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IOT Based Smart Campus Covid-19 Readiness

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ABSTRACT: Internet of things (IOT) plays an important role in connecting everything together and to the internet through specific protocols for information exchange and communications. The current global challenge of the COVID-19 pandemic has surpassed the provincial, radical, conceptual, spiritual, social, and pedagogical boundaries. Internet of things (IOT) enables a security system to prevent the spread of the COVID-19 virus. The project aims to make smart campus. We propose a system that facilitates automatic sanitization, temperature monitoring gate, and social distancing alert unit. The main objective of this project is to develop a low-cost, low-power, reliable and non-invasive student safety system.

KEYWORDS: arduino-uno, Temperature sensor, Ultrasonic sensor, PIR sensor, Relay, Buzzer, Micro servo motor, LCD

I. INTRODUCTION

Health of a human is a major concern now-a-days so having a health monitoring system ensures the safety of a person. Today our world is affected by COVID-19, so we have to take some health measurements to prevent the covid-19 spreads. One of the early symptoms of COVID-19 is high body temperature. So, we intend to provide a contactless temperature scanning gate and automatic sanitization system at the entry level of a campus. One of the early symptoms of covid-19 is high body temperature. The Reliable approach for slowing down the infectious diseases to keep away from others. It would be helpful if there were a device that could warn.

II. PROPOSED SYSTEM

In our proposed system we introduce a temperature scanning gate and automatic sanitization gate at the entry level of campus using Arduino-uno which is more standard. Block diagram of our proposed system is given below.

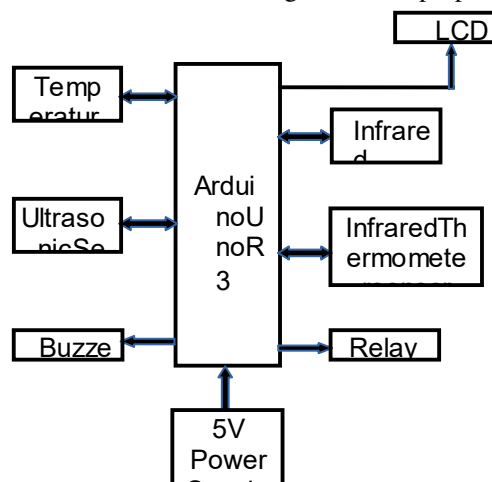


Fig.1.BlockDiagram

The basic components in the proposed system are as follows

- Arduinouno
- MLX90614 Temperature Sensor
- HC-SR04 Ultrasonic Sensor
- Passive Infrared Sensor
- Liquid Crystal Display
- Micro Servo Motor SG90
- Relay
- Buzzer

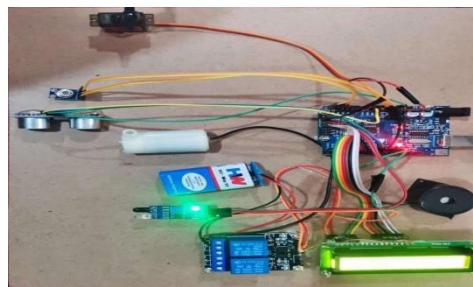


Fig.2.System Design.

Arduinouno

The ATmega328 arduino is an 8051 based microcontroller. It is a low power, high performance CMOS 8-bit microcontroller with 8KB of in-system programmable flash memory.

The specifications are:

1. Operating voltage : 5V
2. Clock speed : 16MHZ
3. Communication Type : UART TTL Serial
4. Pins : 14 GPIO
6 PWM
6 Analog



Fig3.Arduino-unoboard

AVR microcontroller is developed by ATmega. Arduino is an open source hardware and software development platform. It has microcontroller boards for developing digital devices and interactive objects. It is a plug and play device and also it has flexibility to modify and design.

Temperature Sensor

The MLX90614 is a contactless infrared (IR) digital temperature sensor that can be used to measure the temperature of a particular object ranging from -70 to 382.2 degree Celsius. Here, the sensor uses IR rays to measure the temperature

of the object without any physical contact and communicates to the microcontroller using the I2C protocol.

The specifications are:

1. Operating voltage : 3.5v to 5v
2. Temperature range : -70 to 382.2 degree celsius
3. Operating frequency : 40hz
4. Supply current : 1.5mA
5. Filed of view : 80 degrees

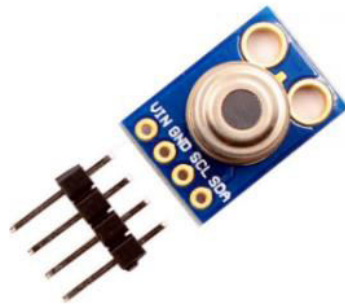


Fig4.MLX90614 Temperature sensor

HC-SR04 Ultrasonic sensor

The HC-SR04 Ultrasonic sensor used for detecting the distance to an object using sonar. It uses non-contact ultrasound sonar to measure the distance to an object, and this sensor consists of two ultrasonic transducers one acts as a transmitter and another acts as a receiver. Here the time between the transmission and reception of the signal allows us to calculate the distance of an object. The circuit inbuilt on the module will itself calculate the time taken for the ultrasonic sensor wave to come back and turn on the echo pin high for that same particular amount of time so, by using this way we can also know the time taken.

The features are:

1. Operating voltage : +5v
2. Operating current : <15mA
3. Operating frequency : 40hz
4. Theoretical measuring Distance : 2cm to 450cm
5. Practical measuring Distance : 2cm to 80cm



Fig 5.HC-SR04 ultrasonic sensor

Passive infrared sensor

A passive infrared sensor is an electronic sensor. It can detect levels of infrared radiation .and it is used to detect whether a human has moved in or out of the sensor range.

The specifications are:

1. 5V DC Operating voltage
2. I/O pins are 5V and 3.3V
3. Range: upto 20cm
4. Adjustable Sensing range
5. Built-in Ambient Light Sensor
6. 20mA supply current
7. Mounting hole



Fig 6.PIR Sensor

Liquid crystal display

A Liquid crystal display is a flat-panel display. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome. LCD1602 Parallel LCD Display with IIC/I2C Interface, The specifications are:

1. Model : LCD1602
2. Interface : I2C
3. Interface Address : 0x27
4. Supply voltage : 5V
5. Dimensions : 80x36x18 mm



Fig 7.liquid crystal display

Micro servo motor

Servo motors are self-contained electric devices that rotate or push parts of a machine with great precision.SG90 is a tiny and light weight servo motor with high output power.

The specifications are:

1. Range : 180degree
2. Motor Type : 3 pole servo motor
3. Modulation : Analog

4. Operating Speed: 0.1s/60 degree
5. Phase Voltage : 5V
6. Torque : 2.5Kg/cm



Fig 8:Micro servo motor

Relay

Relay works on the principle of electromagnetic induction. When the electromagnet is applied with some current it induces a magnetic field around it. Here the copper coil and iron core acts as an electromagnet in relay.

The specifications are:

1. Power rating : 60w
2. Voltage :250v
3. Maximum switch current : 2A

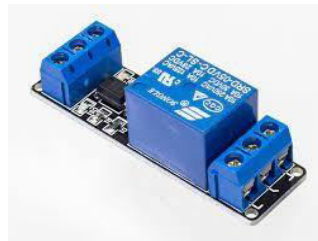


Fig 9.Relay sensor

Buzzer

The buzzer is used to notify the assigned gate personnel by the alarm it makes the moment social distancing is violated and/ or the adult's forehead temperature detected is above normal (greater than 37.5degreesCelsius)

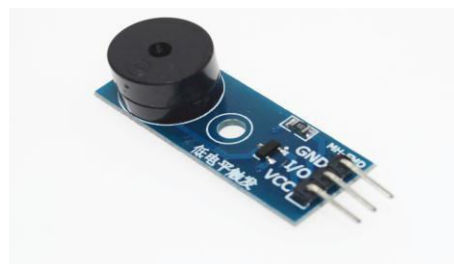


Fig 10.Buzzer

III.WORKINGPROCESS

The process here begins when a person wants to enter an organization. First of all the system checks the distance between the people. Distance between two persons can be calculated using ultrasonic sensor at entry of the campus. If the distance is Greater than the 2 meters then it continues elsewhere sends an alert to maintain Distance. Now it starts sanitization process. Physically touching the dispenser creates a risk of infection. Using an arduino Uno board and ultrasonic sensor combat this problem. We developed completely hands-free and automatic hand sanitizer/soap dispenser. When a person comes near the sanitization system the sanitizer drops automatically from the bottle.

At this stage it checks the temperature of the person. If temperature of a person is more than 99 degree then the gate automatically rejects the entry by closing it. The gate also provides warning beeps if the temperature is high. The data is stored in the cloud

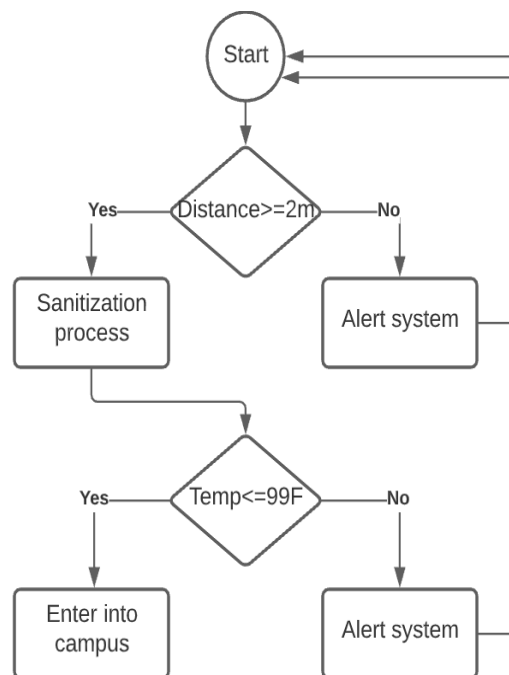


Fig.11. FlowChart

The flowchart explains the following process of the system which the connect to the circuit diagram. The LCD display which displays the information of a person.

Algorithm

The system process is shown in following step that how to measure distance and then sanitization and temperature measurement

Step 1: Start

Step 2: Upload the program code to the Arduino uno

Step 3: By using code and ultrasonic sensor distance is measured.

Step 4: If the distance is greater than or equal to 2 meters then it will do sanitization process.

Step 5: If the distance is less than 2 meters it will alert by using buzzer

Step 6: After doing sanitization temperature of each person is checked

Step 7: If the temperature is in normal range ($\leq 99F$) then that person is allowed to campus.

Step 8: If the temperature is in abnormal range ($> 99F$) it will alert by using the buzzer

Step 9: Stop

The first 3 steps are using the ultrasonic sensor for distance measurement and next 3 steps are using infrared sensor for sanitization process and last 3 steps are using temperature sensor for temperature checking.

The simulation for social distancing monitoring using the ultrasonic and long range infrared sensor with automatic body thermometer on the IDE is shown in Figure 12.

In LCD the parameters like temperature of a respective person is displayed and also social distancing among the people if displayed as if the distance between the persons is greater than are equal to 2 meters it displayed as yes otherwise no.

IV. DISPLAY OF RESULT

The Result of temperature and social distance is shown in fig.13. here if the distance is less than 2 meters it displayed as No. otherwise as Yes and results will be displayed on LCD as shown in below figures

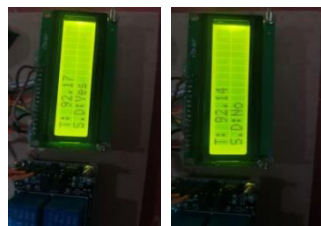


Fig. 13. Display of results

V. CONCLUSION AND FUTURE SCOPE

Using this system, social distancing is maintained inside the gate and the body temperature of each individual entering is monitored automatically. The fully automated features of both social distancing and non-contact, body temperature sensing minimize person to person contact thereby preventing the spread of the COVID19 virus.

It is recommended that we also use this kind of system at all public exits with a simpler system of using the social distancing feature only. Moreover, the speaker can also be connected to an audio amplifier to increase its volume. Furthermore, a long range, higher accuracy, MLX90614ESF-DCx versions of the infrared thermometer sensor can be used.

For further improvement of the prototype device could be done at the later development stage. For instance, an addition of WIFI module could help to send result wirelessly to host computer and adding external memory space could help store any amount of peoples data.

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