ISSN : 2456-1762

Student Journal of Electrical and Electronics Engineering Issue No. 1, Vol. 1, 2022

AUTOMATIC SANITIZER DISPENSER MACHINE USING ARDUINO

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Abstract:

The COVID epidemic has made an impact on human existence in a variety of ways. Various attempts were made to prevent viral transmission via working from home, social separation, and hand cleanliness. Because COVID-19 is spread through touch and contact, WHO recommends that hands be washed or sanitized on a frequent basis to limit the risk of infection. Manual involvement would be required to dispense sanitizer from the bottle and store it. And, thus far, the majority of hand sanitizers on the market do not function automatically. The goal of this article is to create an automatic hand sanitizer that can be used in hospitals, work places, offices, schools, and other locations to reduce the risk of infection caused by contact. The device uses an ultrasonic sensor to detect proximity and delivers a signal to a microcontroller (Arduino Nano). The sensor data is processed by the controller, which then controls the servo motor.

1. INTRODUCTION

It is important to maintain good hygiene in order to stay healthy. The term "hygiene" encompasses a wide range of topics. One of them is a clean hand. Hands are frequently touched on a variety of surfaces and might be directly contaminated. Various health agencies, notably the World Health Organization, encourage hand washing at regular intervals. Hand hygiene is now widely recognised as one of the most critical aspects of infection prevention. As the burden of health-care-associated infections (HCAIs) grows, as does the severity of illness and treatment complexity, all of which are exacerbated by multidrug-resistant (MDR) pathogen infections, health-care practitioners (HCPs) are reverting back to the basics of infection prevention by simple measures such as hand hygiene. This is because there is enough scientific data to suggest that appropriate hand cleanliness can greatly lower the risk of infection cross-transmission in healthcare facilities (HCFs)1-5. Hand sanitization has been shown to minimize the spread of healthcare-associated microorganisms and the occurrence of HCAI (healthcare associated infections). Hand hygiene is defined as the washing of your hands with soap and water, antiseptic hand washes, alcohol-based hand sanitizers (ABHS), or surgical hand antiseptics, according to the Centers for Disease Control and Prevention (CDC). Alcohol-based hand sanitizers are increasingly being utilized in hospital settings instead of soap and water for hand cleansing. Hand washing and/or hand hygiene are recognized to be troublesome in hospital settings, and they are a primary source of infections caught while patients are hospitalized. While hand washing and hygiene regulations and training are important and can help reduce the transmission of diseases, the problem of illnesses caused by poor hygiene among

employees, medical professionals, and even patients persists. Hand washing stations and hand sanitizer dispensers have been seen in examination rooms, corridors, lobbies, and even patient rooms at medical institutions. Such systems, on the other hand, are solely mechanical and are unable to provide an automatic way of creating accountability for appropriate hygiene practises. So far, the majority of hand sanitizers on the market do not run automatically. The goal of this essay is to create an automatic hand sanitizer that will automatically dispense sanitizer liquid. An ultrasonic sensor is used in this circuit. The sensor detects the presence of human hands beneath the machine. The machine is meant to be mounted on a wall at a height of 4 feet so that everyone can reach it and acquire sanitizer. The sensor sends a signal to the microprocessor, which decides whether to engage the pump and valve at the same time to spray liquid sanitizer through a mist nozzle.

2. LITERATURE REVIEW

Guide to implementation of the WHO multimodal hand hygiene improvement strategy. Available from: http://www.who.int/patientsafety/en/ , accessed on August 24, 2010. WHO Guidelines on Hand Hygiene in Health Care. First Global Patient Safety Challenge. Clean Care is Safer Care. Available from: http://www.who.int/patientsafety/en/ , accessed on August 24, 2010.

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Kampf G, Kramer A. Epidemiologic background of Hand Hygiene and evaluation of the most important agents for scrubs and rubs. Clin Microbiol Rev. 2004;17:863–93. Daniels IR, Rees BI. Handwashing: simple, but effective. Ann R Coll Surg Engl. 1999;81:117–8.

1) MY WORK

In order to test the Automatic hand sanitizer container, many actions were taken. We examine the relevance of the environment required for automated hand sanitizer due to the spread of Covid illness. The second stage is to do a literature review of the associated article. We create the hardware, test it, and then report on the results.

The following is a flowchart of the events:

case study => research => design & modeling => algorithm creation => hardware connection => manufacturing => testing & debugging => final report

An Arduino Nano microcontroller is utilized since it is simple to programme and contains built-in ADC and DAC. An ultrasonic sensor is used to provide input to the Arduino. It detects distance by emitting ultrasonic frequency from one side and recording the time it takes for the sound wave to be reflected back. Hands are detected using an ultrasonic sensor at a distance of around 7 cm from the sensor. The sensor will provide input to the Arduino Nano as a microcontroller (central controller) if a human hand is detected. The Arduino Nano microcontroller serves as the control center, with software to access data from the ultrasonic sensor's input.

2) DEVICES FOR MEASURING THE ENTIRE SYSTEM:

Fig No. 1.1 -ARDUINO NANO: The Arduino Nano is a microcontroller board that is based on the ATmega328P microcontroller (datasheet). It features 14 digital input/output pins (six of which may be used as PWM(Pulse width Modulation) outputs,

ISSN : 2456-1762
Student Journal of Electrical and Electronics Engineering Issue No. 1, Vol. 1, 2022

eight analogue inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB port, a power connector, an ICSP header, and a reset button.
Digital I/O Pins: 14 (of which 6 provide PWM)
Analog Input Pins: 8

Fig No. 1.1

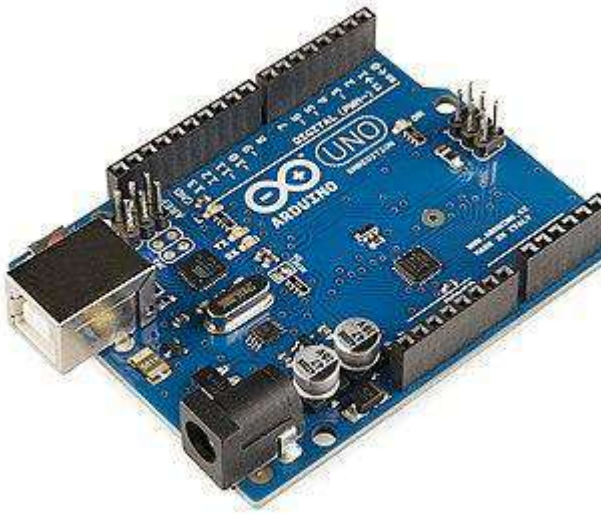

Fig No. 1.2 -ULTRASONIC SENSOR: An ultrasonic sensor is a device that uses ultrasonic sound waves to determine the distance to an object.
A transducer is used in an ultrasonic sensor to emit and receive ultrasonic pulses that communicate information about the proximity of an item.

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

Fig No. 1.2

Fig No. 1.3 -SERVO MOTOR: A Servo Motor is a small device that has an output shaft. This shaft can be positioned to specific angular positions by sending the servo a coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft.
Fig No. 1.3.

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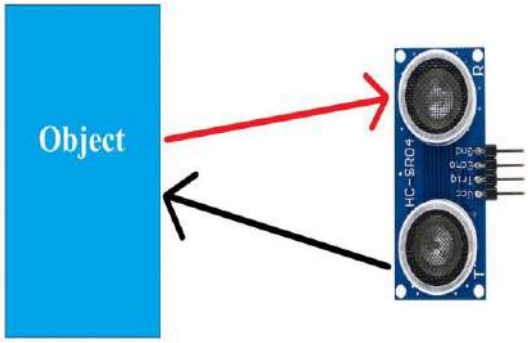
3) EXPERIMENTAL SETUP:

The sensor connected to the Arduino will start working when the device is activated. The ultrasonic sensor in this circuit is used to detect the distance to an object. The setup in Figure 1 works when the distance is less than 8 (<=7 cm) cm, the ultrasonic sensor will send data to the Arduino Nano so that it can activate the 5V pump.

4) SCHEMATIC DIAGRAM:



- The ultrasonic sensor is used to detect hands with a distance of approximately 10 cm from the sensor
- If a human hand has been detected, the sensor will send input to the Arduino UNO
- The Arduino UNO processes the Sensor data and actuates the Servo motor

5) WORKING PRINCIPLE:

- The System sense the proximity with the Help of Ultrasonic sensor and sends signal to Arduino Uno(Micro-Controller)
- The Micro-Controller processes the Sensor data & actuates the servo motor
- As a result the sanitizer liquid dispenes through the nozzle

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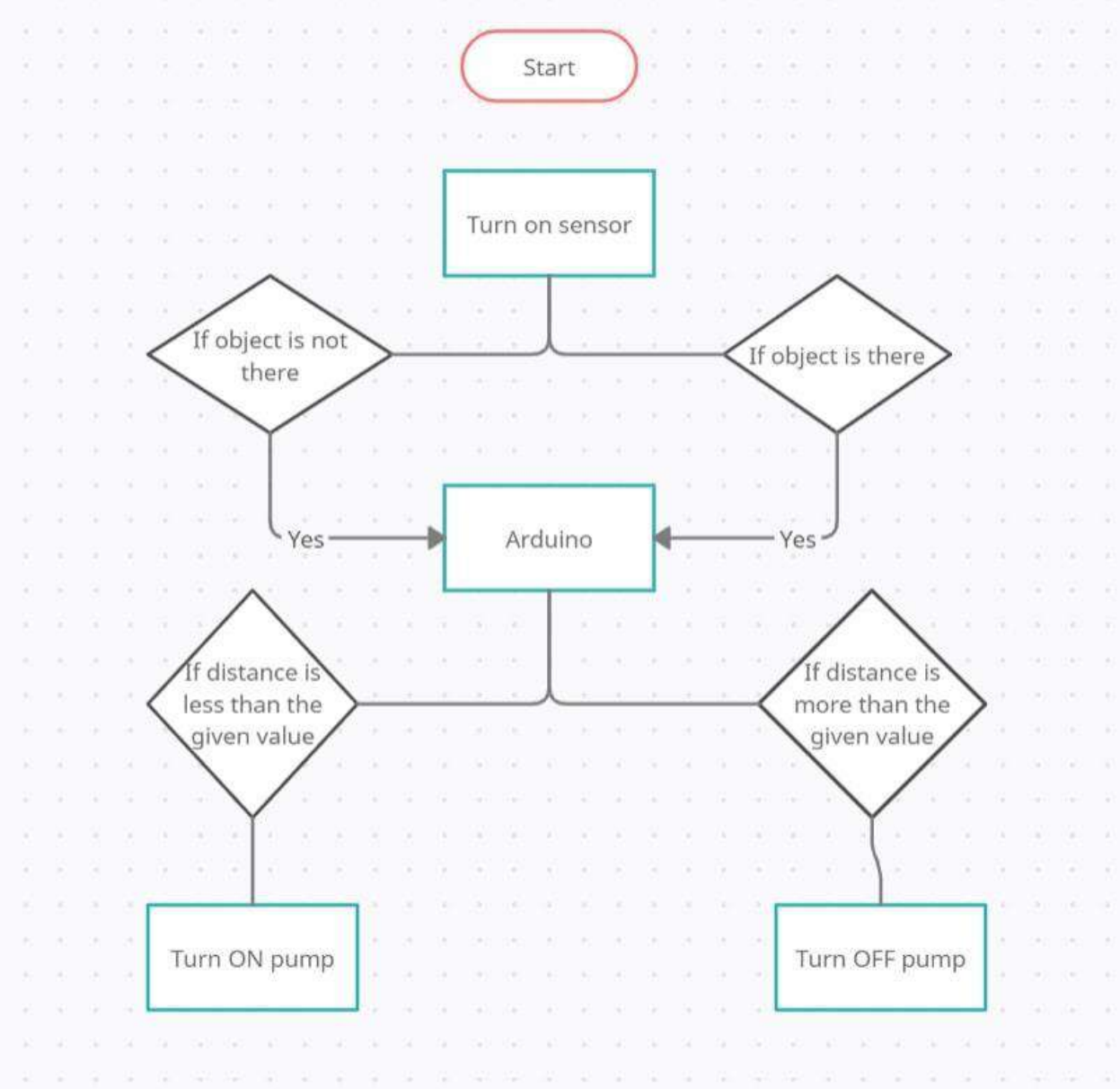
6) BLOCK DIAGRAM:



7) CODE :

```
 #define echoPin 2
 #define trigPin 3
long duration;
 int distance;
void setup() {
 pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);
pinMode(5, OUTPUT);
Serial.begin(9600);
}
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.print(distance);
Serial.println(" cm"); if (distance<=7)
 {
digitalWrite(5, HIGH);
Serial.print("Pump On");
 delay(150); digitalWrite(5, LOW);
Serial.print("Pump OFF");
delay(2000); }
else
{
digitalWrite(5, LOW);
Serial.print("Pump OFF");
}
delay(50);
 }
```

RESULTS AND DISCUSSION:

According to the article, non-contact dispensing is critical for preventing disease spread, and hand cleanliness is critical and must be practiced on a daily basis. A revolutionary design of an automatic hand sanitizer dispenser was exhibited in this study. The components required for device construction were thoroughly discussed. The circuit schematic was explained, which clarifies the link between the microcontroller circuit and the components (Arduino Nano). The plumbing conditions were shown and explained in this manner. For a better understanding, the key schematics and components from the original device were given in a sequential manner.

- The presentation says that non contact dispensing is very important to prevent pathogen spreading and finally, hand hygiene is most important and must be part of our daily life.

- In this project, a novel design of an automated hand sanitizer dispenser was demonstrated. The components needed for the device fabrication were described in detail.

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[1]. Guide to implementation of the WHO multimodal hand hygiene improvement strategy. Available from: http://www.who.int/patientsafety/en/ , accessed on August 24, 2010
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[2]. WHO Guidelines on Hand Hygiene in Health Care. First Global Patient Safety Challenge. Clean Care is Safer Care. Available from: http://www.who.int/patientsafety/en/ , accessed on August 24, 2010.

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