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Temperature Based Automatic Door Control System

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Abstract –

This paper presents the innovative system for automatic door control based human body temperature to avoid entry of vocid'19 infected people in public places. Automatic door control systems are in existence and contactless human body temperature measuring system is also in existence. In this existing system one person should be paid and appointed for temperature measuring at the entrance gate which involves money, time and tedious task in big shopping malls, multiplexes etc. The main objective is to measure temperature with non-contact sensor and allow entry to the place based on temperature. This project has an innovative idea of coming these two features in one system. It involves hardware to measure temperature, display it on LCD and door control circuit. This will really help to not spread covid'19 by avoiding entry to a person having temperature more than or equal to 37°C. Also, save salary of one person to be appointed at the entrance gate, simple task, less time consuming and cost effective. The complete system can be fixed at the entrance door. A person just need to stand in front of a system and system will scan body temperature of a person at the entry and take the action whether or not to open the door.

Keywords: Arduino Uno, temperature sensor, door control system

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I. INTRODUCTION

Due to covid'19 pandemic situations, now a day in almost all public places, like shopping malls, multiplexes, museums, temples, shops etc. a person is required to be appointed, at the entrance gate, to check the human body temperature, and then allow the entry to a person, based on his/her body temperature.
A detailed literature review is done. It is observed that automatic temperature monitoring, and automatic door control systems are in existence separately, having different applications. Lia Kamelia,et.al's [1], presents Integrated smart house security systems using sensors and rfid, limited to automation of door lock and lightning system for security purposes. Sri Ram [2], explains RFID based attendance monitoring system using IOT which saves time to record attendance. To set remote supervision of health, Subhant Mishra et.nal's [3], provides Low cost IOT based remote health monitoring system. No automatic, man less, system is in existence which provides entry to a person at the public places based on person's body temperature. Human body temperature is the first and most parameter to test whether or not that person having covid'19 infections.
It has become necessary and important to restrict the entry to a person suffering from high fever as it is one of the major reason of covid'19. The existing manual temperature checking system and door open system is costly, inconvenient, time consuming, and tedious one. This project gives a solution to existing manual operated door control system. It has an innovative idea of combining these two features in one system. It involves hardware to measure temperature, display it on LCD and circuit to control door opening and closing. This will really help to not spread covid'19 by avoiding entry to a person having temperature more than or equal to 37°C. Also, save salary of one person to be appointed at the entrance gate, simple task, less time consuming and cost effective. The complete system can be fixed at the entrance door. Infrared temperature sensor for non-contact temperature measurement are highly developed sensors and used in this project work.
A person just need to stand in front of a system and system will scan body temperature of a person at the entry and take the action whether or not to open the door. Complete system is contactless man less, cost effective, and convenient. The main aim of this project work is to monitor temperature with non-contact sensor and allow access to entry to the public places based on to measured human body temperature. The next section, section II of this paper explains the detailed methodology of proposed system, section III, provides conclusions. Section IV provides future scope.

II. PROPOSED SYSTEM

This proposed project work involves hardware as well as software systems. The schematic block diagram of a proposed hardware is depicted in Fig. 1

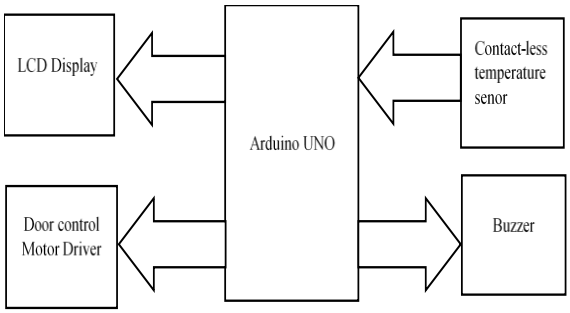

Fig. 1 Block diagram of proposed system

The **Fig. 1** consist of Arduino Uno Board, contactless temperature sensor, motor driver circuit for automatic door opening and closing, LCD display for display of measured temperature and status of a person, and buzzer. The specifications of all the hardware components is provided in Table 1. The detailed explanation and specifications of all the hardware components is provided below.

Arduino Uno Board –The Arduino Uno is microcontroller board based on the ATmeha328. It has 14 digital input/output pins of which 6 can be used as PWM (Pulse width modulation) outputs, 6 analog inputs, a 16 MHz ceramic resonator, a USB (Universal Series Box) connection, a power jack, an In Circuit Serial Programming (ICSP) header, 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 an AC-to-DC adapter or battery to get started.

Arduino IDE software: The IDE (Integrated Development Environment) is a special program running on computer that allows one to write sketches for the Arduino board in a simple language modeled after the processing language. To program the microcontroller Arduino microcontroller Arduino coding language is used. The Arduino language is based on C/C++ and the most basic executable program only needs two function, a setup () and a loop (), to run. In the setup () function variables, pin modes, serial communication, etc. are initialized. This function, loops continuously, until the device is powered off. Simply, as it may sound, it is possible to write complex programs using the above described structure.

Table 1. Component Specifications

Component	Specifications
Arduino UNO	ATmega328P [7] Operating Voltage: 5 Volts Input Voltage: 7 to 20 Volts Digital I/O Pins: 14 (pin 6 provide PWM output) UART: 1 I2C: 1 SPPI: 1 Analog Input Pins: 6 DC Current per I/O Pin: 20 mA DC Current for 3.3V Pin: 50 mA Flash Memory: 32 KB of which 0.5 KB used by bootloader SRAM: 2 KB EEPROM: 1 KB Clock Speed: 16 MHz Length: 68.6 mm Width: 53.4 mm Weight: 25 g
MLX90614	Operating Voltage 3.6V to 5V (available in 3V and 5V version) Supply Current: 1.5mA Object Temperature Range:-70° C to 382.2°C Ambient Temperature Range: -40° C to 125°C Accuracy: 0.02°C Field of View: 80° Distance between object and sensor: 2cm-5cm (approx. (Price: Rs. 800)

Buzzer	Rated Voltage: 6V DC. Operating Voltage: 4-8V DC. Rated current: <30mA. Sound Type: Continuous Beep. Resonant Frequency: ~2300 Hz. Small and neat sealed package. Breadboard and Perf board friendly
Motor driver	Motor driver:L298N Motor channels:2 Maximum operating voltage:46 V Peak output current per channel:2 A Minimum logic voltage:4.5 V Maximum logic voltage:7 V Package:Multiwatt15
LCD Display	Operating Voltage is 4.7V to 5.3V Current consumption is 1mA withoutBacklight Alphanumeric LCD display module, meaning can display alphabets and numbers Consists of two rows and each row can print16 characters.Each character is build by a 5×8 pixel box Can work on both 8-bit and 4-bit mode It can also display any custom generated characters Available in Green and Blue Backlight(Price: Rs. 200)

Arduino UNO: The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. Each pin can provide or receive 20 mA as the recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50K ohm. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX).

MLX90614: The MLX90614 is an infrared thermometer for non-contact temperature measurements. Use of the MLX90614 temperature sensor: The key feature of MLX90614 is that it is a contactless IR temperature sensor with high accuracy. So it can be used in industries to measure the temperature of moving objects like a rotating motor shaft. 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. As in, if the temperature is normal it allows entry inside and the motor driver moves the shaft and thus door is opened only for user with normal temperature and if temperature is above specified range, the access is denied thus with a buzzer used to indicate denied access to enter in. In case, if the user has high temperature then the normal range, the system informs the organization about this to avoid the other users from getting at risk to get infected as well and also to keep track of temperatures of employees.

Buzzer: A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. A buzzer is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications. There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beep.... sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customized with help of other circuits to fit easily in our application.

Motor Driver: Motor drives are circuits used to run a motor. In other words, they are commonly used for motor interfacing. These drive circuits can be easily interfaced with the motor and their selection depends upon the type of motor being used and their ratings (current, voltage). The major motor drive components for DC motors are: a controller, a motor driver IC or a motor driver circuit, the desired DC motor being used, power supply unit and the necessary connections to the motor. Servo motor is a type of actuator device that consists of a motor and a sensor to control velocity, acceleration etc. The major motor drive components for a servo motor are a controller, power supply unit, servo motor and the necessary connections with the motor. Commonly, motor drive for a servo motor is also known as Servo motor controller or Servo Motor Driver. Usually, 8051 controllers are used for controlling a servo motor driver with a single servo motor. If there are multiple servo motors; then PIC, ATMEGA etc. can be used.

LCD Display: A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do

not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are used in a wide range of applications, including LCD televisions, computer monitors, instrument panels, aircraft cockpit displays, and indoor.
The hardware implementation is shown in Fig. 2.

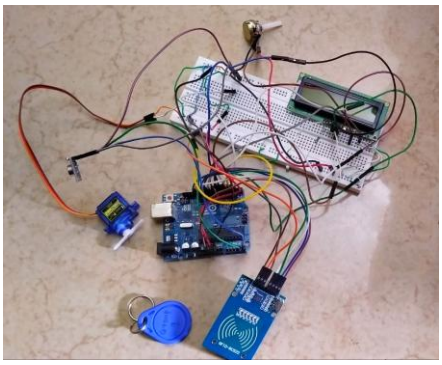

Fig.2 Hardware Implemetation

III. CONCLUSION

The proposed temperature based automatic door control system has been implemented. It is quite effective to minimize risk of Covid-19 spread. The advantages of this system are, it is very useful, cost effective over exiting manual system. Use of this system can make tasks like keeping record of each employee and then allowing the entry inside an organization that are done manually, be done by using a system like this and avoid the high risk of spread of pandemic.

IV. FUTURE SCOPE

This project can be further extended for other applications with the additional use of RFID for authenticate access control. For company entrance with temperature checking feature, Access control system for home automation, Security system, Access control system for Event Halls etc. Interfacing the system with a GSM so that data can be transmitted through messages. Once, various limitations like lack of a global standard, security concerns, the cost factors, etc. are overcomes and this technology is fully implemented, it can transform the way we live our lives.

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