

Low-Cost Contactless Thermometer for Screening and Monitoring During Covid-19

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Abstract

COVID 19 has made a huge impact on the society, the new restriction 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 stimulate a room where such necessary precautions are taken, we make use of a laser diode and receiver to detect the entrance of a person, when the project detect entrance it will check the temperature of the person if the temperature is less than the set temperature the person is allowed entry otherwise the entry is denied. Only a predetermined number of people are allowed in the room.

INTRODUCTION

COVID 19 has made a huge impact on the society, the new restriction has been imposed as in the number of users allowed in a particular room in offices, shops, to maintain social distancing, along with social distancing regular temperature check at entrances of malls, the office is mandatory. In this project we stimulate a room where such necessary precautions are taken, we make use of a laser diode and receiver to detect the entrance of a person, when the project detect entrance it will check the temperature of the person if the temperature is less than the set temperature the person is allowed entry otherwise the entry is denied.

Body temperature indicates human physiological activity and health, especially in pediatrics, surgery, and general emergency department. Most of the early methods of measuring body temperature used contact mercury thermometers advances in electrical technology mean that contact-type electronic thermometers have become widely used the measurement sites are the sublingual mouth, the rectum, the axillary, and the base of the urethra some medical reports show that contact thermometers accurately measure body temperature for illness screening, many individuals' body temperature must be measured, so non-contact type infrared thermometers are used to measure the tympanic (ear) and forehead temperature.

LITERATURE REVIEW

The literature review highlights the various aspects of IoT-based Surveillance and Health Monitoring Systems for elderly and physically challenged people. The wearable devices, sensors, communication protocols, and data analysis methods used in these systems have

been widely studied in recent years. Further research is needed to improve the accuracy and reliability of the system and to ensure the privacy and security of the data collected and stored by the system.

IR-sensitivity Infrared thermometers work based on a phenomenon called black body radiation. Anything at a temperature above absolute zero has molecules inside it moving around. The higher the temperature, the faster the particles move. The molecules emit infrared radiation as they travel beyond the visible spectrum of light; when they heat up, they release infrared and even visible light. That is why heated metal can glow red or indeed white. Infrared thermometers detect and measure this radiation. The ability to accurately measure the temperature of different materials has always been a challenge for the Instrumentation Engineer.

PROPOSED SYSTEM

The main objective of the system (temperature scanning gate) is to monitor the human body temperature when a they passed through the gate. In normal situation the gate is always open. If the gate senses any high temperature (more than 99.0 degree Fahrenheit), the gates automatically rejects the entry by closing the gate. The gate also provides warning beeps while the body temperature of a person is high. Our world is effected by covid-19. Some health measurements are needed for preventing the covid-19 spreads. One of the early symptoms of covid-19 is high body temperature or fever. Our temperature monitoring gates able to detects high body temperature. This temperature screening gate is useful for bus stops, hospitals, restaurants, airports, grocery stores and shopping malls etc. The implementation cost of this gate is also cheap.

Block Diagram

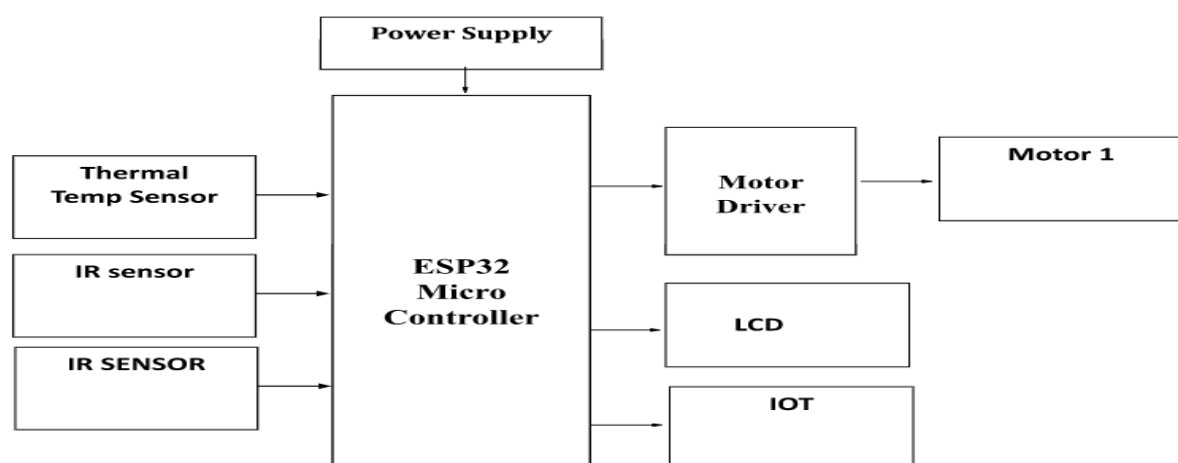


Fig 1. Block Diagram

HARDWARE COMPONENTS:

Power Supply

The power supply section is the section which provides +5V for the components to work. IC LM7805 is used for providing a constant power of +5V. The ac voltage, typically 220V, is connected to a transformer, which steps down the ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also retains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

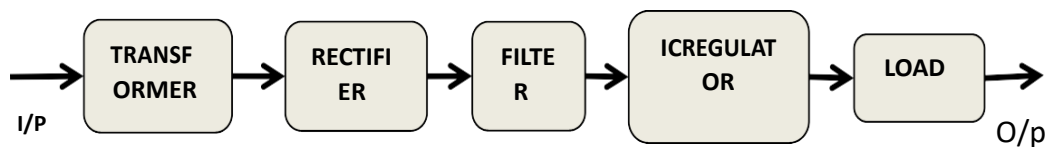


Fig 2. Block Diagram of Power Supply

Esp32 Module

The ESP32 module is a low-cost, low-power system-on-chip (SoC) microcontroller with integrated Wi-Fi and Bluetooth capabilities. It is manufactured by Espressif Systems, and is designed for use in a variety of applications, including Internet of Things (IoT) devices, wearable electronics, and other embedded systems. The ESP32 module features dual-core

processors running at up to 240 MHz, as well as a variety of built-in peripherals, including touch sensors, analog-to-digital converters, and pulse width modulation (PWM) controllers. It also includes support for a wide range of communication protocols, including Wi-Fi, Bluetooth, and Ethernet.

LCD (liquid crystal display)

The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580. The most commonly used LCDs found in the market today are 1 Line, 2 Line or 4 Line LCDs which have only 1 controller and support at most of 80 characters, whereas LCDs supporting more than 80 characters make use of 2 HD44780 controllers. Most LCDs with 1 controller have 14 Pins and LCDs with 2 controllers has 16 Pins (two pins are extra in both for back-light LED connections).

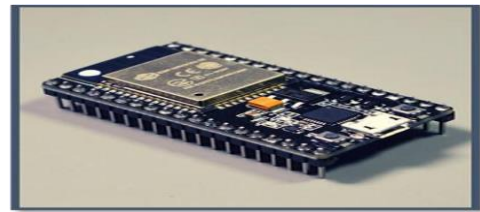
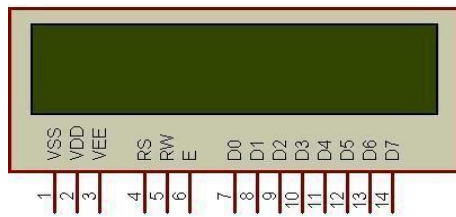


Fig 4.LCD type HD44780 pin diagram

Temperature Sensor

A temperature sensor is a device that detects and measures hotness and coolness and converts it into an electrical signal.



Fig 5. Temperature Sensor

Oximeter Sensor

An oximeter sensor is a device used to measure the oxygen saturation level in a person's blood. It is a non-invasive device that clips onto a person's fingertip, and uses light to measure the amount of oxygen present in the blood.

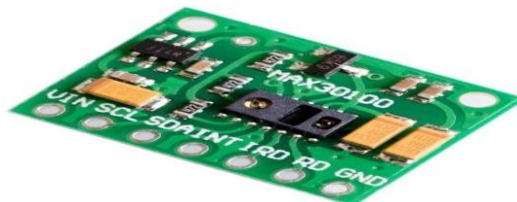


Fig 6. Oximeter Sensor

Heartbeat Sensor

Heart beat sensors are designed to give digital output heart beat when a finger is placed on it. When the heart beat detector starts working, the light emitting detector (LED) blinks simultaneously for every heartbeat. The output of this LED flash is in digital form, which can be processed by the microcontroller to measure beats per minute (BPM) rate.



Fig 7. Heartbeat Sensor

RESULT

We have finally reached our goal. We have to implement the hardware as all equipment is at our hands. So, in a nutshell the whole procedure is as follows The comparison of the measured distances (with and without correction) against a 15 cm measuring scale. The prototype was tested for two cases, the reading without and with distance compensation, for the distance between 2 cm to 4 cm, with an interval of 0.5 cm. The trendline of linear regression analysis shows that the coefficient of determination (R^2) value of the measured distance is only 0.7508. without the compensation algorithm.

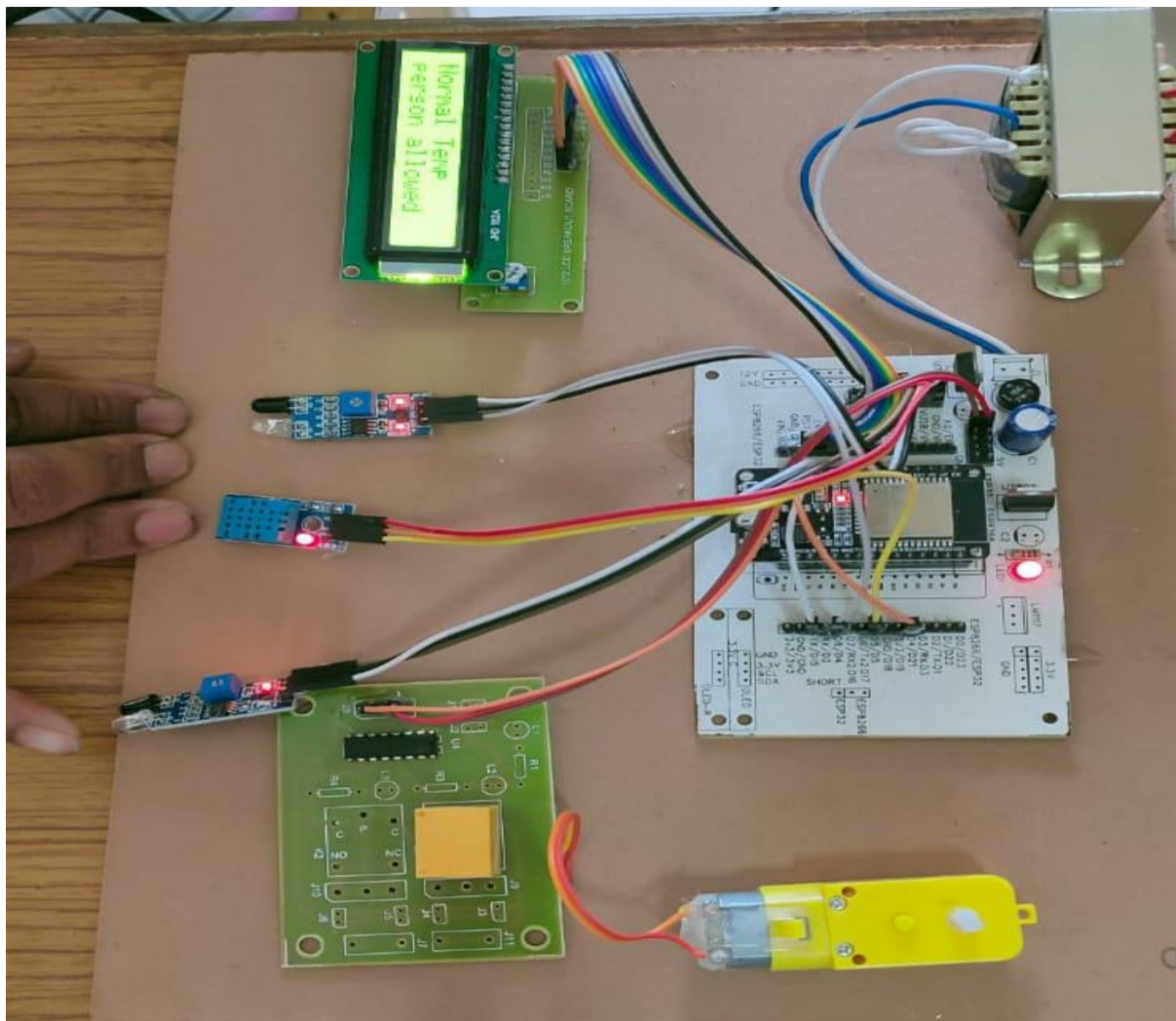


Fig 8. Hardware kit

CONCLUSION

The project “LOW COST CONTACT THERMOMETER FOR SCREENING AND MOINTORING DURING COVID-19” has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every

module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly using highly advanced IC's and with the help of growing technology the project has been successfully implemented. The recent pandemic has forced us to search for non-contact based health care solutions. The temperature is one of the major parameters to detect many types of contagious diseases such as COVID19.

The present work successfully improved the accuracy of the popular IR sensorbased thermometers by augmenting a distance compensation algorithm. However, this technique may be extended to any type of medical or non-medical sensor device that depends on (Red) accurate distance measurement through ultrasonic sensor. The prototype has a small form factor and cheap components compared to most of the commercially available non-contact based thermometer models.

The accuracy after the distance correction is almost equivalent to contact based mercury. Interested researchers can extend the model for additional functionalities by adding any ESP 8266 based Wi-Fi shield on the top of Arduino and port the data to the cloud. The implementation of multiple numbers of this model at the entrance of highly populated areas such as shopping mall or movie theatre's along with the cloud integration facility may establish an automated healthcare network for community temperature monitoring. So, there exists a number of opportunities to extend the work based on the research requirements.

Conflict of Interest.

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