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TOUCHLESS SWITCHBOARD

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Abstract: This project has the main aim to help users to avoid touching any item including the electrical switches as far as possible. In public places such as schools and offices, the electrical switchboards are touched by one and all, so it could pass the virus and other infections from one person to many by the contact of hands from switches. Here is a solution in the form of a touchless switchboard using Arduino as the heart of the project, surrounded by the ultrasonic sound sensor, PIR sensor (passive infrared sensors), MQ3 gas sensor, and LCD display. The switches can be turned on and off alternately by just placing a hand next to the sensor and can sense whether the hand is sanitized or not, without touching the switch.

Keywords - Arduino Uno, Ultrasonic sensor, PIR sensor, MQ3 gas sensor, LCD display.

I. INTRODUCTION

The Covid-19 pandemic has greatly increased the demand for **non-contact pushbuttons and switches**. Various studies and research has shown that the transmission of viruses and other transmitting bacteria that are spread through surfaces exposed to constant contact with hands is high. A broad range of technologies for contactless switching are varying for different developers and buyers. But not every product is suitable enough. It has three test conditions, first is an ultrasonic sensor that is used to find the hand within the range or not and the second block is a PIR sensor that detects the human or not by the mean of body temperature and the last block is the MQ3 sensor that is used to find whether the hand is sanitized or not whenever the all conditions are true then only the switch will be ON otherwise the switch conditions will fail that will displayed in the LCD. These switches can be used for a wide range of applications. They fit the use in public areas, such as in **vending machines, parking systems**, or **sanitary areas** to avoid any contact by hand. Moreover, the detection distance can also be set so that this switch can be used as a photoelectric barrier for other fields of applications.

II. LITERATURE SURVEY

Vibhuti et al [1] proposed a system that operates with the control of relays and with the use of WAGO PLC and Arduino Uno. Switching operation of devices such as tube lights, fans, AC, etc. can be operated spontaneously by using a PIR sensor and based on environmental conditions. In a real-time implementation, automatic control is done by sensor data, and Manual control is done by the android application. But, the difficulty in this paper is the controlling and monitoring of devices done by WAGO PLC and Arduino Uno. These operations can be done by using only Arduino Uno microcontroller.

Maslekar et al [2] proposed a smart lighting system that Raspberry Pi has used. Raspberry Pi controller can be used for monitoring lights and fans simultaneously. In the absence of a person's room, lights and fans will automatically turn OFF. Energy can be saved by using this smart lighting system. The experimental results of this system have shown that 50% of energy is conserved. But the difficulty in this paper is Raspberry Pi is much more expensive than the Arduino Uno.

In [3], Automatic Lighting and Control System for Classroom. The electrical lights are controlled by Bluetooth, PIR sensor, and a relay module. To switch ON or OFF the light Bluetooth module is connected to Arduino Uno which sends

Voice commands from Arduino Uno by using the mobile android application. The experimental results have shown that 50% of energy is conserved. But this paper can be implemented by removing the Bluetooth module as well.

In [4], the disquisitions speak about automatic room systems by using visitor counters operation. Depending upon the human presence, the room lights are ON or OFF. By this project there is no need for an manual switching operation. The PIR sensor is used to the human presence which is at the entrance of the room. As a visitor counter is used, there is an increment in the counter when a person enters the room and this leads to turning the room light which is controlled by the microcontroller program. If the person exits the room, the counter decrements and this leads to turning OFF the lights. When the all persons left the room then only the lights in the room will be switched OFF. The difficulty in this system is that the door of the room should not allow more than one person at a time.

Vahid et al [5] proposed a system whose control is dependent on the Arduino microcontroller, network communications, and Modbus industrial protocol. Arduino Ethernet shield and a wireless router device are used to build the network communication. The specific Android application is used to load the Modbus program into mobile or Windows software named “mypro” and on the Arduino board, Arduino code is loaded through a USB (Universal Serial Bus) cable. This is the interconnection between Arduino Ethernet Shield and mobile through Ethernet cable and router. By connecting the to the user can control and monitor the appliances easily. Table 1 summarizes the available methods the in literature survey.

Raja R et al,[6] worked on energy-saving concepts. Smart sensor networks in DC electrical appliances like lights, help monitor energy usage. Conventional lamps are power AC grid for LED DC supply is sufficient to provide power. Dimming of light can also be achieved by using appropriate protocol helps in energy and power saving. Replacing the conventional lamp with makes 44% energy savings

III. BLOCK DIAGRAM

The square outline of the touchless display is displayed in figure 1. It involves a microcontroller, an ultrasonic sensor, PIR sensor, MQ3 sensor, LCD display and relay module.

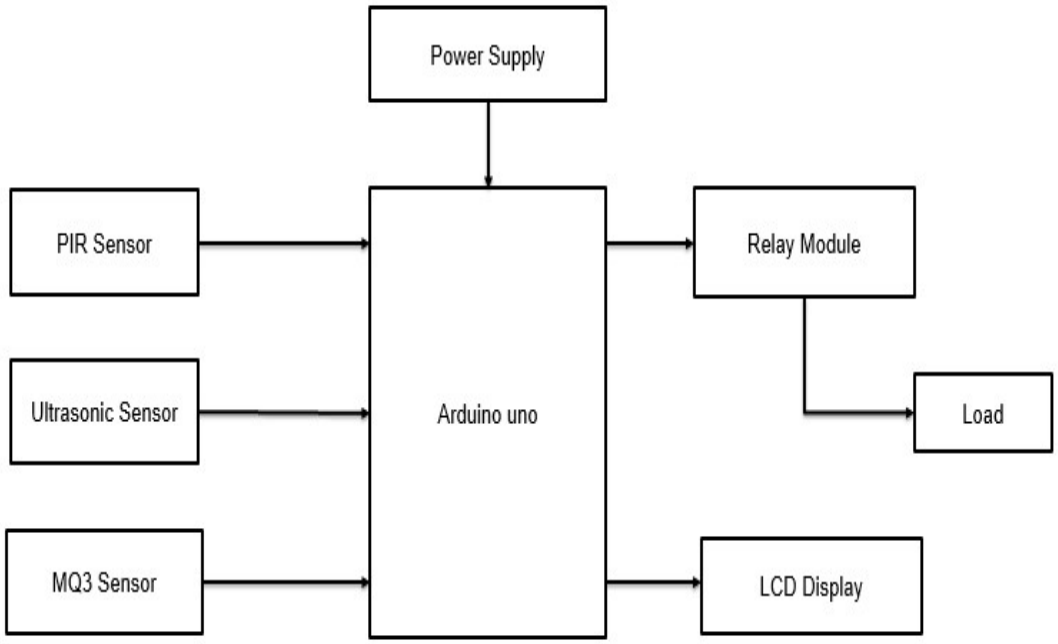

Figure1 block diagram

3.1ULTRASONIC SENSOR

The HC-SR04 ultrasonic sensor is used to determine the distance of an object just like the bats do. The Crystal Oscillator of frequency 4MHz is also present in the Ultrasonic sensor which is useful in delivering the stable output for a required period and working on the principle called the piezoelectric effect. It detects non-contact range detection with high accuracy and stable readings in an easy-to-use range from 2 cm to 400 cm. The operation is not affected by sunlight or black material, soft materials like cloth can be difficult to detect. It comes complete with an ultrasonic transmitter module and receiver module. The HC-SR04 Ultrasonic sensor commonly known as the Ultrasonic distance detector is a sensor that has two transducers which are Ultrasonic. Among the two transducers, one acts as a transmitter and the other acts as a receiver. It usually sent a wave at the transmission terminal and receives the reflected waves.

3.2PIR SENSOR

PIR sensor enables you to sense motion occurred, nearly always used to find whether an individual has enraptured in or out of sensors range. They are little, cheap, low power, simple to use, and do not wear out. They are usually noted as PIR, " Passive Infrared ", "Pyroelectric", or " IR motion " sensors. The working of the PIR sensor is to detect the motion of a person when a person comes into the sensing range of the sensor. PIR sensors are passive electronic devices that detect motion by sensing infrared fluctuations. The system functions based on infrared radiation, which is emitted from the human body. The specialty of this sensor is it is little, affordable, low power, easy to use, and does not exhaust. Hence, this sensor is used in home automation appliances.

3.3MQ3 GAS SENSOR

The analog gas sensor- MQ3 is suitable for alcohol detection. It detects the existence of alcohol gases at consolidations from 0.07 mg/L to 11 mg/L. It has a high sensitivity to alcohol. The sensing is based on the change of resistance of sensing material when exposed to alcohol. The sensitivity can be adjusted by the potentiometer-sensitive material of the MQ3 gas sensor is SnO2, which with lower conductivity in clean air. When the alcohol gas exists, the sensor's conductivity is higher through the gas concentration rising.MQ3 sensor has high sensitivity and fast response. The sensor provides an analog resistive output based on the alcohol concentration present in the target.

3.4LCD DISPLAY

LCDs (Liquid Crystal Displays) are used in embedded system applications such as interfacing sensors and displaying the sensor output and also for displaying various parameters and the status of the system. LCD 16x2 is a 16-pin device that has 2 rows that can accommodate 16 characters each. LCD 16x2 can be used in either 4-bit mode or 8-bit mode. It is also possible to create custom character strings. It has 8 data lines and 3 control lines that can be used for control purposes of display.

3.5ARDUNIO

Arduino UNO is a microcontroller board that is based on the ATmega328P.Arduino is an open-source microcontroller.it can be used to interface with ultrasonic, pulse and temperature sensors, etc. It is a very cheap platform to develop simple embedded projects.

3.6RELAY

The relay is the device that opens or closes the contacts to cause the operation of the other electric control. . While we use normal switches to close or open a circuit manually, a Relay is also a switch that connects or disconnects two circuits. This protects the system from damage.

3.7 METHODOLOGY

In our day-to-day life, Numerous consoles exist at various public locations or establishments that are operated by the public or employees/workers on a large scale. The following are a few of the equipment/devices that fall under this category: Elevators, Public, telephones, Coffee machines, and Train ticket vending machines. This project is developed to turn on electric switches automatically by sensing the human presence and avoiding the risk involved in turning on it manually and monitoring whether human hands are sanitized or not. Without direct human body contact, this switch detects the presence of a human in a predefined area and can turn on the lights or any electrical appliances that we want. This means not only maintaining a safe distance from publicly and also using as switch panels but also controlling these without having any physical contact.

IV. PROPOSED SYSTEM

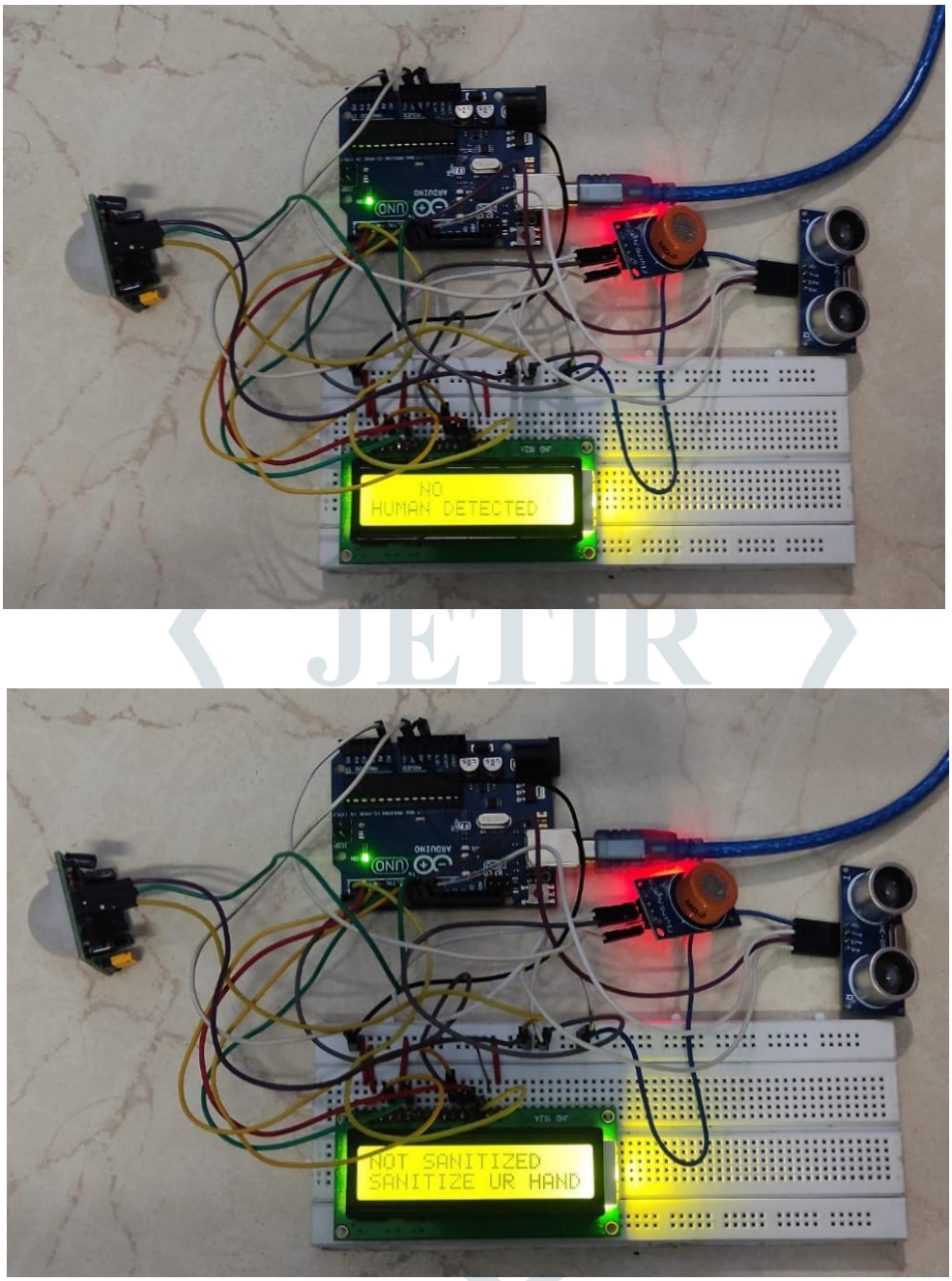

Figure 4 Touchless Switch

V. RESULT

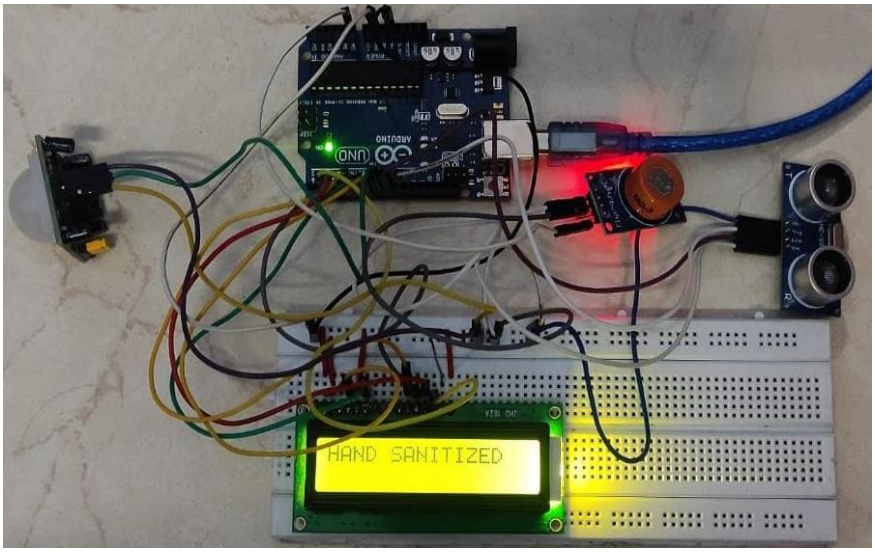

Figure 5 Touchless Switch

The hardware execution has also been done properly and the results have been verified. The hardware execution is shown in figure 4 & 5

VI. CONCLUSION

The need for social distancing and safe health practices such as using sanitizers after using public environments such as taps, switches, etc. is very much essential to reduce the spread of diseases. So, there is an immediate need for the innovation involving the touch-free triggers to facilitate actions such as activating taps, switches, etc. In this project, getting to know about activating the switch using an ultrasonic, PIR, and MQ3 gas sensor. So this solution should be a retrofit and can be fitted on a switchboard to activate the switch based on whether the hand gesture or hand is sanitized or not.

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