

Cost Estimation and Fabrication of Automatic Hand Sanitizing Machine

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Abstract: An automatic hand sanitizing machine (also known as automatic hand sanitizer dispenser) is an automated, non-contact type, alcohol-based hand sanitizer dispenser. It is best suited for public place where many people come at a time i.e. at hospitals, work places, offices, schools etc. places. Sanitizer is an alcohol based liquid which is used as disinfectant. Alcohol is basically a solvent, and also a very good disinfectant when compared to other liquid soap or solid soap. It does not need water to wash off. It is also volatile and vaporizes instantly after application to hands. It is also proven that a concentration of greater than 80% alcohol can kill corona virus on hands. Here, an ultrasonic sensor senses the hand placed near it, the Arduino uno is used as a microcontroller, which senses the distance and the result is the pump running to pump out the hand sanitizer.

Keywords: Arduino Uno, Automatic hand sanitizing machine, LED, Peristaltic pump relay module.

1. Introduction

Today's world is passing through a horrific time due to COVID-19 pandemic. Currently Indian is suffering covid's 2nd wave within which many people are dying. Use of mask, sanitizer and maintain 6ft distance etc., are the main precautions against this disease. In this situation automatic hand sanitizing machine (AHSM) can play a pivotal role. Sanitization means cleaning or sterilizing an object or body part like hands or whole body. Sanitization can be done in many ways including Ultra-violet Sanitization, Soap Sanitization, Alcohol Sanitization, Bleach Sanitization and so on. Of the above methods, alcohol was found to be more useful for human beings since it is harmless on skin surface, vaporizes easily and kills most of the viruses, bacteria, and also removes dirt in our hands. Alcohol may be expensive for mass scale sanitization of buildings or rooms and a major disadvantage is that, alcohol is highly inflammable and requires careful storage to avoid catastrophe. Alcohol also makes hands dry since it absorbs moisture, and hence also needs addition of moisturizers. Alcohol based hand sanitizers are also provided with antiseptic disinfectants like Chlorohexidine Gluconate. Minimum concentration of alcohol in hand sanitizers must be greater than 70% for effectiveness against viruses. But, repeatedly touching the hand sanitizer containers to get a drop of sanitizer again initiates contact with persons, which may be risky. Hence there is need for non-contact-based hand sanitizer dispense.

2. Block Diagram

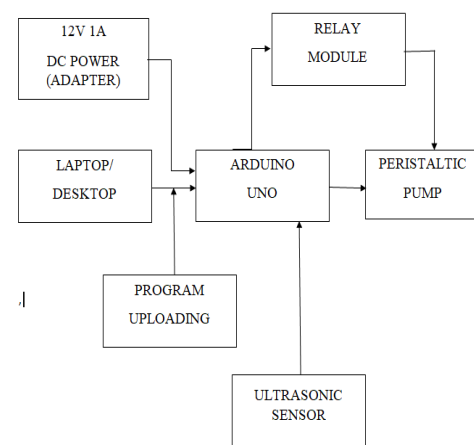


Fig. 1. Block diagram

Figure 1 shows the block diagram of AHSM. The main part of this machine is arduino uno. We can say it is the CPU of the instrument. Basically the arduino program is uploaded to the UNO after that it starts to run. It is an open loop system. The UNO controls the relay, ultrasonic sensor and motor operation simultaneously.

3. Components Details

Ultrasonic Sensor: An ultrasonic Sensor is an electronic device that measures the linear distance between two objects or two targets by using very large frequency sound waves and it converts the reflected sound waves into an electrical signal. It is used to avoid and detect obstacles with robots like biped robot, obstacle avoider robot, path finding robot etc. and to measure the distance within a wide range of 2cm to 400cm.



Fig. 2. Ultrasonic Sensor

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Arduino UNO: The arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button.



Fig. 3. Arduino UNO

Relay Module: A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit.

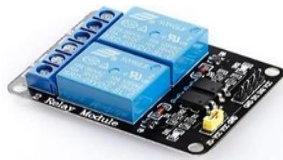


Fig. 4. Relay Module

Solenoid Valve: A solenoid valve is an electrically controlled valve. The valve features a solenoid, which is an electric coil with a movable ferromagnetic core (plunger) in its centre. In the rest position, the plunger closes off a small orifice. An electric current through the coil creates a magnetic field.



Fig. 5. Solenoid valve

Peristaltic Pump: Peristaltic pump is so a common type of pumps that they can be found at home, in fields, on farms and other places. It is exclusively used for displacing water. This pump runs on different sources of power.



Fig. 6. Peristaltic Pump

Male - Female Connector: A male connector is commonly

referred to as a plug and has a solid pin for a centre conductor. A female connector is commonly referred to as a jack and has a centre conductor with a hole in it to accept the male pin.



Fig. 7. Male-Female connector

LED: A Light Emitting Diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. It is used as indicator and decorating component as well in this project.



Fig. 8. LED

Plastic Outside Cover: It covers the components & used for its good looking also.



Fig. 9. Plastic outside cover

4. Working Principle

Germs are everywhere, and we need to apply caution because of what the world is going through now. Sanitizing your hands cannot be overemphasized because these germs can get into hands and items we touch during our day to day activities, which can make us sick. Cleaning hands regularly with hand sanitizer is one of the most important steps we can take to avoid being ill or spreading germs to those around us.

When we need to have the sanitizer or wash our hands, the user's hands are placed under the nozzle and before the sensor. The activated sensor will further activate a pump that dispenses a specific amount of sanitizer from the nozzle. When the ultrasonic sensor detects the hand, the green indicator light will light up. This indicates that the hand sanitizer is active and will discharge liquid from the hand sanitizer. The pump motor will run for 3 milliseconds, because the program is with a delay of 3 milliseconds. When no hands are present in front of the device, no reflection of light takes place, and therefore, no pulse is sensed. In this paper ultrasonic operation has also described in brief separately. An ultrasonic sensor senses the closeness of

hands when placed under the machine. It works on ultrasonic wave's reflection principle. This sensor module provides 2cm - 400cm non-contact measurement function, the ranging accuracy can be reached upto 3mm. in this paper we consider maximum distance of hand from the sensor is 10cm. The modules include ultrasonic transmitter, receiver and control circuit. The basic principle of work is as follows: using IO trigger for at least 10microseconds high level signal. The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. If the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time × velocity of sound (340m/s) / 2. As the controller receive High signal from the sensor module it triggers the pump to pull water from storage area and send to the nozzle spray the sanitizer. The program runs the pump for 3 milliseconds. Even we can change the time as per our requirement through program.

A. Programme

```
#define echoPin 4
#define trigPin 5
int long duration;
int distance;
const int motor= 10; // pin connected to 9v relay module
void setup()
{
  pinMode(echoPin,INPUT); // defining pin modes
  pinMode(trigPin,OUTPUT);
  pinMode(motor, OUTPUT);
}
void loop()
{
  digitalWrite(trigPin,LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin,HIGH);
  delayMicroseconds(10);
  duration=pulseIn(echoPin,HIGH);
  distance=(duration*0.034/2); // now you got the distance
  if(distance<=10) // checking the presence of hands
  in 10 cm limit
  {
    digitalWrite(motor,HIGH); // if present motor operates
  for some time
    delay(3000); // delay value to changes the
operating time
    digitalWrite(motor,LOW); // pump stop working for
some time
    delay(3000); // some delay prevents continous
operation
  }
  else
  {
    digitalWrite(motor,LOW); // if no hands detected - no
operation
  }
}
```

B. Circuit Diagram

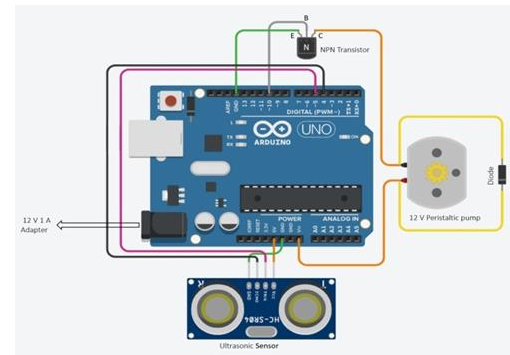


Fig. 10. Circuit diagram

5. Cost Estimation and Materials List

Table 1
Cost Estimation of the Project

Name of the Items	Quantity	Rating	Price (In Rs.)
Water Pump	1	12 V DC	1000
Solenoid Valve	1	24V DC	300
Plastic outside cover	1	-	700
Arduino UNO	1	7-12 VOLT	250
Ultrasonic Sensor	1	40-70 KHz	250
Relay	1	5 VOLT	350
Male Female Connector	1	Male dia- 0.8 inch Female dia- 0.6 inch	20
Spray Nozzle	1	15-40 psi	200
LED	1	5mWatt	20
PVC tube (mm ODI)	1	20 mm Dia	50
Tube Connector	1	-	200
Plastic tube connector	1	-	30
TOTAL			3370

A. Future Scope

By showing this report we can get any bank loans for starting a venture. Willing persons who are interested to start up a business of automatic hand sanitizing machine, they can easily understand the about costing and material required for it. If this project will run then it is a good opportunity for us to plan a business with this.

B. Application

It mostly used in hotels, restaurants, schools, offices, homes, hospitals, factories, and industries. During the time of COVID-19, it is one of the most needed products for mankind. It is available mainly at the main gate on any organization, corporate houses, banks, shopping malls, airports, and theatres. In short, it needed at every place where person to person contact could be possible.

6. Conclusion

Although, many scientific and professional research

proclaim that hand sanitizers do in fact prevent the spread of diseases. It is still an alternative of hand washing with soap and water, for the most efficient way to prevent spreading of diseases. We have learnt a lot of things from this project:

- From this project we have come to know how to create an Automatic Hand Sanitizing Machine, it's uses, what prevents and why used.
- It is used to prevent some virus bacteria of several diseases and replace the soap. We can use it in a place with no sink facility.
- Also, we have learnt how to start-up a business plans with this product.
- How to calculate its cost estimation?

It is important to use the good quality sanitizer in the proper way. Alcohol-containing hand sanitizers are the most effective, and it must be used in a dime sized amount, spreading it all over

your hands, between your fingers and covering all surface area. This is the only way in which, hand sanitizers will fully complete its job and prevent the spread of diseases.

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