



DE MINI PROJECT

TOPIC : **AUTOMATIC HAND SANITIZER**

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BRANCH: EEE

SECTION: A



REPORT

Title of project: AUTOMATIC HAND SANITIZER

Aim: To sanitize the hands without any physical contact.

Abstract:

An automatic hand sanitizer is a device that sprays sanitizer on the hands without any physical contact. After the year 2020, the world will never be the same. All the people have affected by COVID – 19 which is still prevailing in today. The requirement of masks and sanitizers has raised all of a sudden. There were 3 phases of pandemic and the people are in fear of the fourth. So, it is must for us to wear masks and be sanitized.

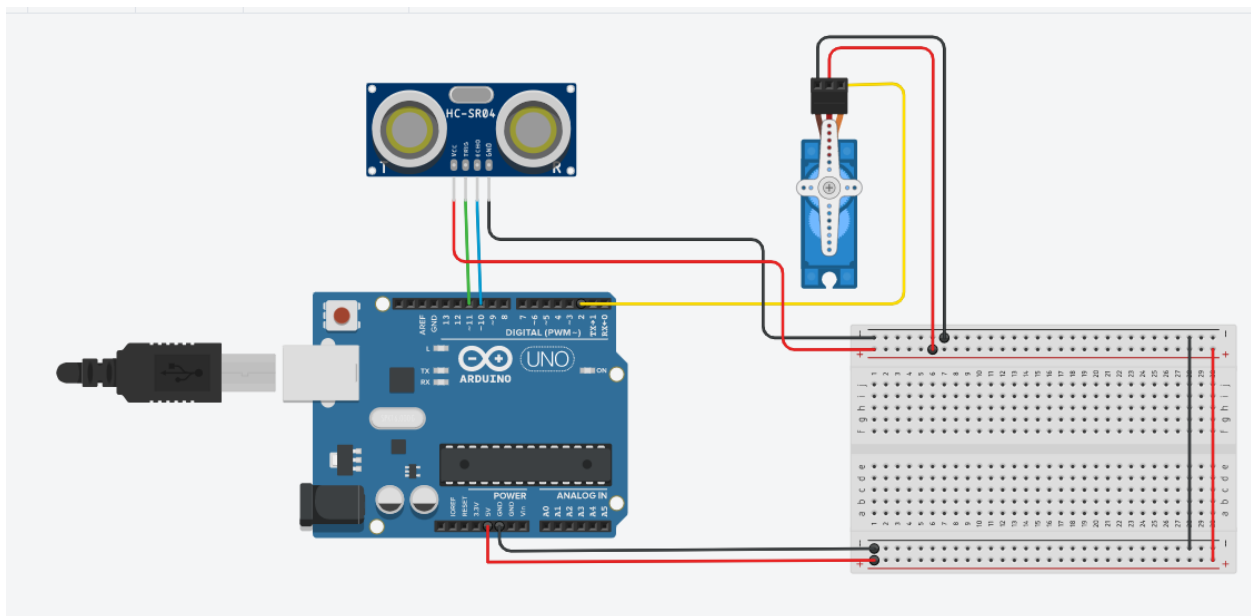
BUT WHAT IF THE PROCESS OF SANITIZATION MAY LEAD TO THE VIRUS SPREAD?

When people use sanitizers in public areas like malls, hospitals, restaurant, railway stations etc., there is a huge chance of spread of corona virus as the people touch the sanitizer in order to spray it. As contact is done, it thus spreads virus further. Here the necessity for an automatic hand sanitizer arises.



An automatic hand sanitizer dispenser helps in dispensing a controlled amount of sanitizer. They are often used in conjunction with automatic faucets in public restrooms. They help conserve the amount of sanitizer used and stem infectious disease transmission.

CIRCUIT DIAGRAM:



HARDWARE DESCRIPTION:

The components used in the circuit are,

1. ULTRASONIC SENSOR – HCSR04:



Specifications

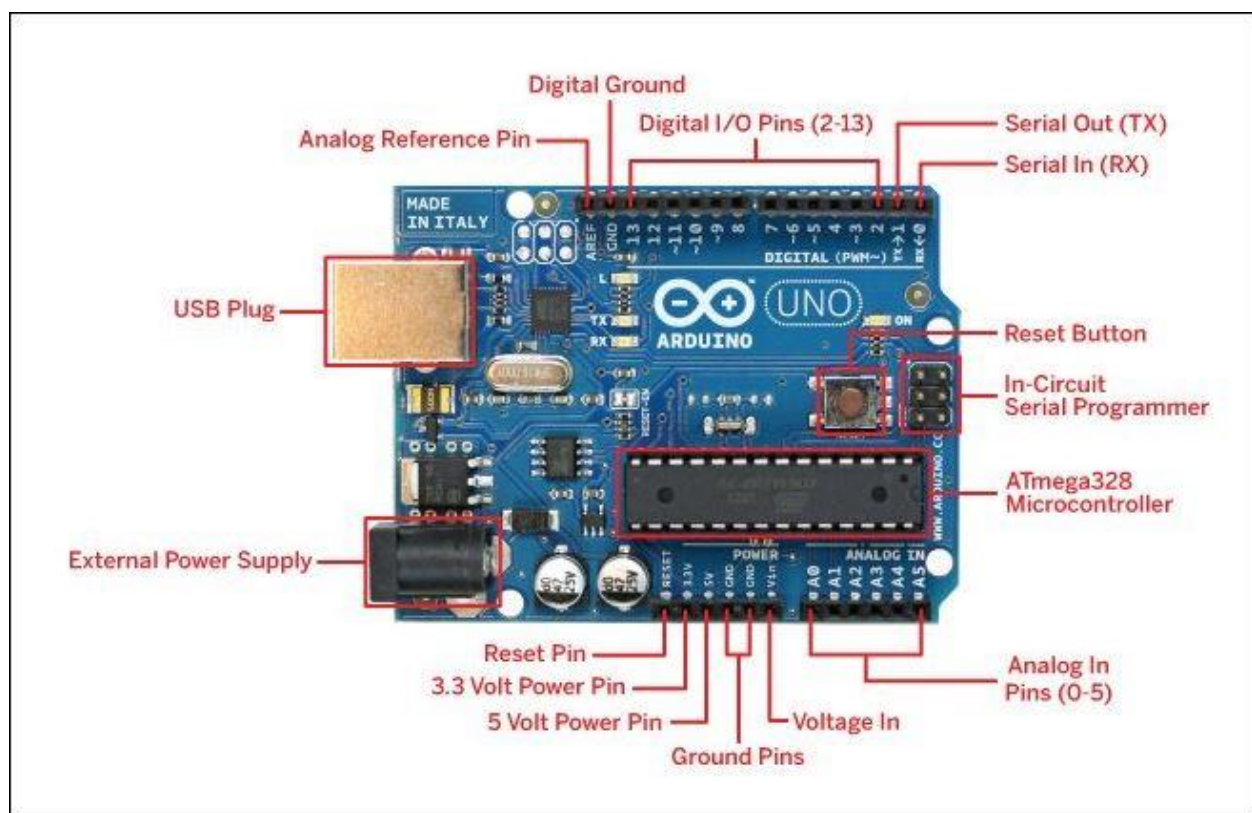
- Power Supply: DC 5V
- Working Current: 15mA
- Working Frequency: 40Hz
- Ranging Distance: 2cm – 400cm/4m
- Resolution: 0.3 cm
- Measuring Angle: 15 degrees
- Trigger Input Pulse width: 10uS
- Dimension: 45mm x 20mm x 15mm

This is the key component in the circuit. It is used to calculate the distance between the hand of the person and the sanitizer. It plays a main role in function of the sanitizer. It consists of four terminals – Vcc (power input to sensor), trigger, Echo, Ground.

It works by sending out ultrasonic waves at a frequency above the range of human hearing. The trigger sends the signal and if the obstacle is detected the signal or the waves are reflected back and received by echo. The crystal visible on the module is responsible for the clock pulse. Sound waves can reflect off any air-other media boundary. The distance of obstacle from the sensor is calculated and this value is sent to the Arduino.

The HC-SR04 module Trigger pin when set HIGH does not immediately set off an ultrasonic wave. Instead, a burst of 8 ultrasonic waves are sent out from the transmitter, invoked on the falling edge of the Trigger pin (after set HIGH). The minimum length of the Trigger pin HIGH pulse needed to invoke the ultrasonic pulse burst is 10 microseconds.

2.ARDUINO UNO R3:



Arduino uno R3 is a microcontroller board. It has 20 output/input pins of which 6 pins can be used as analog inputs and 6 as PWM (pulse width modulation outputs), 16Mhz resonator (generates clock signal), USB connection, power jack, in-circuit system programming (ICSP) header, and a reset button. It can be started if connected to computer using USB. Arduino has an extensive set of support libraries.

When it reads the distance from the ultrasonic sensor, it follows the code and gives command to servo motor.

SPECIFICATIONS:

- It is an ATmega328P based Microcontroller
- The Operating Voltage of the Arduino is 5V
- The recommended input voltage ranges from 7V to 12V
- The i/p voltage (limit) is 6V to 20V
- Digital input and output pins-14
- Digital input & output pins (PWM)-6
- Analog i/p pins are 6
- DC Current for each I/O Pin is 20 mA
- DC Current used for 3.3V Pin is 50 mA

3.SG90 MICRO SERVO MOTOR:

SPECIFICATIONS:

- Product: SG90 Servo.
- Torque: 2.0kg/cm (4.8V), 2.2kg/cm (6V)
- Speed: 0.09s/60° (4.8V), 0.08s/60° (6V)
- Rotate angle: 180°
- Operating voltage: 4.8 ~ 6V.
- Gear: plastic.
- Dead band: 7us.

- Weight: 10.5g.



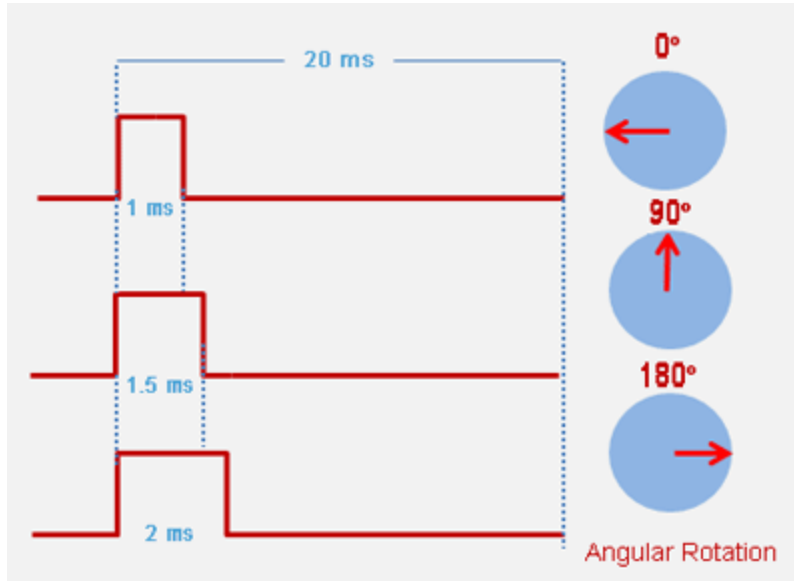
It serves as driver to press the pump bottle. Micro Servo Motor SG90 is a tiny and lightweight server motor with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. One can use any servo code, hardware or library to control

these servos. This motor is used in low-cost projects. SG90 is also compatible with the Arduino software. It consists of 3 terminals – ground, power and signal.

How does a servo motor work?

Servo motor is controlled by PWM (Pulse with Modulation) which is provided by the control wires. There is a minimum pulse, a maximum pulse and a repetition rate. Servo motor can turn 90 degrees from either direction from its neutral position. The servo motor expects to see a pulse every 20 milliseconds (ms) and the length of the pulse will determine how far the motor turns.

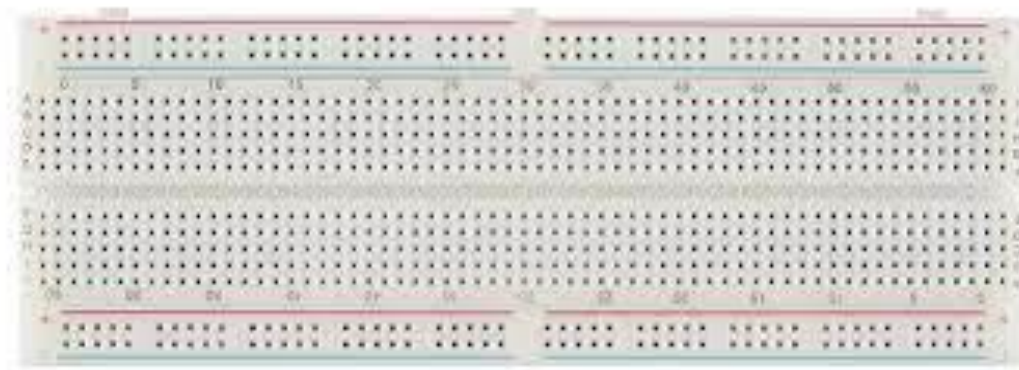
Servo motor works on **PWM (Pulse width modulation)** principle, means its angle of rotation is controlled by the duration of applied pulse to its Control PIN. Basically, servo motor is made up of **DC motor which is controlled by a variable resistor (potentiometer) and some gears**. High speed force of DC motor is converted into torque by Gears.



4. BREADBOARD:

A breadboard is used to build and test circuits quickly before finalizing any circuit design. The breadboard has holes into which circuit components like ICs and resistors can be inserted.

It acts as a bridge between the sensor, motor and Arduino.



5. JUMPER WIRES:

Jumper wires are used for connections and have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.



6. SANITIZER and WIRE:

The basic requirement is sanitizer and a wire that connects motor to pump of the sanitizer. When the motor rotates the sanitizer is pumped and sprayed.

CODE FOR ARDUINO:

```
int servo=2;

int trigpin=11;

int echopin=10;

long duration;

int distance;
```

In these lines, we are giving initial inputs as we connected the servo motor at position 2 of Arduino, trigger pin of ultrasonic sensor is connected to 11 and echo pin is connected to 10 slot of Arduino. Then 2 different variables duration and distance are declared.

```
#include <Servo.h>

Servo myservo;

int pos=0;

void setup()

{

    pinMode (trigpin, OUTPUT);

    pinMode(echopin, INPUT) ;

    myservo.attach(servo) ;

    myservo.write(0) ;

    Serial.begin(9600);

}
```

In setup function, we assigned trigger pin to give the output as an ultrasonic wave and echo pin to receive back the signal. Then we are setting the initial position of servo motor at 0 degrees.

```

void loop()
{
    digitalWrite(trigpin,LOW) ;
    delayMicroseconds(2) ;
    digitalWrite(trigpin,HIGH) ;
    delayMicroseconds(10) ;
    digitalWrite(trigpin,LOW) ;
    duration=pulseIn(echopin,HIGH) ;
    distance=duration*0.034/2;
    Serial.print("distance:");
    Serial.println(distance);

```

Here, initially when the code starts running we are delaying the initial pulse of trigger pin by 2 micro seconds and then a high pulse of 10 microseconds. Then if there is an obstacle, then the duration between the pulse leaving and then receiving by the echo pin. Then this time is used to calculate the distance between the obstacle and sensor.

```

if (distance<30) {
    myservo.write(45);
    delay(100) ;
    myservo.write(90) ;
    delay(100) ;
    myservo.write(135) ;
    delay(100) ;
    myservo.write(180) ;
    delay(1000) ;

```

```

    myservo.write(0) ;

    delay(3000) ;

}

}

```

Then, after the distance is calculated, here if the distance is greater than 30 cm, it will return. If the distance is less than 30 cm, then signal is given to servo motor to move by an angle of 45 degrees and stay for 0.1 seconds, then move to 90 degrees position and stay for 0.1 seconds, then move to 135 degrees position and stay for 0.1 seconds and finally move to 180 degrees position and stay for 1 second then move to initial position. Then after 3 micro seconds this loop will be repeated.

```

1  // C++ code
2  // servo library is used
3  int servo=2;
4  int trigpin=13;
5  int echopin=10;
6  long duration; // time
7  int distance;
8  #include <Servo.h>
9  Servo myservo;
10 int pos=0;
11 //the below code is used to set up the circuit trigpin is as output
12 //echopin as input and intially distance set to 0
13 void setup()
14 {
15     pinMode (trigpin, OUTPUT);
16     pinMode(echopin, INPUT) ;
17     myservo.attach(servo) ;
18     myservo.write(0) ;
19     Serial.begin(9600);
20 }
21 // the below is a loop programme which keeps on running contionuously
22 void loop()
23 { //initially trig pi set to low
24     digitalWrite(trigpin,LOW) ;
25     delayMicroseconds(2) ;
26     // after some delay it is set to high
27     digitalWrite(trigpin,HIGH) ;

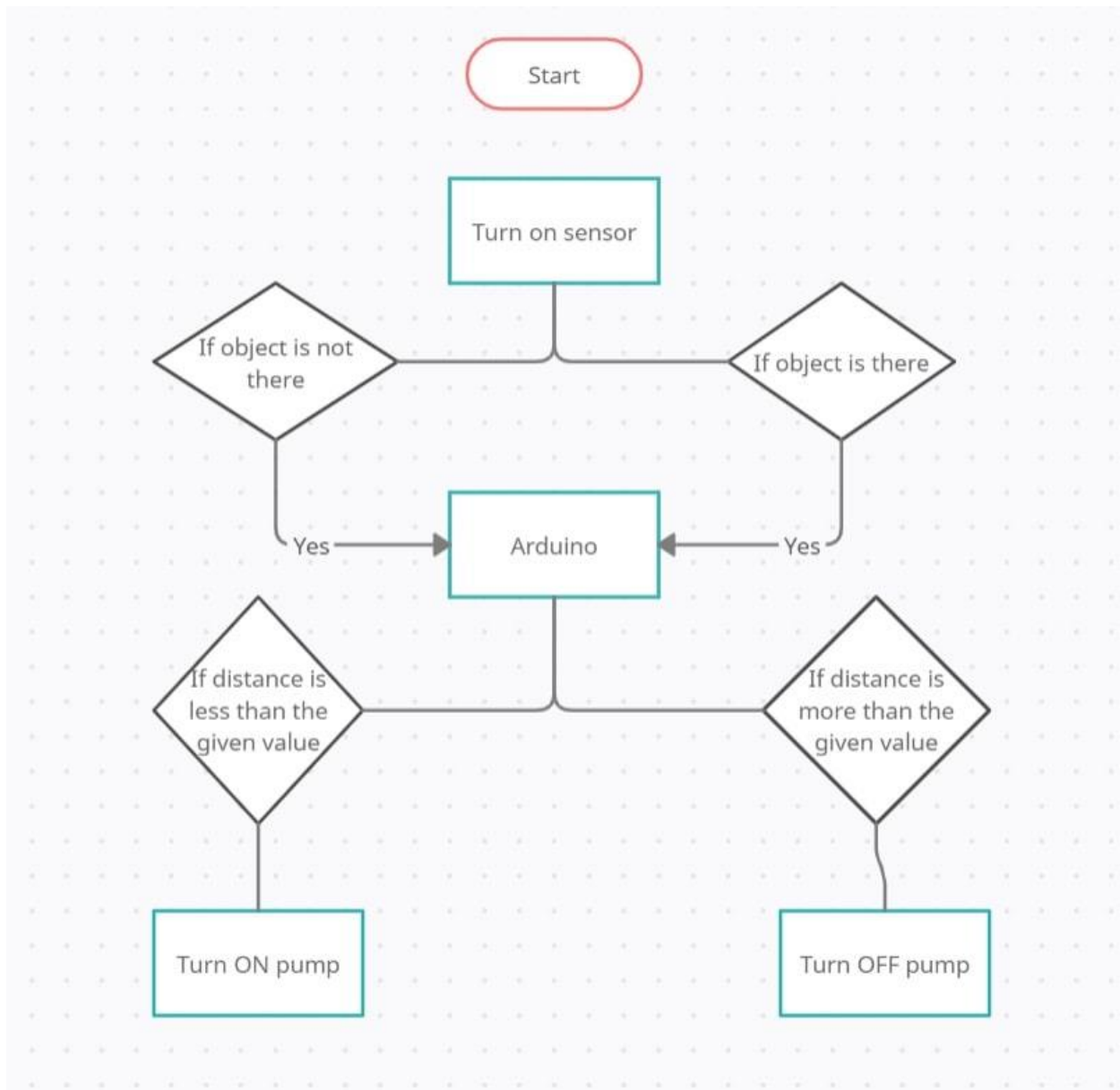
```

```

26 // after some delay it is set to high
27 digitalWrite(trigpin,HIGH) ;
28 delayMicroseconds(10) ;
29 digitalWrite(trigpin,LOW) ;
30 duration=pulseIn(echopin,HIGH) ;
31 //the distance is calculated between hand and sensor.
32 distance=duration*0.034/2;
33 Serial.print("distance:");
34 Serial.println(distance) ;
35 // if distance is less than 30 cm,first it rotates to 45 degrees,then 90,135,and 180 degrees.
36 if (distance<30) {
37   myservo.write(45);
38   delay(100) ;
39   myservo.write(90) ;
40   delay(100) ;
41   myservo.write(135) ;
42   delay(100) ;
43   myservo.write(180) ;
44   delay(1000) ;
45   myservo.write(0) ;
46   delay(3000) ;//after the spray it delays by 3 seconds and returns to its original position and is reset.
47 }
48 }

```

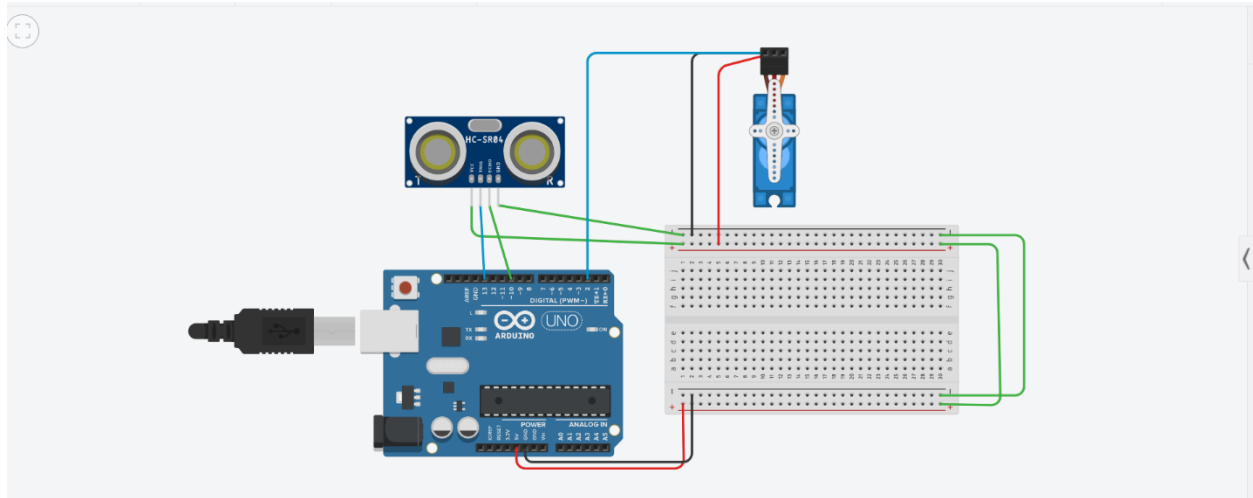
This above code is set in the Arduino and thus the components work based on this code.



THE ABOVE IS THE BASIC PRINCIPLE BEHIND THE WORKING.

WORKING AND SIMULATION:

Link: <https://www.tinkercad.com/things/l363e13tiCN-automatic-hand-sanitizer/editel>



1. The USB from the computer is connected to Arduino and it reads the code.
2. When a person puts his hand below the pump the ultrasonic sensor activates.
3. The trigger sends the ultrasonic waves, when hit by obstacle it reflects and echo pin receives it. Speed = 340m/s.
4. It calculates the distance between the sensor and the hand by sending the ultrasonic waves and receives the echo.
5. It calculates the distance using the formula $\text{distance} = (\text{speed} * \text{time})/2$.
6. This reading is sent to the Arduino uno r3.
7. It reads the code and processes it. If the limit set is 30 cm and the calculated distance is less than 30cm, it sends signal to the servo motor.
8. The motor rotates to 45 degrees and halts for 0.1 milliseconds.
9. It repeats the same and halts at regular intervals for 90, 135 and 180 degrees.
10. When it completes a rotation of 180 degrees then it halts for 1 second and returns to initial position, also the distance is also set to zero simultaneously.

11. As a cable is connected from motor to pump of sanitizer, it is sprayed into the hands of the person.
12. Thus is a contact less way to sanitize and thereby prevents further spread of corona virus or any other deadly virus.

CONCLUSION:

- An automatic hand sanitizer has been developed.
- Its primary use is the no-contact property.
- It is also an efficient way to use the sanitizer in a controlled way that is conserves the amount of sanitizer.
- It is cost efficient and easily affordable.
- It can be used in bulk quantities at public toilets, malls, hospitals, railway stations, etc.
- Enough amount of sanitizer and looks stylish.
- Its fast, safe and efficient for a better future.

Thank You!!

Rahul Bomma – 202110

REFERENCES:

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<https://timesofindia.indiatimes.com/most-searched-products/electronics/miscellaneous/touchless-automatic-hand-sanitizer-dispenser-suitable-for-homes-and-commercial-premises/articleshow/78426243.cms>

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CIRCUIT SIMULATION POWERED BY TINKERCAD



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THE END