Temperature Detection and Automatic Sanitization and Disinfection Tunnel-COVID 19

Goda Vasantharao[#1], Sk Arifunneesa[*2]
[#]*ECE,*CSE, RGUKT IIIT ONGOLE*
[1]vasanth.goda@gmail.com
[2]arifunneesa.sk@gmail.com

***Abstract*— This paper explores the designing and synthesis of temperature detection and automatic sanitization and disinfection tunnel using Arduino uno. In recent days, due to pandemic like Covid-19, automatic sanitization is gaining popularity like never before. The main objective of this paper is to measure and display the temperature when it goes beyond certain limit then a buzzer will blow as an indication of danger and that person was sent for medication and safety treatment. In near future it can also be used at different industries, companies and many public places. Another objective is to design a tunnel for sanitization that works automatically without any human intervention that may helps in maintaining social distance and prevention of COVID-19. This paper provides a glimpse of Arduino, working principle, design and implementation using Arduino and IDE and their applications.**

***Keywords*— Arduino, PIR sensor, Temperature sensor TMP 36, 16 X2 LCD display, DC motors, relay LU-5-R.**

I. INTRODUCTION

This "Temperature detection and automatic sanitization and disinfection tunnel" measures the temperature of a person using temperature sensor LM 35 and tells us the whether the temperature is normal or abnormal. The system is designed with using Arduino uno and all the modules are interconnected together and are programmed with Arduino IDE tool.

Due to the pandemic of COVID-19, temperature measurement of persons became one of the major task is to detect the affected one. For doing this contact less measurement and social distance are becoming more and more challenging. As a Part of solution this paper proposes the measurement of temperature and if found abnormal it gives a danger alarm sound so that every one of us may alert.

Ardunio can find its many applications now days because of its simplicity of programming feature. Unlike, the normal micro-controller,the Arduino provides on board USB for port for communicating with PC and power supply, with ATmega328p that runs on 16 MHz.

II. LITERATURE SURVEY

Leo Louis et.al [1] proposed the working principle of Arduino and using it as a tool for study and research. In his paper he discussed the working principle of Arduino and its applications. The different types of Arduino boards and their comparison was discussed and tabulated. The programming part was done with Ardunio IDE tool and explained with some of the examples like Arduino Satellite (ArduSat), Ardupilot (Ardupilot Mega-APM) and Lilly pad Arduino.

Osmah Ibraheim khalaf et.al [2] proposed a low cost effective wireless protection system using Arduino. He used temperature sensor as heat sensor and developed a system which will send an email notification to an mobile phone or fire station nearby.

E Harshavardhan et.al [3] designed a time based temperature controlling unit using Arduino that helps in saving wastage of energy. In this, it displays real time temperature and displays it on LCD. The programming was done in such a manner that when temperature goes beyond certain limit and then controlling the unit so that energy wastage can be minimized.

Yang Cao et.al [4] proposed a fuzzy PID control system based on PROTEUS. He did experiments on sealing machine walls and demonstrated heat output simulations using Matlab.

A L Amoo et.al [5] designed a room temperature control system that works on micro controller. Like [2] a temperature is used to measure the temperature and based on some defined boundaries set by the programmer, the room temperature was controlled using a network enabled control system.

Kim S.I and Lee [6] discussed about the Walk through (WT) screening for COVID-19. A walk through screening center using negative pressure booth that is inspired by bio safety has been designed and implemented in Korea for easy screening of COVID-19. It may increase patient access to the screening centers. A WT (walk through) can be implemented in other institutions and modified depending on local needs to cope with COVID-19 pandemic.

III. RELATED WORK

A) Arduino: A microcontroller board contains on-board power supply, USB port to communicate with PC, and an Atmel microcontroller chip. In 2005, building upon the work of Hernando Barragán (creator of Wiring), Massimo Banzi and David Cuartielles created Arduino, an easy-to-use programmable device for interactive art design projects, at the Interaction Design Institute Ivrea in Ivrea, Italy. It is an open source hardware, anyone can get the details of its design and modify it or make his own one himself. Basically there are different types of Arduino boards are available and are depicted in Fig 1 and the comparison given with Table 1 below.

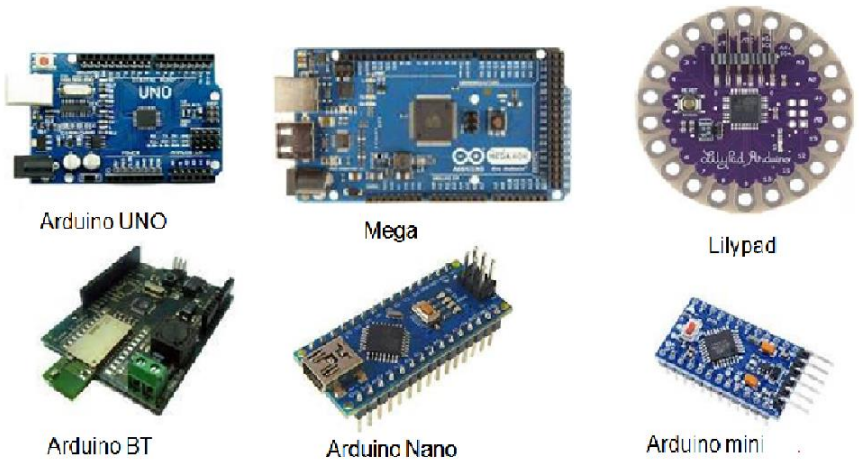

Fig. 1 Types of Arduino boards

Table 1 Comparison of Arduino boards

Name	Processor	Operating/input voltage	CPU speed	Analog in/out	Digital IO/PWM	USB	UART
UNO	ATmega328p	5V/7-12V	16 MHz	6/0	14/6	Regular	1
Mega	ATmega2560	5V/7-12 V	16 MHz	16/0	54/15	Regular	4
Lilly pad	ATmega328p ATmega168V	2.7-5.5 V 2.7/5.5 V	8MHz	6/0	14/6	--	--
BT	ATmega328p	5V/2.5-12 V	16 MHz	6/0	14/6	Regular	1
Nano	ATmega328p ATmega168V	5V/7-9 V	16 MHz	8/0	14/6	Mini	1
Mini	ATmega328p	5V/7-9 V	16 MHz	8/0	14/6	--	--

In this project we used Ardunio uno which has 14 digital pins out of which 6 can be used as PWM pins and provides 6 analog pins and Works with ATmenga 328p runs on 16MHz speed and is depicted in Fig 2 as shown below.

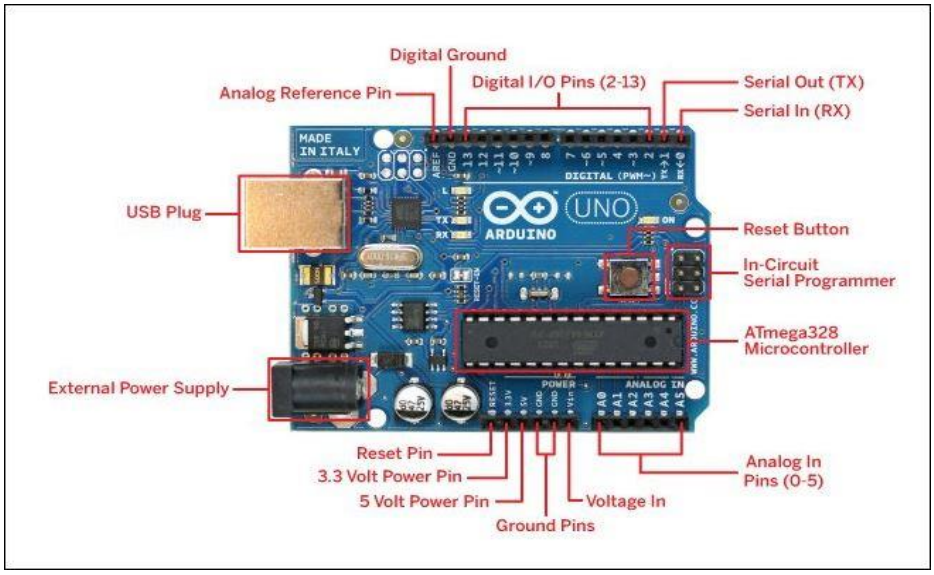

Fig. 2 Arduino uno board

B) Relay LU-5-R & Buzzer: A relay (SPDT) is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. Buzzer is just like an output signal that makes sound with some frequency depending on the condition it was programmed. The relay and buzzer are shown with Fig 3 as below.

Fig. 3 Relay LU-5-R & Buzzer

C) Temperature sensor TMP 36& 2X16 LCD: Temperature sensor is a one which is used to sense temperature from outside environment. Here we used TMP 36 and it is a low voltage, precision centigrade temperature sensors. It provides a voltage output that is linearly proportional to the Celsius (centigrade) temperature. A 2 X 16 Liquid Crystal Display (LCD) capable of carrying characters of size 16 as 2 rows was used to display message. i.e, it carries 16 characters per each row. The TMP 36 and 2 X 16 LCD are shown below.

Fig. 4 Temperature sensor TMP 36 & Buzzer

D) PIR sensor: A passive infrared sensor (PIR sensor) 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 sensor detects a human being moving around within approximately 10m from the sensor. This is an average value, as the actual detection range is between 5m and 12m. The PIR sensor is shown below with Fig 5

Fig. 5 PIR sensor

IV. BLOCK DIAGRAM & WORKING PRINCIPLE

The block diagram of the proposed system is shown below with Fig 6 which includes Arduino uno board, external power for board, LCD 2 X 16, Relay LU-5-R, temperature sensor TMP 36 and DC motors.

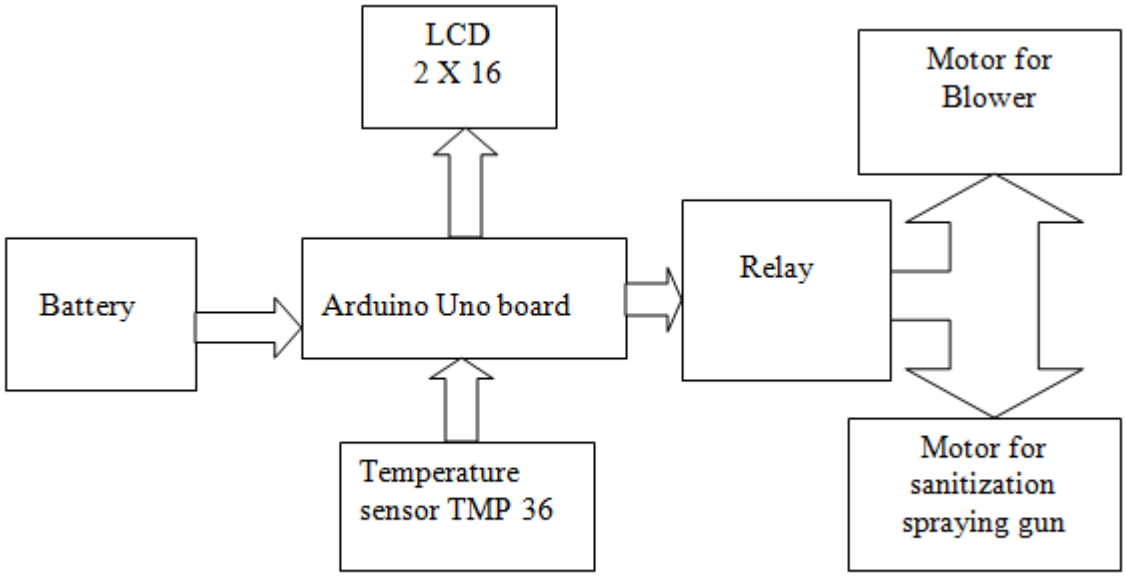

Fig. 6 block diagram

The working principle of the proposed "Temperature detection and automatic sanitization and disinfection tunnel" can be explained with a flow diagram which was shown below with Fig 7.

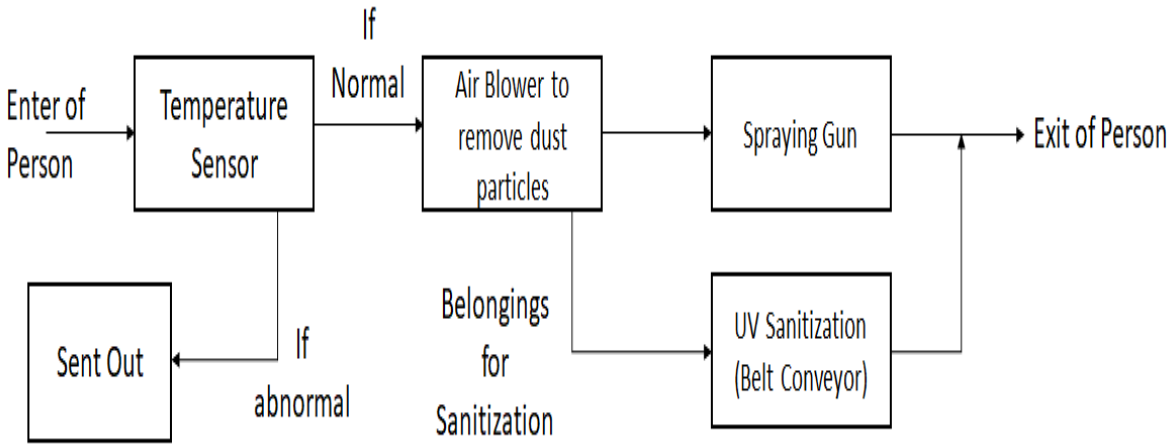

Fig. 7 Flow diagram

In this when a person enters into a room/tunnel, then PIR sensor detects the presence of human at entrance of the tunnel then using temperature sensor we measure the temperature of the person which are fixed at the entrance. The temperature measured is always analog quantity and using analog pins of Arduino it reads that temperature and converts into degree Celsius and Fahrenheit using baseline temperature. Here we considered baseline temperature to be 40 degree Celsius.

The Arduino was programmed using Arduino IDE such that if the temperature is less than or equal to 99 degree Fahrenheit then sanitization is sprayed and blower is on to remove the dust particles of Luggage, else, If temperature is greater than 99 degree Fahrenheit then a buzzer will ON and gives some sound, means that person need to take medical check up and medication.

V. DESIGN AND IMPLEMENTATION

In this we designed a temperature detection and automatic sanitization and disinfection tunnel. PIR sensor was connected to the pin 6 of Arduino and it does the job of detecting humans. Once it detects human then red led will turn on as an indication of some work has to be done by tunnel and that red led is connected to pin 9 otherwise green led turns on which is connected to pin 8. We used temperature sensor TMP 36 generates a small voltage corresponds to the temperature across IC. This generated voltage is in the continuous, analog form. This voltage is fed to the controller unit. Here we use Arduino (ATmega8) as a controller. This voltage is given to the Analog port 0 (A0) of the Arduino UNO. Arduino UNO reads analog input and converts this analog voltage into digital form using inbuilt A to D converter. It converts analog voltage level in any number between 0 to 1023. It uses 10 bits for processing. This is given to the ATmega328 microcontroller, it multiplies the digital data with coefficient 0.488 and converts this voltage in particular value. This value is nothing but the temperature in degree centigrade. Similarly, we multiplies the data with 1.8 and the add 32 to convert voltage level into Fahrenheit unit.

Using Arduino UNO we programmed it in a manner that if the temperature value exceeds the rated value then the buzzer which was connected to pin 10 of Arduino give some alarm sound so that necessary precautions taken care, else sanitization and blower are performed that were connected to pins 7 and 13and the same was displayed using 2 X 16 LCD interfaced to Arduino. The designing of this project using Tinker CAD is depicted below with Fig 8.

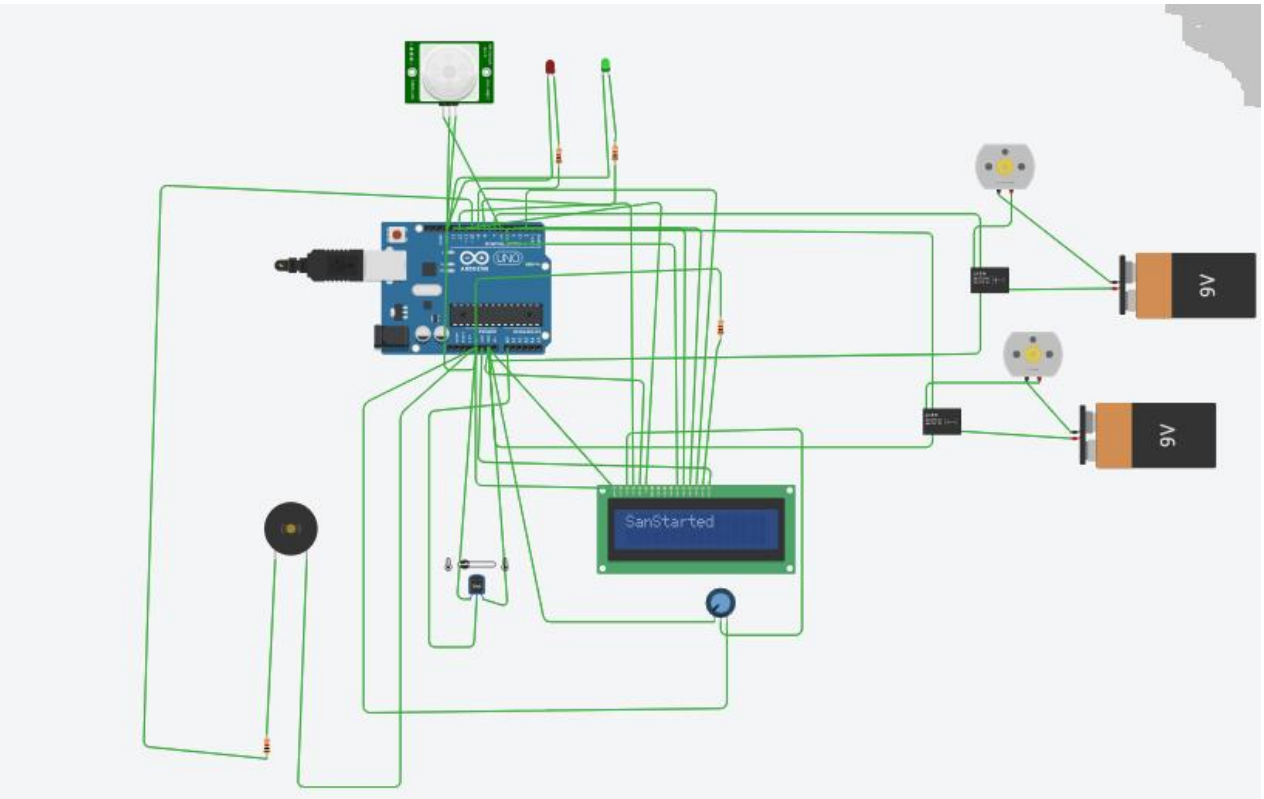

Fig. 8 Designing and implementation using Tinker CAD

VI. EXPERIMENTAL RESULTS AND DISCUSSION

As paper names, it automatically does sanitization and blower functions. The entire functioning depends on temperature value read from temperature sensor and possibly gives two outputs.

a) When temperature is below set point (i.e. 99 Fahrenheit) buzzer remains OFF. Consequently, sanitization will taken place.
b) When temperature goes above set point (i.e. 99 Fahrenheit) buzzer turns ON. Consequently, he/she sent out for medication

VII. CONCLUSION & FUTURE SCOPE

In our paper we designed and implemented an efficient temperature detection and sanitization that can function in an automated way using Arduion UNO. The experimental results were tested for different values of temperatures and found working with 100% accuracy. This is a low cost and effective set up that may help people in the view of pandemic Covid 19. There is still much space is there for future development that would bring happening more.

REFERENCES

[1] Leo Louis, "Working principle of Arduino and using it as a tool for study and research," IJCACS vol 1 ,No 2,April 2016.

[2] Dr Osamah Ibrahim Khalaf et al, IOT fire detection system using sensor with Arduino REVISTA AUS 26-1 / Dr.Osamah Ibrahim Khalaf et al., / DOI:10.4206/aus.2019.n26-7

[3] Samuel Ndueso John, Charles Ndujiuba, Oladeinde Ifedayo Oluwaseyi, Ibeanu Charity Onyinye, "Design and Implementation of a Microprocessor based Temperature Controller with Real Time Display", International Conference Comp., Energy, Net. , Robotics and Telecom, pp.14-18, 2012.

[4] Yang Cao, Chaochao Zhong, Kaiwen Qiu, "Design and Experiment About Temperature Control System Of Sealing Machine Based On Fuzzy PID", 8 th International Conference on Intelligent Human-Machine Systems and Cybernetics, pp. 308-311, 2016 IEEE.

[5] A. L. Amoo, H. A. Gud, H. A. Sambo, T. L. G. Soh, "Design and Implementation of a Room Temperature Control System: Microcontroller-Based", IEEE Trans. Energy Conservation , 2014.

[6] Kim, S.I. and Lee, J.Y., 2020. Walk-Through screening center for COVID-19: an accessible and efficient screening system in a pandemic situation. Journal of Korean Medical Science, 35(15).