully. In this system we understand the how Automatic temperature detection sensor has needed in this Covid-19 situation and we observed that in the MLX90612 sensor there are some GLITCH or ERROR has been Observed like 2° to 3° F.

ACKNOWLEDGEMENT

First of all, I indebted to ALMIGHTY GOD for allowing us to excel in our efforts to complete this project on time. i express my sincere thanks to my respected guide assistant professor Sri Rajib Biswas sir, Department of electronics and communication engineering of Tripura institute of technology, Agartala, west Tripura. who helped me a lot for this project with ultimate effort.

REFERENCES

- [1] BG, Vinod; A, Tejas;, "Implementation of Automatic Contactless Temperature Sensing and Door Access," International Journal of Advance Research in Computer and Communication Engineering, vol. 9, no. 6 June 2020, pp. 2278-1021, 2020.
- [2] Pasha, Syed Danish; Suhail, Maaz; Madhumitha, V; Sasi, Archana;, "IoT-enable Smart Door Monitoring Body Temperature and Face Mask Detection," Global transitions Proceedings, 10 june 2021.

- [3] M. N. Abdullah and I. Taib, "Design pf a Contactless Body measurement system using arduino," Indonesian Journal of Electrical Engineering and computer science, pp. 1251-1258, 17 april 2020.
- [4] Rahimoon, ASif A.; Abdullah, Mohd Noor; Taib, Ishkrizat;, "Design of a contactless body temperature measurement system using ARDUINO," Indonesian Journal of electrical engineering and computer science, pp. 1251-1258, September,2020.
- [5] Varshini, B; Yogesh, HR; Pasha, Sayed Danish; Suhail, Maaz; Madhumitha, V; Sasi, Archana;, "IOT-Enable Smart Doors for Monitoring Body Temperature and Face Mask Detection," Global Transition proceedings, vol. 2020, no. 10 june 2021, 2 July 20221.
- [6] Galina, Mia; Prasetyo, Ghalib Eko; Sitompui, Erwin; Suhartomo, ANTONIUS;, "Automatic Door Lock with hand Cleaning and Infra- Red Temperature Detection System," ELKOMIA, Vols. 10 /NO. 2/ HALAMAN 364-378, no. 8 December 2021, pp. 2338-8323, 1 JANUARY 2022.