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Automatic Hand Sanitizer Dispenser

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I confirm that I understand my coursework needs to be submitted online via Google Classroom under the relevant module page before the deadline in order for my assignment to be accepted and marked. I am fully aware that late submissions will be treated as non-submission and a mark of zero will be awarded.

Acknowledgement

We would like to express our gratitude to all the people who have been a helping hand providing motivation, encouragement, and inspiration to complete this proposal. We would also like to thank our college and teachers for providing us the chance to do research and expand our knowledge on the topic. This topic has helped us broaden our knowledge and know new facts related to this topic. We would like to thank module leader Mr. Sugat Man Shakya and tutor Sujil Maharjan and Mr. Umesh Nepal for providing guidance related to coursework.

Finally, we aim to provide a detailed, simple, and knowledgeable proposal that is understandable and presentable containing useful information which could be applied everywhere.

Abstract

COVID pandemics are affecting human life in many areas. Various attempts have been made to reduce work-related viral infections. Social distance and hand hygiene from home. When COVID-19 is transmitted by touch and contact, there are WHO Guidelines for regular hand washing or disinfection to reduce the risk of infection. When the disinfectant is dispensed from the bottle and stored manual intervention is required. And most of the hands available so far Disinfectants do not work automatically. This article aims to make automatic hand sanitizer used in hospitals and workplaces places, offices, schools, etc. to mitigate risk contact. Here, the system can detect proximity with the help of ultrasonic sensor and micro controller (Arduino Uno). The controller processes the sensor data and controls motor to eject the sanitizer.

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Automatic Hand Sanitizer Dispenser

1. Introduction

The COVID-19 virus is fast spreading and governments and physicians advise regular hand washing can help prevent the disease. But what if someone who isn't infected with COVID-19 comes into contact with a hand sanitizer used by someone who has been infected with COVID-19? Using an automatic hand sanitizer dispenser is the answer to these questions.

Hand sanitizers (also known as hand sanitizers, hand sanitizers, hand sanitizers, or hand sanitizers) are liquids, gels, commonly used to kill many viruses / bacteria / microorganisms in the hand. Or a bubble. In most cases, hand washing with soap and water is generally preferred. Hand sanitizers are less effective at killing certain types of bacteria such as norovirus and Clostridium difficile, and unlike hand washing, they cannot physically remove harmful chemicals. People can accidentally wipe the hand sanitizer before it dries, and some are less effective because the alcohol concentration is too low.

1.1 Problem Statement:

The demand for hand sanitizers has risen since the outbreak of coronavirus over the world. When a hand sanitizer is applied, the disinfectant is ejected when the pump is pressed by hand. As a result, many people come in contact with the pump's handle, increasing the risk of virus transmission. When switching hand sanitizers consumers must also purchase a container for liquids because the disinfecting container and pumping device are designed to be compatible only between goods from the same manufacturer. As a result, the development of an automatic hand disinfection system compatible with various disinfection containers

is proposed in this work. (Design of Automatic Hand Sanitizer System Compatible with Various Containers,2022)

1.2 Solution to the problem:

To address this issue, we have proposed an automatic hand sanitizer system that can be used in a variety of containers. It is possible to avoid many people encountering the pump handle using the suggested device, preventing fomite viral transmission and making hand sanitizer use considerably more convenient. Furthermore, the system dispenses a consistent amount of hand sanitizer at all times, making refills and replacements simple. Furthermore, compatibility with a variety of disinfection tanks eliminates the need for users to purchase a liquids tank when changing hand sanitizers. As a result, it is both cost-effective and environmentally friendly. The automatic hand sanitizers presented in this research is aimed at assisting non-contact hand sanitizers and preventing virus transmission. (Design of Automatic Hand Sanitizer System Compatible with Various Containers) . Some attractive features of proposed automatic hand sanitizer dispenser are:

1. A touchless solution to provide you the safest solution to sanitize and clean your hands
2. Work on A/C (4 x C Batteries) or D/C battery (DC plug is optional)
3. Heads pumps solution easy to switch and use
4. Can be added with spray Head for Liquid sanitizer or alcohol disinfectant and Foam Head for Liquid soap to be turned into foam
5. Smooth Discharge by its Automatic Induction

1.3 Aim and Objectives

The aim and objectives of this project are given underneath:

Aim:

The major aim of this project is to eventually contribute to contactless hand disinfection in public spaces and the avoidance of viral infection. It also assists in the distribution of a precise amount of sanitizer. It helps to reduce the quantity of sanitizer needed while also preventing the spread of infectious diseases.

Objective:

1. To create a prototype project of an Automatic Hand Sanitizer Dispenser using IoT devices.
2. To Investigate the Internet of Things and its ramifications.
3. To be well-versed in programming ideas, hardware, and software.
4. To figure out the application areas of the project.
5. To keep contactless hand disinfection and viral infection prevention in public locations.
6. To remain cost-effective and environmentally sustainable by reducing waste emissions.

2. Background

2.1 Structure Overview

This project will use an Arduino Uno, an HCSR04 ultrasonic sensor, and a 5V Pumper with a relay module. This mechanism can be adapted to most disinfectant bottles. Before we show you how to create your sensors, let's take a look at the basics of how these sensors work. The ultrasonic sensor uses ultrasonic waves to determine the distance between the transmitter and the obstacle in front of it. Ultrasound is emitted by the transmitting element, reflected by the target, and received by the receiving module. The distance from the sensor to the target is calculated using the concept of time of flight and the known speed of sound. The working principle of this automatic sanitizer dispenser is by activating the 5V Pump to force the dispenser to activate whenever the sensor detects a close-range reading due to an obstacle in its line of sight. Where the relay module acts as a switch that controls the high circuit using the low circuit in the process. When a person's hand goes under the cleaner and blocks the sensor's view, the Arduino board receives a reading in close range and prompts the 5V Pump to turn on and dispense the sanitizer.

2.2 Design Diagram

Hardware Architecture:

Flowchart:

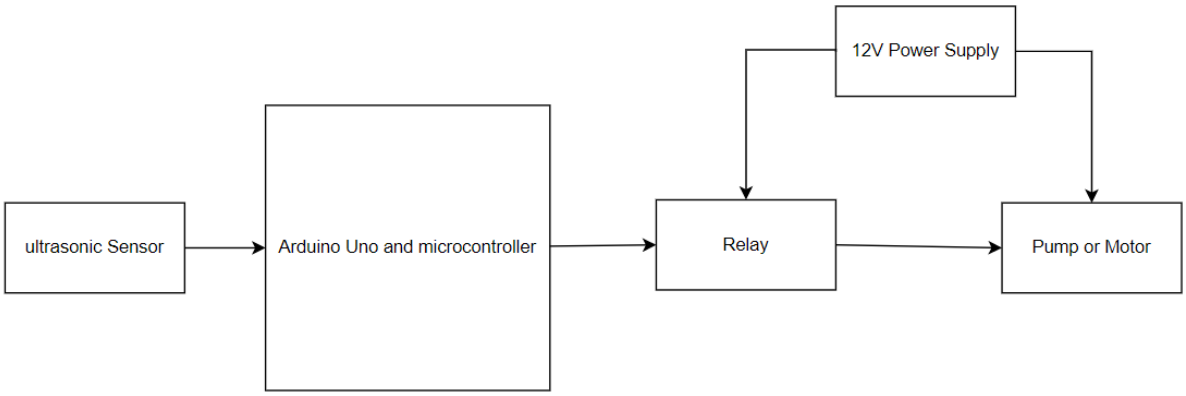

Figure 1: Flowchart

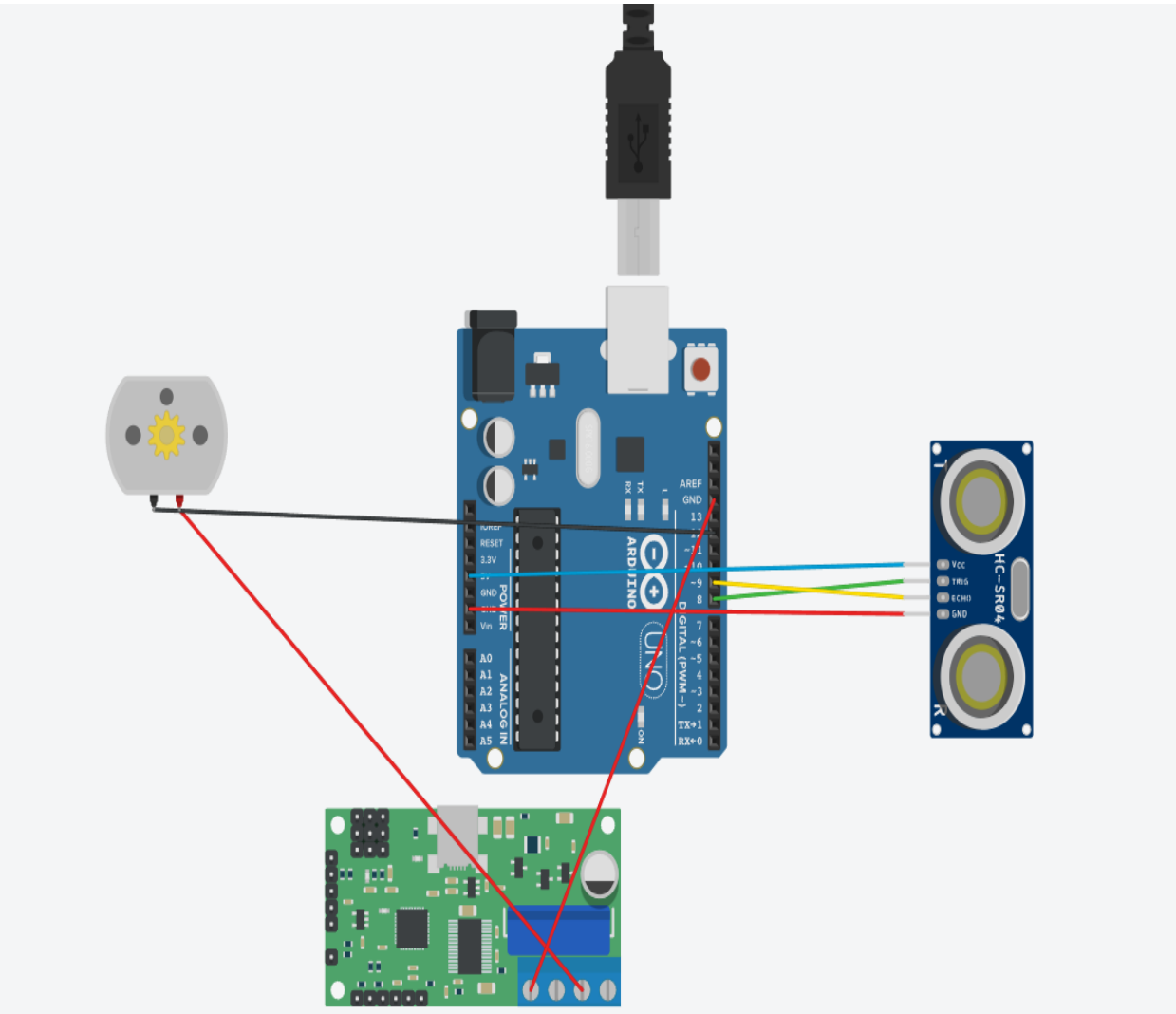

Figure 2: Circuit Diagram

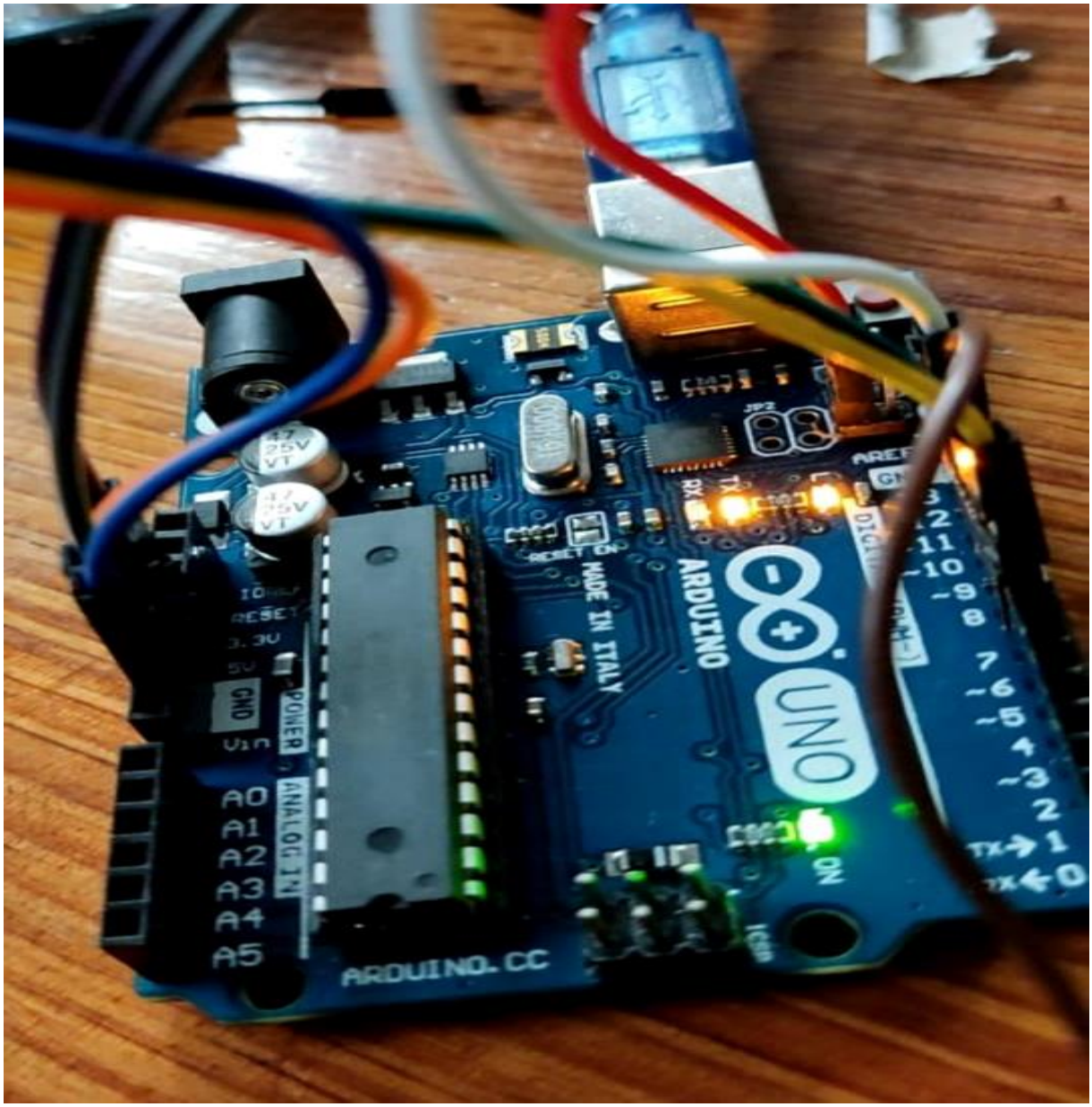

Figure 4: Arduino Connection

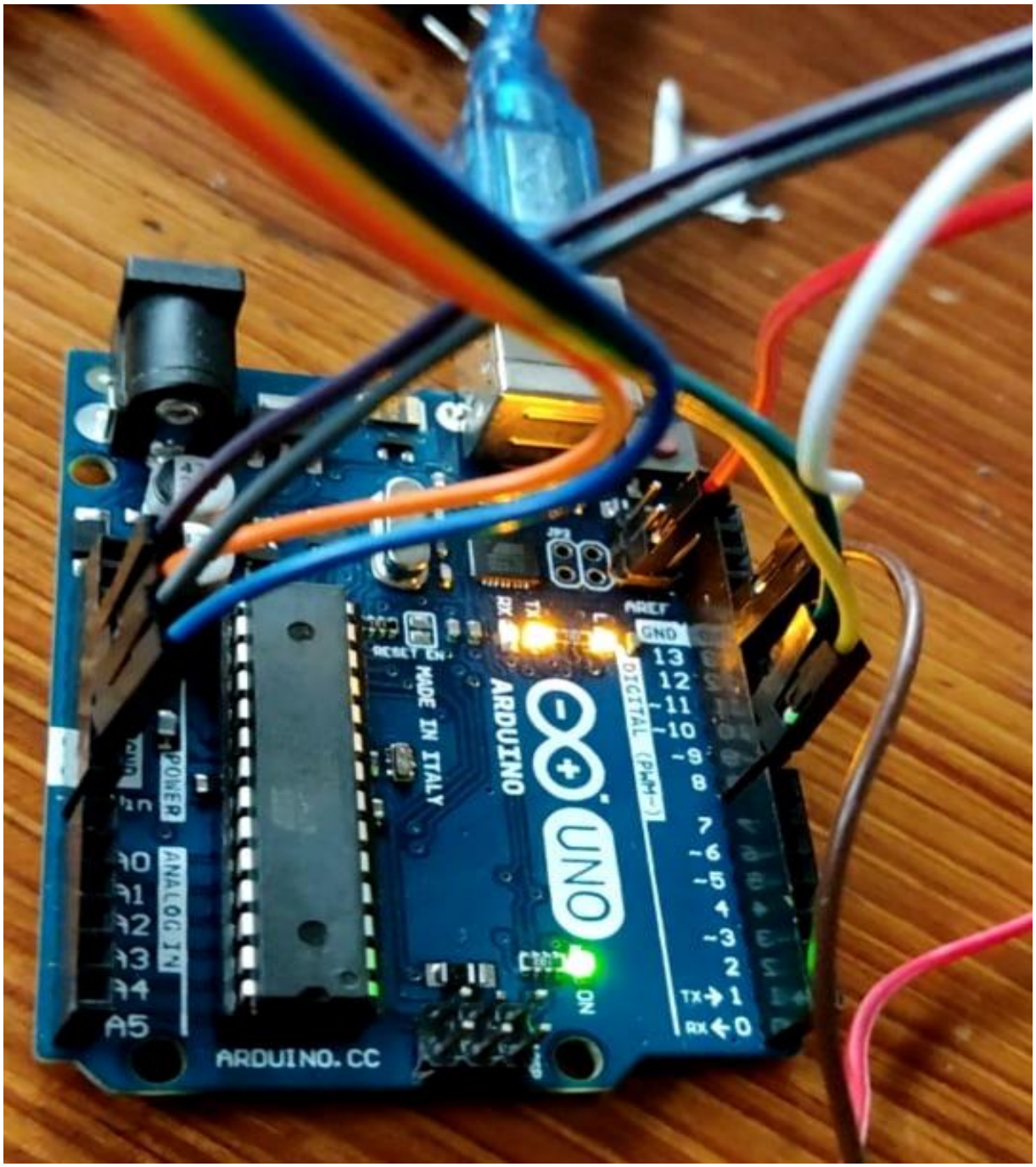

Figure 5: Arduino connection

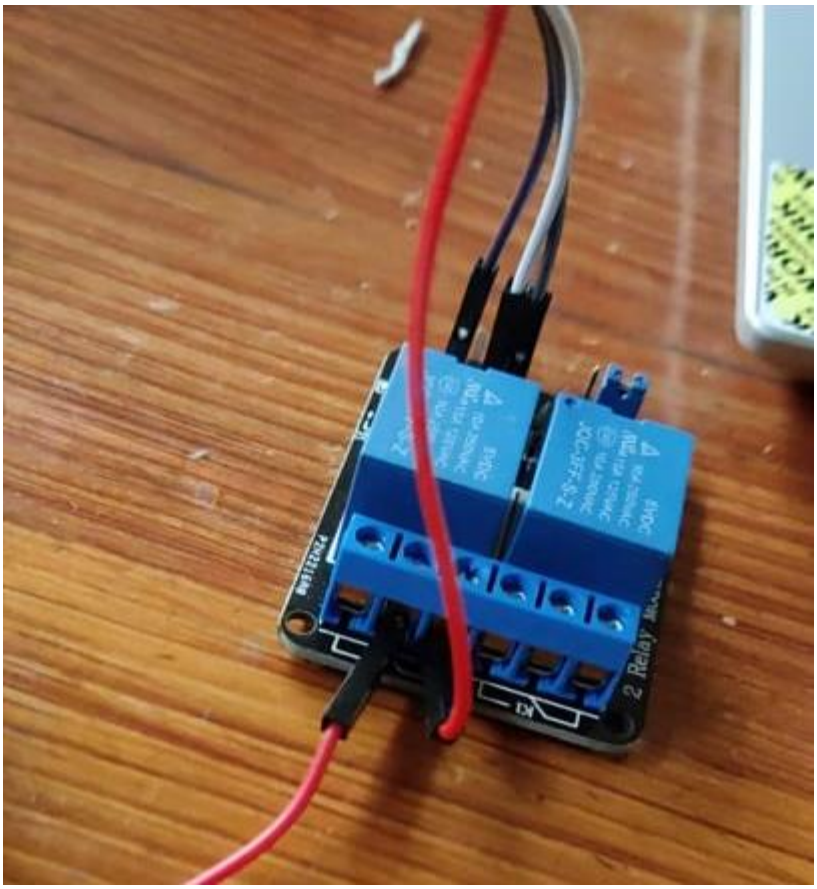

Figure 6: Connection to and out from relay

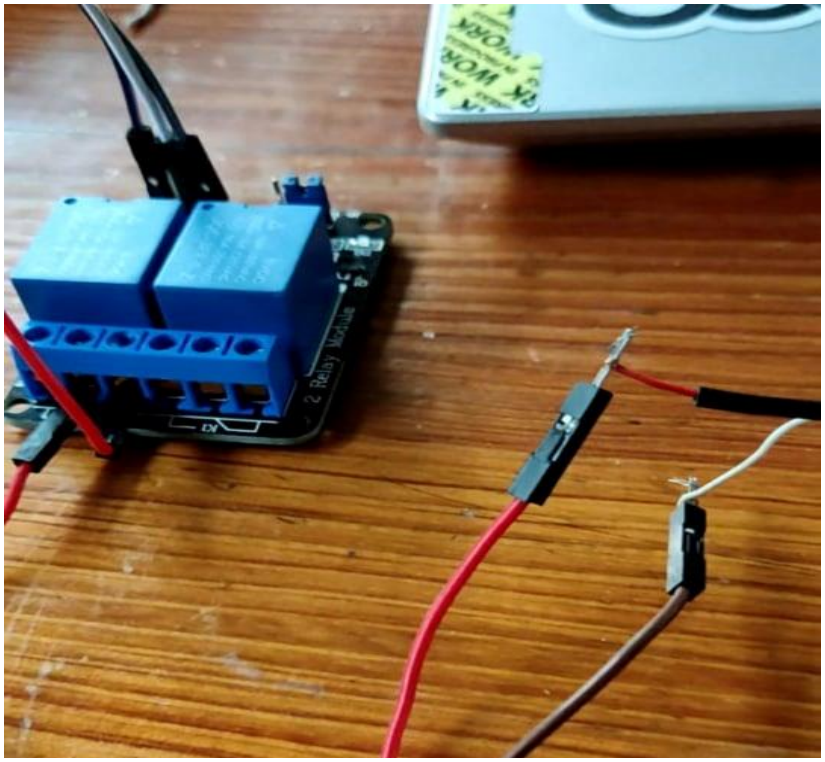

Figure 7: Connection to dc pump from delay

2.3 Requirement Analysis

The following hardware is included in this automatic hand sanitizer creation proposal:

- Arduino Uno

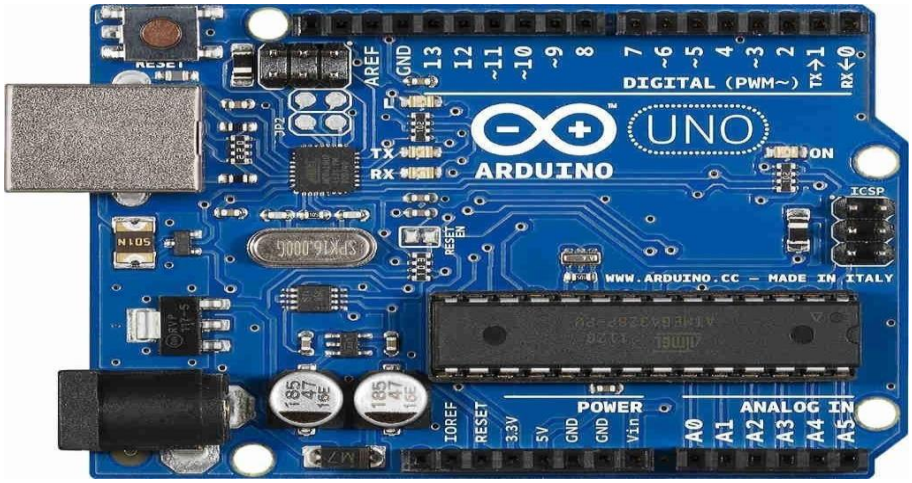

Figure 8: Arduino Uno R3

The ATmega328P-based Arduino Uno is a microcontroller board. Includes 14 digital input/output pins, 6 analog inputs, 16MHz frequency crystal, USB connector, power connector, ICSP header, and reset button.

- Ultrasonic Sensor

Figure 9: Ultrasonic distance sensor

An ultrasonic sensor is a device that uses ultrasonic waves to measure the distance to an object. In an ultrasonic sensor, a transducer sends and receives ultrasonic pulses that convey information about an object's environment.

- Jumper Cable:

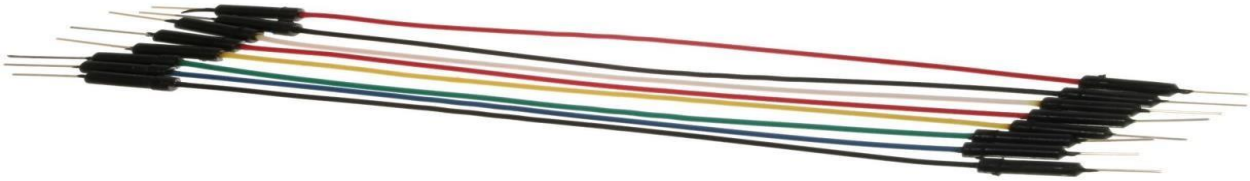

Figure 10: Jumper Cable

Jumper cables are simple cables with connector pins on both ends that allow you to connect two points without soldering. Jumper wires are typically used on breadboards and other prototyping tools to quickly change the circuit as needed. Jumper wires come in a variety of colors, but the colors themselves have no meaning. This means that the red jumper cable is the same as the black jumper cable. However, you can take advantage of colors by distinguishing between different types of connections. B. Earth or current.

- 5V Pumper

Figure 11: 5V Motor

A server motor might be set up in the hand sanitizer container. The bottle`s cause might be related to the motor through a thread. When the server motor turns, the cause is pulled, but while the use of the pumper, the water degree needs to usually be more than the motor. 5V Water Pump that can be powered with the aid of using a 2.5-6V energy supply. Simply connect a tube pipe to the motor output, immerse it in water, and flip it on. Ensure that the water degree is usually more than the DC Pump. Due to temperature, a dry run might also additionally purpose harm to the motor.

- Relay Module

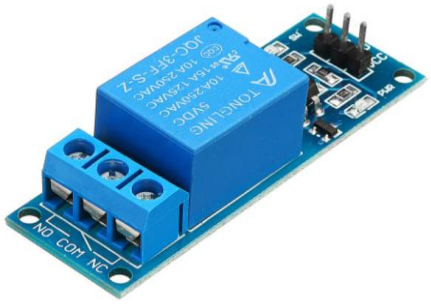

Figure 12: Relay Module

The power relay module is an electromagnetically driven electric switch. Another low-power signal from the microcontroller activates the electromagnet. The electromagnet is pulled to open and close the circuit when energized.

- Hand Sanitizer

Figure 13: Hand Sanitizer

Hand sanitizers, also known as hand **antiseptics** or hand creams, are drugs that are applied to the hands to remove common bacteria (pathogens). Hand sanitizers are generally available in the form of foam, gel, or liquid. If soap and water are not available for handwashing, you should use them.

- Arduino IDE

  The Arduino Integrated Development Environment (IDE), commonly known as Arduino software, includes a text editor for writing code, a message box, a text terminal, a toolbar with buttons for basic operations, and a set of menus. increase. Communicate with your Arduino hardware and upload your program.

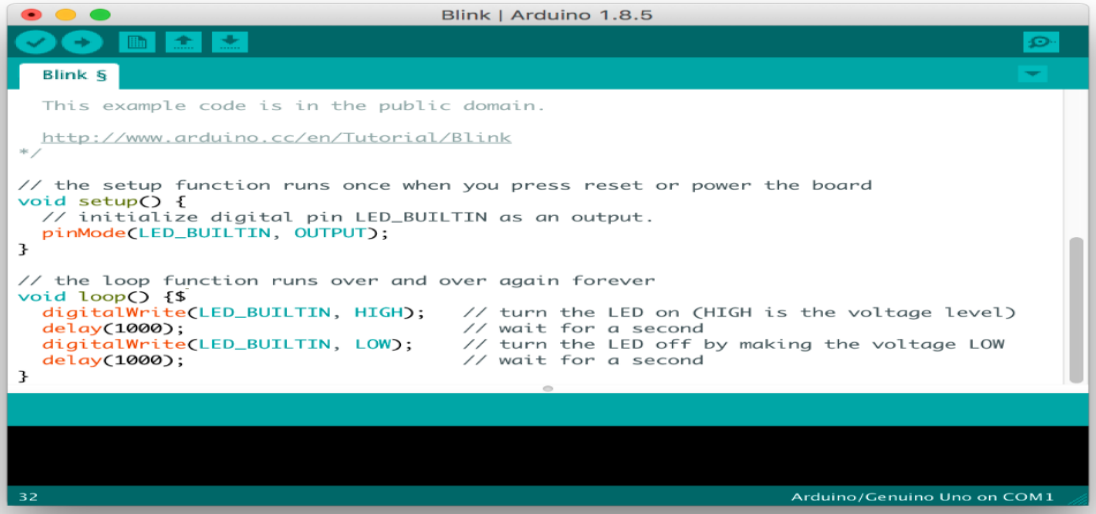

Figure 14: Arduino IDE

3.Development:

In order for the optimize performance of the developed project we have had ability and performance test considering the use of this development into future implementation. Here, we have first assembled all the required tools and hardware. Then, we have implemented the coding for the process to be carried out. The following technique are applied for the final outcome:

Step 1: All the devices and wires were gathered and assembled. The devices gathered are:

a. Ultrasonic sensor

b. Arduino UNO

c. Pump

d. Relay module

e. Jumper wire

Step 2: The Arduino uno was connected to the ultrasonic sensor where the trig was connected to 8 of digital pin of Arduino whereas echo was connected to 9th pin.

Step 3: Then the relay module was connected to the Arduino digital pin 7 whereas pump was connected to the relay at K2 and Arduino Uno on 12th pin.

Step 4: The pipe was connected to the motor and the motor was dipped within the liquid sanitizer.

Step 5: The code was developed and uploaded with the help of the Arduino IDE.

Step6: The product was tested by putting hand infront of the ultrasonic sensor where the activation of the product depended on the distance i.e. within 10 cm. When the hand was sensed the product was activated and when the hand was removed the product was deactivated. This process worked in loop.

Step 7: After the successful testing of the product the outer design of the product was created with the use of cardboard and hot glue.

4. Results and Findings

The purpose of this project is to serve as a basis requirement for disinfection and in determining whether the project is being carried out according to plan. This project allows you to have the exact guidelines of how to build automatic hand sanitizer successfully. This project provides automatic hand sanitizer which can be used without any manual operation which helps prevent spreading of infection. When the sensor senses any foreign object within the assigned distance, then the sanitizer is activated, whereas when the foreign object is kept out of the assigned distance then the sanitizer is deactivated. Hence, a disinfecting device was created which does not need to be physically touched.

Test 1: To test the working of system

Test: To test the product while getting your hands close to the sensor	
Action	Hand was taken closer to the sensor.
Expected Result	The sanitizer should be dispensed by the system
Actual Result	The sanitizer was dispensed
Conclusion	The test was successful, and the system worked

Table 1: Test 1

Figure 15: Test 1 result

Test 2: To test the idle status of system

Test: To test the product while getting your hands far from the sensor	
Action	Hand was taken away from the sensor.
Expected Result	The sanitizer should not be dispensed by the system
Actual Result	The sanitizer was not dispensed
Conclusion	The test was successful and the system was idle while objects were not near to the system

Table 2:Test 2

Figure 16: Test 2 result

5. Future Works

The designed system can be modified and advance features can be added. Some of the improvements that can be done to the system are:

1. This project can be modified into battery less project operated by solar energy which can be charged by keeping it in the sun.

2. This project can be made portable and minimized in size for easy carrying. This project can be implemented with waterproof layer and can be the base idea for other similar ideas.

3. This project can be implemented with the addition of hand wash and water dispenser where when the person has completed washing hand then a dryer is activated then the sanitizer can be activated. This help develop a healthy habit. In this new and exciting project can be implemented with this as the bases.

4. We can even include a measuring sensor which can be used to measure the amount of sanitizer left with the amount being displayed with the current covid-19 update being displayed in a LED display board.

5. A temperature measuring device can also be implemented such that the LED displays the effectiveness of the sanitizer on disinfection with the help of the temperature. We can even modify it into a small, easy to use portable device which can be AI implemented.

6. Conclusion

The goal of this project was to take use of the pump's elasticity and improve people's access to it. We created an automatic hand disinfection device that works with a wide range of containers. The hand sanitizer tank will be pumped once you get your hand close to the device sensor. The automatic hand sanitizers proposed in this research will eventually lead to non-contact hand sanitizers and viral illness prevention in public spaces. In addition, it is economical and environmentally friendly as it reduces waste emissions.

The teamwork and the individual contribution have made this project successful whereas we also have got to know individual strength and developed good skills related to teamwork, communication, and time management. This project helped us identify the IoT and its components and grow sound knowledge on cloud and internet.

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8. Appendix

8.1 Individual contribution plan

Our project began with decision-making processes to figure out how to tackle the project at hand. In this first phase, we discussed much more information that we decided it was time to organize those ideas and begin working on the project. While learning groups are correctly designed and everyone has contributed 100% of their own, it may be an excellent technique for gaining new abilities and enhancing current ones. Each of us contributed to the research, and subsequently, a discussion was made to consolidate our findings.

Team Members	Tasks Performed	Contribution
Arya Amatya	Coding, System designing	33%
Krish Shrestha	Research and resources collection	33%
Sugam Dangal	Circuit creation, Inspection, and management	33%
Srijan Sapkota		1%

Table: Individual contribution plan

Program Code

```
//Pins connected to the ultrasonic sensor

#define trigPin  8
#define echoPin 9

//pump pins

#define pump 12
#define relay 7

long duration;

int range = 5;//range in inches

void setup() {

  // initialize serial communication:

  Serial.begin(9600);

  //initialize the sensor pins

pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);

  //initialize LED pins

  pinMode(pump, OUTPUT);
  pinMode(relay, OUTPUT);

  //set LEDs

  digitalWrite(pump, HIGH);
  digitalWrite(relay, LOW);

}
void loop()
{
// establish variables for duration of the ping,
// and the distance result in inches and centimeters:

  long inches, cm;
```

```
// The PING))) is triggered by a HIGH pulse of 2 or more microseconds.
// Give a short LOW pulse beforehand to ensure a clean HIGH pulse:

  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(5);
  digitalWrite(trigPin, LOW);

  // Take reading on echo pin
  duration = pulseIn(echoPin, HIGH);

// convert the time into a distance
  inches = microsecondsToInches(duration);
  cm = microsecondsToCentimeters(duration);


  Serial.print(inches);
  Serial.print("in, ");
  Serial.print(cm);
  Serial.print("cm");
  Serial.println();

  if(inches < 5) {

  Serial.println("hand puted");
  digitalWrite(pump, LOW);
  digitalWrite(relay, HIGH);

  delay(100);
  } else {

    Serial.println("no hand");
   digitalWrite(pump, HIGH);
   digitalWrite(relay, LOW);
   delay(100);
  }
delay(200);
}
long microsecondsToInches(long microseconds)
{
  return microseconds / 74 / 2;
}
long microsecondsToCentimeters(long microseconds)
{
// The speed of sound is 340 m/s or 29 microseconds per centimeter.
```

```
// The ping travels out and back, so to find the distance of the
// object we take half of the distance travelled.

  return microseconds / 29 / 2;

}
```