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ijirset@gmail.com

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An Automatic Hand Sanitizer Dispensing Machine

Harshada S. Kadu¹, Sakshi S. Mohod², Saurav K. Saykhede³, Akash D. Ingle⁴, Shreyas S. Ghawale⁵,

Prof. Hemant S. Kulat⁶

UG Students, Department of Electrical Engineering, P.R.Pote (Patil) College of Engineering and Management,
Amravati, Maharashtra, India^{1,2,3,4,5}.

Assistant Professor, Department of Electrical Engineering, P. R. Pote (Patil) College of Engineering and
Management, Amravati, Maharashtra, India⁶

ABSTRACT : An automatic hand sanitizer dispensing machine is automated, non-contact, alcohol-based hand sanitizer dispenser and also, we included thermal screening, oxygen level and pulse rate indication by using IOT technology. Here, an ultrasonic sensor senses the hand placed near it, the Node MCU is used as a microcontroller, which senses the distance and the result is the pump running to pump out the hand sanitizer and also we are using IR Temperature sensor for the thermal screening of body as well as we are implementing the oximeter sensor which is used to measure the pulse rate and oxygen level of the body. All these values are transferred on the one Android Application which is installed in doctors' mobile so that he is easily able to read those values without any contact with person.

KEYWORDS: Automatic Hand Sanitizer Dispenser, Node MCU, pulse oximetry sensors, Ultrasonic sensor, Temperature Sensor, relay, DC motor, Covid-19

I. INTRODUCTION

Hand sanitizer machines have come in the market to sanitize our hands, but they are not able to measure the body temperature, pulse rate and oxygen level. Handwashing is important and also effective with proper handwashing steps, but washing with soap and water is time-consuming for peak hours in hospitals. Sanitization means cleaning or sterilizing an object or body part like hands or whole body. Sanitization can be done in many ways including UV Sanitization, Soap Sanitization, Alcohol Sanitization, Bleach sanitization and so on of the above method. This project also showed the effectiveness of the alcohol-based hand sanitizers, which reduced infection rates by whopping 30%. They used hand sanitizers with 60 to 70 percent ethanol or isopropanol for reducing a significant number of pathogens. In this method, the machine is not only able to dispense the sanitizer automatically but also able to measure the temperature of the body, oxygen level and the pulse rate of the body and if there is a crowd gathered together nearby the machine, then it will alert the people by means of a buzzer.

II. EASE OF USE

This method is very useful in this pandemic type of situation where we can easily prevent against Covid-19 which helps to reduce the death rate of the population. Along with this, doctors are also able to detect the Covid patients in the crowd very easily without making a contact with person.

III. EXISTING METHOD

Many studies are done on Automatic Hand Sanitizing Machine to reduce the spread of the Corona Virus. This is shown below:

1) Foot Operated Hand Sanitizer Dispenser: Longpress is made with the footer, such that the mechanical stress is made on the instrument. The mechanical stress made, is forced to spray out the Sanitizer liquid. The human at aged people is unable to use this system as there is mechanical stress and there is a sudden liquid force coming from the sanitizer bottle.



Foot Operated Hand Sanitizing Dispenser

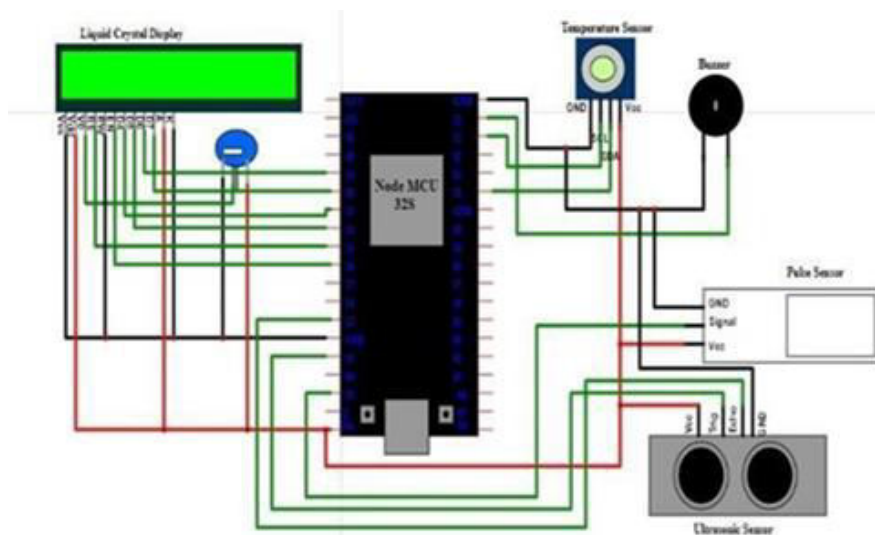
2) With the help of Servo motor : The Easy Non-Contact Automatic Hand Sanitizer Dispenser or Automatic Soap Dispenser with Arduino, it has the Arduino microcontroller to control the sanitizer liquid with the help of a Servo motor. This is used to power up the system by the external power supply of 6V battery or through computer USB cable. This method is good to use and the drawback is the battery replacement for the usage of the system.



Servo Motor Based Hand Sanitizer Dispenser

IV. METHODOLOGY

IV.I.) Circuit Diagram :-





Node MCUESP8266 :

The NodeMCU ESP8266 development board comes with the ESP-12E module containing ESP8266 chip having TensilicaXtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in- built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

Ultrasonic Sensor :

The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. It comes complete with ultrasonic transmitter and receiver modules.

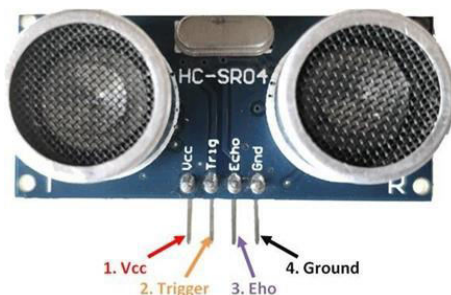


Fig. of Ultrasonic Sensor

Heartbeat Sensor :

Heartbeat Sensor is an electronic device that is used to measure the heart rate i.e. speed of the heartbeat. Monitoring body temperature, heart rate and blood pressure are the basic things that we do in order to keep us healthy. Monitoring heart rate is very important for athletes, patients as it determines the condition of the heart (just heart rate). There are many ways to measure heart rate and the most precise one is using an Electrocardiography.

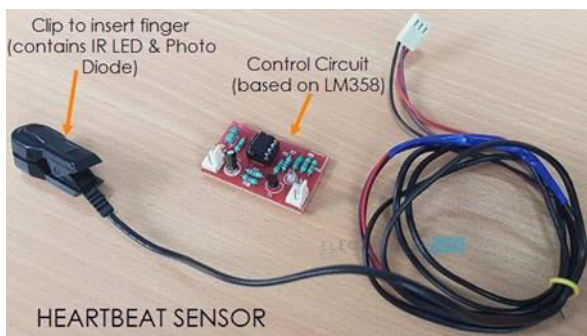


Fig of Heartbeat Sensor

DC Motor :

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor’s magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor’s shaft. Electric motors can be powered by direct current (DC) sources, such as from batteries, or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters or electrical generators. An electric generator is mechanically identical to an electric motor, but operates with a reversed flow of power, converting mechanical energy into electrical energy.



Temperature Sensor :

An infrared temperature sensor measures temperature by detecting infrared energy from all the materials. It works on the one or more photodetector. IR thermometer use lense to focus infrared energy from an object on a sensor that measure it typically a thermopile. It absorb the radiation and convert it into electrical energy.

NPN Transistor :

A bipolar junction transistor (BJT) is a type of transistor that uses both electrons and electron holes as charge carriers. In contrast, a unipolar transistor, such as a field-effect transistor, uses only one kind of charge carrier. A bipolar transistor allows a small current injected at one of its terminals to control a much larger current flowing between two other terminals, making the device capable of amplification or switching.

Relay :

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, combinations thereof.

IV.II.) Working of the Covid Prevention Machine :

This project consist of Node MCU, MLX90614 IR Temperature Sensor, Relay, NPN transistor, LCD display, ultrasonic sensor, Pulse oximetry sensor, sanitizer bottle, 9v dc motor, Nozzle, 12v battery, etc. Main controller of this project is Node MCU32s EPS32 series it same as a Arduino. Node MCU is same as a Arduino but it contains more number of pin and some additional features like WIFI module and Bluetooth. Wi fi is required when data of machine send on someone control panel then we can send through IOT. Then the Ultrasonic Sensor is connected which is used for detect the obstacles in given permissible limit which are set in program. Ultrasonic sensor is consist four pins which is VCC, Trig, Echo, Gnd. The working of this pin are as follows Vcc – Power in Trig – Trigger, send a signal for emission of ultrasound wave Echo – Echo, receive signal on reception of ultrasound wave GND – Ground. Ultrasonic sensor VCC pin is connected to +5v supply of Node MCU pin Trig and echo pin is connected to digital pin of Node MCU. The Vcc pin powers the sensor, typically with +5V. Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave. Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor. This pin is connected to the Ground of the system. Then it signal passed to 12v dc motor. DC motor is used for pump the sanitizer and spread through nozzle. But the is connected through transistor and relay. Transistor is used for amplify the signal. Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit When are lay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. Then connect one temperature sensor MLX90614 which sense the human body temperature it consist four pin VCC , SDA,SCL,GND . The MLX90614 sensor can measure the temperature of an object with any physical contact. This is often made possible with a law called Stefan Boltzmann Law, which states that each one objects and living beings emit IR Energy and therefore the intensity of this emitted IR energy is going to be directly proportional to the temperature of that object or living being Therefore the MLX90614 sensor calculates the temperature of an object by measuring the quantity of IR energy emitted from it. Vdd (Power supply) can be used to power the sensor , typically using 5V . Ground the metal can also act as ground. SDA(Serial data) pin used for I2C Communication. SCL (Serial Clock) Pin used for I2C Communication. Then connect one buzzer between temperature sensor which operates when temperature of body detected more than limit. Which alert the public. Then connect one pulse oximetry sensor (MAX30100) which detect the pulse rate of body. When person put a finger on this pulse oximetry sensor Then device as two LEDs, one emitting red light, another emitting infrared light. For pulse rate, only the infrared light is needed. Both the red light and infrared light issued to measure oxygen levels in the blood. When the heart pumps blood, there is an increase in oxygenated blood as a result of having more blood. As the heart relaxes, the volume of oxygenated blood also decreases. By knowing the time between the increase and decrease of oxygenated blood, the pulse rate is determined. It turns out, oxygenated blood absorbs more infrared light and passes more red light while deoxygenated blood absorbs red light and passes more infrared light. Then all this temperature data and pulse rate detect reading shows on 16*2 Liquid crystal display. And external 12v battery supply is connected which is required for dc motor. Working of project is when one person come

in front of Automatic Hand sanitizer dispenser machine with temperature and pulse detection machine then this person put her hand in front of ultrasonic sensor with given distance limit sense by sensor and passed signal to motor and motor operate and spray the sanitizer on person hand and after that this person put a finger on side pulse oximetry sensor tap then it detect the pulse rate of person and shows on 16*2 Liquid crystal display. Then he stand in front of temperature sensor it detect the temperature of person and if temperature is more than set limit buzzer will operate and alert the people. After the operation is perform by the machine the data will be send on the one app which is develop on the computer as well as mobile phones.

Advantages :

1. Require less time than hand washing and reduce bacterial count on hand.
2. Easy to refill it.
3. No wastage of water.
4. Automatic touch to free dispenser which reduce the chances of the spread of the disease.
5. Along with the sanitizer dispenser it is also able to measure the body temperature , pulse rate and the oxygen level of the body.

Disadvantages :

1. Due to the sanitizer, our hand may be suffer through the skin allergy like rashes and dry skin.
2. It is also leads to the fire hazards.

Application :

This automatic hand sanitizer dispenser machine is generally used for the commercial as well as domestic purpose. But it is mostly used in commercial purposes like offices , schools , hospitals , hotels ,banks, bars , airports etc.

V. CONCLUSION

This covid prevention machine in that alcohol based hand sanitizers are more effective than soaps, and also easy to use. non contact dispensing is again important to prevent pathogen spreading and it gives on time temperature reading, pulse rate and oxygen level in body. hand hygiene is most important and must be part of our daily life. This machine is also help to reduce the spread of virus.

Model of the Project





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