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Disinfection Station for Face Masks

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Disinfection Station for Face Masks

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ABSTRACT

As the world currently faces a global pandemic where anyone can get sick from COVID-19, one way for people to stay safe from the general public is by wearing face masks. This project involves the design, construction, and testing of a disinfection station device for face masks where the user can clean and dry their face masks in order to make them safe to be used multiple times. The device consists of a push button, potentiometer, servo motors, DC motor, and LEDs attached to an Arduino UNO. This device follows a finite state machine approach, where it uses a push button to move from one state to another. In the first state, it will turn the servo motors to move the tray of face masks down and back up to a box filled with water to wash the face masks. In the second state, it will turn the DC motor using a potentiometer to dry off the face masks. During the operation of the device, different LEDs will emit different colors to show different states of the program. Additionally, by using data communication with the PC Serial Monitor, the same actions can be performed as the push button, to go from one state to another, if the user chooses to not use the push button. This project will undergo troubleshooting by using sample codes to test the hardware components. By the end of this project, a complete documentation of the project will be recorded in a poster format. Due to the world having to face COVID-19, now is the time to show the importance of creating devices such as this to stay safe and healthy. This project was inspired by a similar device created by Jean Noel Lefebvre.

INTRODUCTION

Face masks became so crucial during this time of the year due to COVID-19. People of all age groups need to wear face masks. By wearing face masks, you can stay safe and keep others safe as well. However, washing face masks every time you use them can be a big hassle, or keep buying a face mask every day can be expensive. Therefore, our project involves washing and drying face masks by using a Disinfection Station Device. This device will clean and dry your face masks to make them safe to be used multiple times.

HARDWARE

- By using cardboard and glue gun, we built the disinfection station for the face mask.
- By cutting copper aluminum wire and gluing them together, we were able to create the grid to place the mask on top.
- Then we placed the aluminum foil tray inside the disinfection station.

Figure 1: First step of construction process

Figure 2: Creating the grid to place face masks

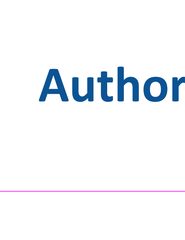

Figure 3: Third step of construction process

- By using all these components (DC motor, servo motors, push button, potentiometer, LEDs, temperature & humidity sensor connected onto a breadboard with subcomponents of resistors, diode, NPN transistor to an Arduino UNO), we built the circuit and connected it to the disinfection station.

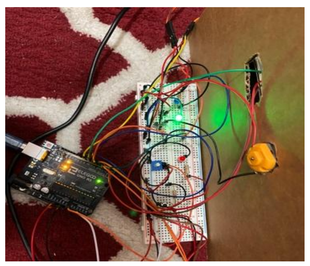

Figure 4: Circuit built to operate the disinfection station

Figure 5: Final step of construction process

- Lastly, we tied the copper wire grid to servo motors and placed the mask on top.

FINITE STATE MACHINE

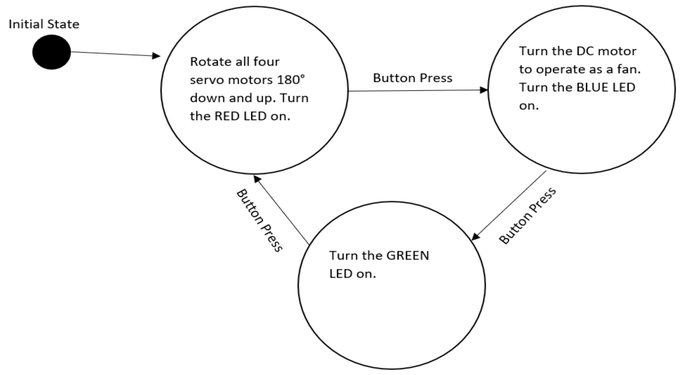

Figure 6: Finite State Machine Design for how the device operates

SCHEMATICS

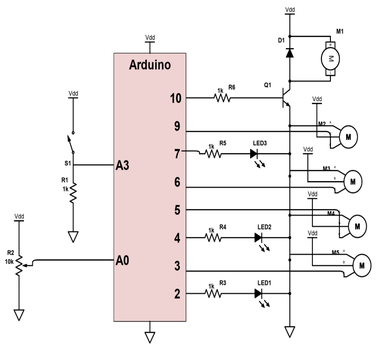

Figure 7: Electrical Circuit of the Device

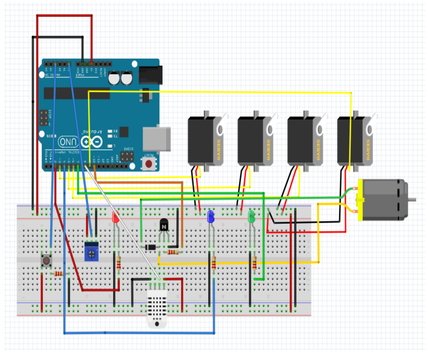

Figure 8: Breadboard Assembly of the Device

ACKNOWLEDGEMENTS

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PROGRAM CODE (SAMPLE)

```
//state functions
void One_fn() {
  digitalWrite(red_light_pin, HIGH); // turns the RED LED on
  analogInPin_val = analogRead(analogInPin); // read the analog value of the potentiometer
  servo_pos = map(analogInPin_val, 0, 1023, 0, 180); // scale it to control the servo motors using potentiometer (value from 0 to 180)
  myservo1.write(servo_pos); // set the first servo motor position
  myservo2.write(servo_pos); // set the second servo motor position
  myservo3.write(servo_pos); // set the third servo motor position
  myservo4.write(servo_pos); // set the fourth servo motor position
  delay(250); // wait for the servo motors to get there
  // print the potentiometer and servo motors analog values on serial monitor
  Serial.print(analogInPin_val);
  Serial.print("   ");
  Serial.println(servo_pos);
  Serial.println("RED LED ON");
}

void Two_fn() {
  digitalWrite(blue_light_pin, HIGH); // turns the BLUE LED on
  digitalWrite(red_light_pin, LOW); // turns the RED LED off
  sensorValue = analogRead(analogInPin); // read the analog value of the potentiometer
  outputValue = map(sensorValue, 0, 1023, 0, 255); // map it to the range of the analog out
  analogWrite(motor_pin, outputValue); // controls the DC motor based on the scale using potentiometer
  // print the potentiometer and DC motor analog values on serial monitor
  Serial.print("sensor = ");
  Serial.print(sensorValue);
  Serial.print("\t output = ");
  Serial.println(outputValue);
  Serial.println("BLUE LED ON");
}

void Three_fn() {
  digitalWrite(green_light_pin, HIGH); // turns the GREEN LED on
  digitalWrite(red_light_pin, LOW); // turns the RED LED off
  digitalWrite(blue_light_pin, LOW); // turns the BLUE LED off
  Serial.print("GREEN LED ON");
}
//end state functions
```

RESULTS

After connecting the sensors to the Arduino, the programming code was uploaded to the device producing the following result. Once the device activates, during the first button press the servo motors pulled down the tray of face masks to the box filled with water in order to wash them then the face masks pulled up. During the second button press, the DC motors which operates as fans were used to dry off the face masks. Lastly, during the third button press, the green LED lit up to show that the process has been completed.

CONCLUSION

Throughout the process of constructing the device, after connecting the pins of the sensors to the Arduino, while programming the code, it took numerous trial and errors to get the push buttons to function based on the finite state machine. Once the device was able to function using push buttons, we programmed it using data communication to send characters for each state using the serial monitor to test that it performed correctly. After constructing the device, the results matched the hypothesis which showed that it worked successfully.

FUTURE WORK

For future work on this disinfection station, we can make the copper wire grid bigger to place two face masks instead of one. Also, we can add two more DC motor fans to speed up the mask drying process. To keep track of time and use the device remotely, we can also add a small clock and operate the device using Bluetooth through the user's phone.