JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

PRIVRATNIK

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Abstract : With the day by day increase in the victims of ongoing pandemic, the COVID-19; governments have been struggling to contain the spread and improve herd immunity. Majority of the cases have been associated with huge gatherings and common places of frequent meetings like, theatres, malls, cafes, restaurants etc. to name a few. To find a potential solution to this problem, this work has been developed. This work emphasizes on deploying a system that has pre-loaded capacity of in and out counters using specified sensors, temperature sensors and a sanitization system. These counter sensors, count the number of people entering the hall/room etc. and also the number of people leaving simultaneously. By calculating the difference in the number of people; the number of people inside is displayed. If the number of people exceeds the pre-loaded capacity; an alarm is triggered indicating the excessive count. Once the crowd is zero, the sanitization system starts working by continuously spraying the sanitizer inside the hall. This can be one of the solutions to minimize the further spread and to achieve optimum safety, thereby helping in reducing the number of victims.

Keywords:

Maximum capacity, Microcontroller, Sanitization, Temperature Sensor, Ultrasonic sensor.

I. INTRODUCTION:

In this paper, the design of an indoor temperature monitoring system using covid-19 protocols is discussed. The body temperature monitoring is one of the way to detect the covid Symptoms. There are variety of thermometers available in the market. The basic thermometer can measure the temperature of a person and may also become a reason for the spread of virus with skin contact. In this special situation we can use the Non-Contact Thermometer (Thermal Screening).

We can make a Non-Contact indoor temperature monitoring system using covid-19 protocols with some commonly available components. IR sensor is used for bidirectional visitor's count, Fog Sanitizer is used to sanitize the hands and room. UV light is used to disinfect the surfaces in the particular chamber or room. In this system design, we are using DC motor for the sliding purpose of door. The status of this system will be displayed on LCD module. Here relay works as a switch to on/off the UV lamp and for sanitizers which receive the signal from Arduino UNO.

The main controlling device of the project is Arduino UNO microcontroller, MLX90614, LCD display, IR Sensors, DC Motor along with L293d motor driver is interfaced to the Arduino UNO microcontroller.
IR sensor is used here to detect the presence of a person nearby it. Then Arduino UNO measures the body temperature without any contact through MLX90614 sensor. If the person temperature is at permissible level (i.e., 98.6°F), it will switch on the sanitizer to sanitize the hands and also opens the door to let the person in. Otherwise, it is not possible. When the person tries enter/exit the room, it will detect the presence of object/person at entrance and exit spot of the room and this system displays the bidirectional visitor count on LCD module. When there are no visitors in the room it will be detected by IR sensor and process this data to the Arduino UNO. Arduino will switch on the UV lamp and Fog sanitizer which is placed inside the room to disinfect the surfaces. To performing this intelligent task microcontroller loaded the program written in embedded C language.

The terminology PRIVRATNIK is taken from RUSSIAN Language, which means DOOR/ GATE KEEPER. It symbolizes with our System design.

The main objectives of the project are:

- Make a Non-Contact Thermometer.
- Measured temperature is displayed on the LCD.
- Automatic hand sanitization.
- Temperature based door accessing system.
- IR sensor based bidirectional visitor counter.

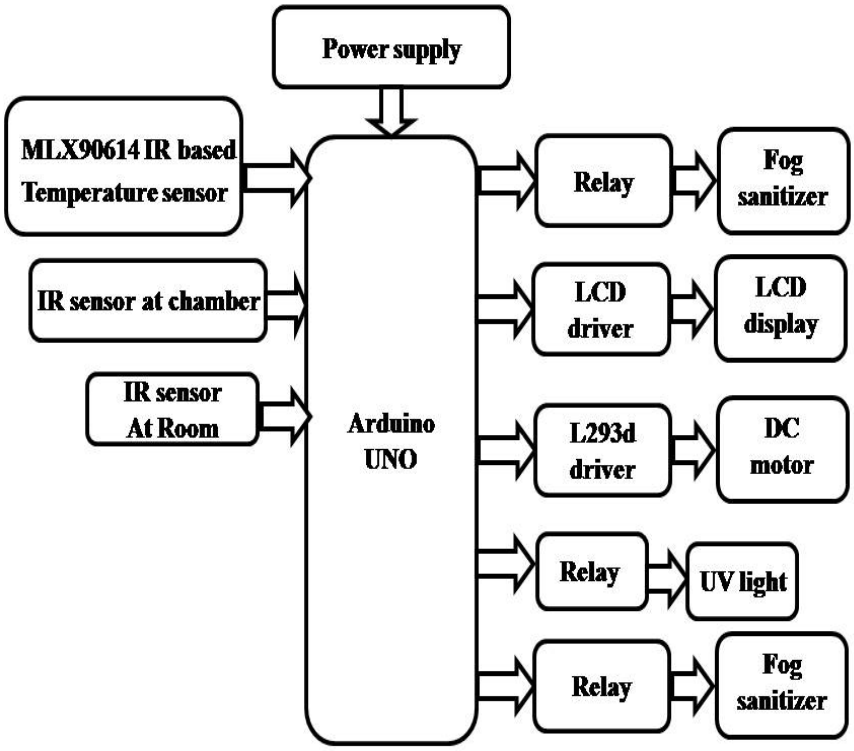
Person based room sanitation and UV light control system

- Visible alerts are displayed on the LCD screen.
- Using Arduino UNO to achieve these tasks.

2. Introduction with block diagram of PRIVRATNIK:

In this section the block diagram of the project and design aspect of independent modules are considered. Block diagram is shown in Fig 1:

Fig 1: Block diagram of PRIVRATNIK



The main blocks of this project are:

- Arduino UNO.
- MLX90614
- LCD display.
- IR Sensors
- DC Motor.
- L293D motor driver
- Fog Sanitizer.
- UV lamp.
- Relay.

Arduino UNO Micro controller:

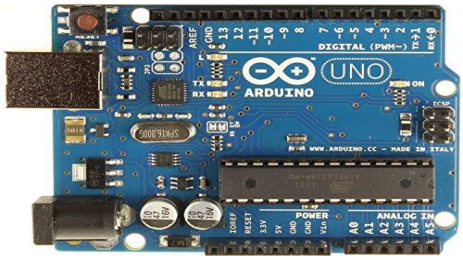


Fig 2: Arduino UNO

The Arduino UNO is a microcontroller board which has ATmega328 from the AVR family. There are 14 digital input/output pins, 6 Analog pins and 16MHz ceramic resonator. USB connection, power jack and also a reset button is used. Its software is supported by a number of libraries that makes the programming easier.

2.1 MLX90614 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° C to 382.2°C. 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 MLX90614 Temperature sensor is

manufactured by a company called Melexis. The sensor is factory calibrated and hence it acts like a plug and play sensor module for speeding up development processes. The MLX90614 consists of two devices embedded as a single sensor, one device acts as a sensing unit and the other device acts as a processing unit. The sensing unit an Infrared Thermopile Detector called MLX81101 which senses the temperature and the processing unit is a Single Conditioning ASSP called MLX90302 which converts the signal from the sensor to digital value and communicates using I2C protocol. The MLX90302 has a low noise amplifier, 17-bit ADC and a powerful DSP which helps the sensor to have high accuracy and resolution.

The sensor requires no external components and can be directly interfaced with a microcontroller. As you can see above the power pins (Vdd and Gnd) can be directly used to power the sensor, typically 5V can be used, but there are other versions of this sensor which can operate on 3.3V and 7V as well. The capacitor C1 is optional and is used to filter noise and provide optimum EMC. The signal pins (SCL and SDA) for used for I2C communication and can be connected directly to microcontroller operating on 5V logic.

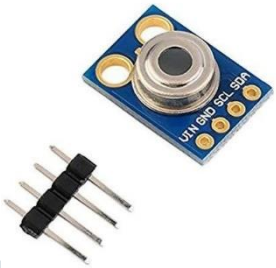


Fig 3: MLX90614 Thermometer Sensor

2.2 LCD Background:

One of the most common devices attached to a micro controller is an LCD display. Some of the most common LCD's connected to the many microcontrollers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

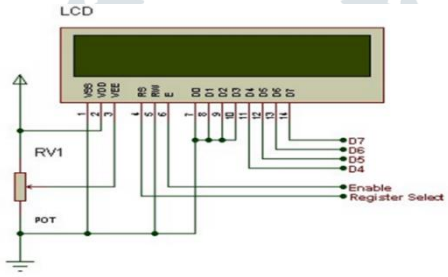


Fig 4: LCD Display

Checking the busy status of the LCD:

It takes a certain amount of time for each instruction to be executed by the LCD. The delay varies depending on the frequency of the crystal attached to the oscillator input of the LCD as well as the instruction which is being executed.

Table 1: Pin description of LCD

Pin No.	Name	Description
Pin no. 1	**VSS**	Power supply (GND)
Pin no. 2	**VCC**	Power supply (+5V)
Pin no. 3	**VEE**	Contrast adjust
Pin no. 4	**RS**	0 = Instruction input 1 = Data input
Pin no. 5	**R/W**	0 = Write to LCD module 1 = Read from LCD module
Pin no. 6	**EN**	Enable signal
Pin no. 7	**D0**	Data bus line 0 (LSB)
Pin no. 8	**D1**	Data bus line 1

Pin no. 9	**D2**	Data bus line 2
Pin no. 10	**D3**	Data bus line 3
Pin no. 11	**D4**	Data bus line 4
Pin no. 12	**D5**	Data bus line 5
Pin no. 13	**D6**	Data bus line 6
Pin no. 14	**D7**	Data bus line 7 (MSB)

The "Get LCD Status" command will return to us two tidbits of information; the information that is useful to us right now is found in DB7. In summary, when we issue the "Get LCD Status" command the LCD will immediately raise DB7 if it's still busy executing a command or lower DB7 to indicate that the LCD is no longer occupied. Thus our program can query the LCD until DB7 goes low, indicating the LCD is no longer busy. At that point we are free to continue and send the next command.

2.3 IR sensor:

An **infrared proximity sensor or IR Sensor** is an electronic device that emits infrared lights to sense some aspect of the surroundings and can be employed to detect the motion of an object. As this is a passive sensor, it can only measure infrared radiation.

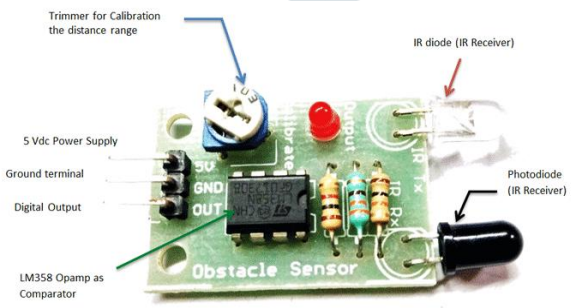


Fig 5: IR Sensor

The IR sensor module consists mainly of the IR Transmitter and Receiver, Opamp, Variable Resistor (Trimmer pot), output LED in brief.

2.4 D.C Motor:

A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The reverse process, producing electrical energy from mechanical energy, which is accomplished by an alternator, generator or dynamo. Many types of electric motors can be run as generators, and vice versa. The input of a DC motor is current/voltage and its output is torque (speed).

2.5 L293d motor driver:

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

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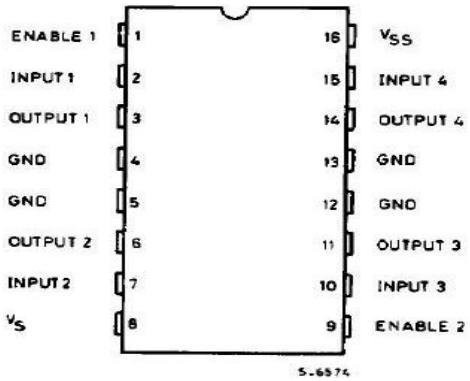

Fig 6: Pin diagram of L293d Motor Driver

Features of L293D:

- 600mA Output current capability per channel
- 1.2A Peak output current (non-repetitive) per channel
- Enable facility
- Over temperature protection
- Logical "0"input voltage up to 1.5 v
- High noise immunity
- Internal clamp diodes

2.6 Fog Sanitizer:

Fog Sanitizer is used in the design of the project as the sanitizer helps to kill the harmful virus.

2.7 UV Lamp:

Ultraviolet lamps used to disinfect surfaces in the home or similar spaces.

UV radiation is a known disinfectant for air, water, and nonporous surfaces. UV radiation has effectively been used for decades to reduce the spread of bacteria, such as tuberculosis. For this reason, UV lamps are often called "germicidal" lamps.

3. Methodology :

In this paper we have split the model into 3 main sections. It will perform their individual tasks. When a visitor enters into the hall, the temperature check will be performed. If temperature is under standards, sanitization section will perform its task and then counter will increase. The system is rooted on the basics of interruption of the sensors. Each section is discussed separately.

3.1 Sanitization Section

In this section we have used following components given below: -

1) IR sensors
2) Arduino UNO
3) One Relay module
4) Mist nozzles

The sanitization section is based on the interruption of the ultrasonic sensors. When any visitor comes under the range of ultrasonic sensor i.e., 100 meters, the ultrasonic sensor gets activated and give high signal to the Arduino UNO pin. In Arduino we have given delay of 2 seconds. After this, the Arduino UNO will send command to the relay module. A relay is electrically operated switch which is used in industrial application to provide segregation between high voltage and low voltage circuits. The high voltage and low voltage circuits have different voltage rating. One might be a high voltage side and other low voltage side. A relay is electro mechanical switch which is used for switching between 5 Volt circuits and 220/120 Volt AC circuits. Now the relay module give signal to the diaphragm pump to start the pumping. It will pump the sanitizer filled in the mist sprayer tank. Whole frame is made from the interconnected pipes in which we have attached mist nozzles. By the help of mist nozzles, the sanitizer will be sprayed on the visitors entering in the hall. In our project we have specifically used mist nozzles because it produces tiny water droplets in the form of fog, which will not harm visitors in any way.

3.2 Bidirectional Visitor Counter Section

The components used in this section are: -

1) IR sensor
2) Arduino UNO
3) Buzzer
4) Motor for Sliding door

Arduino UNO is the master controller. In this section when there is interruption on IR sensor it transmits a high signal to Arduino UNO in real-time.IR sensor is powered with a 5V DC supply. And fixed on the one-side of the door frame. When signal is high it means that a visitor has entered in the halls and the counter increase by one value. Same when the visitor exits from the room the counter decrease by one value. And the total number of visitors will be shown on the LCD screen. The sliding door gets activated when someone leave or enter.

3.3 Thermal Screening Section

In this section we have used Infrared Temperature sensor (MLX90614). It uses infrared rays to measure the temperature of the body. The IR sensor will be placed on the door frame. When any visitor wants to enter the halls, he/she must stand in front of the door frame for temperature check. If the temperature is according to the COVID-19 Standards. The LCD screen will display the access status to enter and visitor can enter the hall. If not the buzzer will be activated so he/she will be warned for entering the room.

3.4 Room Sanitization with UV lamp Section

When the count int the room Displays as zero in the LCD Screen the Ultraviolet germicidal irradiation (UVGI) is an established means of disinfection and can be used to prevent the spread of certain infectious diseases. Low-pressure mercury (Hg)

discharge lamps are commonly used in UVGI applications and emit shortwave ultraviolet-C (UV-C, 100–280 nanometer [nm]) radiation, primarily at 254 nm. UV-C radiation kills or inactivates microbes by damaging their deoxyribonucleic acid (DNA).

II. RESULTS AND DISCUSSION:

The project "**PRIVRATNIK**" was designed as an indoor measurement system using thermal screening, sanitation, door accessing and disinfection systems. In which that the visitors who's having the temperature >98.6°f are not allowed, but the visitors with <=98.6°f are allowed at a time with bidirectional counting facility and the sanitization takes place for the allowed visitors.

III. CONCLUSION:

Integrating features of all the hardware components used have been developed in it. 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 with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

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