Design and Implementation of Automatic Temperature Sensing and Hand Sanitization System for the Prevention of COVID-19 Outbreak.



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Declaration

It is declared hereby that this project paper or any part of it has not been submitted to anywhere else for the award of any degree.

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I certify that I have read this project and that, in my opinion, it is fully adequate, in scope & quality as a dissertation for the degree of BSc in Engineering.

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Abstract

Corona virus disease 2019 (COVID-19) being an acute respiratory disease caused by a novel corona virus (SARSCoV-2) is transmitted in most instances through respiratory droplets, direct contact with cases, and also through contaminated surfaces/objects. Though the virus survives on environmental surfaces for varied periods, it gets easily inactivated by disinfectants. Therefore, this project aims to highlight the role of surface disinfection and hand disinfection during the COVID-19 pandemic. Disinfection with appropriate and recommended physical or chemical disinfectants will not only reduce the spread of the disease but also play a significant part in flattening the curve. Alcohol-based disinfectants and other chemical disinfectants play major roles. Ether, ethanol, hydrogen peroxide, sodium hypochlorite, other chlorine-containing disinfectants, peracetic acid, chloroform used under appropriate concentrations and techniques are necessary to stop the chain of transmission. Hand disinfection using soap and water or alcohol-based hand rubs are also of equal importance. Irrespective of the importance, the judicious use of disinfectants is also necessary. Therefore, the fastest, easiest, and most effective way to halt or reduce the spread of SARS-CoV-2 the virus resulting in the corona virus disease (COVID-19) is through surface disinfection and hand washing with soap and water and its role in the COVID-19 pandemic is highly important. In this project we use arduino microcontroller development board to make a system by which we can disinfect virus from human body by hand sanitizer disposer so that anybody can use the sanitizer without touching anything.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

The corona virus disease is gripping the world through its devastating pandemic currently. Its transmission through droplets occurs when a person is in close contact with someone who has respiratory symptoms (e.g., coughing or sneezing) and is therefore at risk of having his/her mucosae or conjunctiva (eyes) exposed to potentially infective respiratory droplets. Transmission may also occur through fomites in the immediate environment around the infected person.1 Droplets may also land on surfaces where the virus could remain viable; thus, the immediate environment of an infected individual can serve as a source of transmission. Therefore, this article aims to highlight the role of surface disinfection and hand disinfection during the COVID-19 pandemic.

The Smart disinfectant tunnel and hand sanitization system is a demonstration of how it has been designed to provide maximum protection to people passing through the tunnel in around 5 seconds. Which can help the community to fight against the COVID-19.

The main idea of this project is to make a tunnel that can try and prevent the spread of COVID-19.

This disinfection and sanitation tunnel is prepared in order to sanitize people within 5 seconds from any possible bacteria.

The disinfectant solution used consists of a combination of sodium hypochlorite (NaOCl) and water (H2O). The disinfectant is non-volatile, thus enabling prolonged veridical and bactericidal activity and sanitizing the surfaces.

So, we took this initiative to make this Smart Disinfection and Sanitation Tunnel. This tunnel was made in a time span of 12hrs. It can disinfect a person fully from head to toe in a time span of just 5 seconds and the solution used is completely harmless.

1.2 Historical Background

There are many method to disinfect human body and any surface.

1.2.1 Disinfection

Thermal or chemical destruction of pathogenic and other types of microorganisms. Disinfection is less lethal than sterilization because it destroys the most recognized pathogenic microorganisms but not necessarily all microbial forms (e.g., bacterial spores).

1.2.2 Disinfectants

Usually a chemical agent (but sometimes a physical agent) that destroys disease-causing pathogens or other harmful microorganisms but might not kill bacterial spores. It refers to substances applied to inanimate objects.

1.2.3 Sterilization

Validated process used to render a product free of all forms of viable microorganisms. In a sterilization process, the presence of microorganisms on any individual item can be expressed in terms of probability. Although this probability can be reduced to a very low number, it can never be reduced to zero.

1.2.4 Decontamination

The use of physical or chemical means to remove, inactivate, or destroy blood borne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

1.2.5 Cleaning

The removal of visible soil (e.g., organic and inorganic material) from objects and surfaces and normally is accomplished manually or mechanically using water with detergents or enzymatic products. Thorough cleaning is essential before high-level disinfection and sterilization because inorganic and organic materials that remain on the surfaces of instruments interfere with the effectiveness of these processes.

1.2.6 Sanitation

Sanitation refers to the provision of facilities and services for the safe management of human excreta from the toilet to containment and storage and treatment onsite or conveyance, treatment and eventual safe end use or disposal.

1.2.7 Antiseptic

Substance that prevents or arrests the growth or action of microorganisms by inhibiting their activity or by destroying them. The term is used especially for preparations applied topically to living tissue.

1.2.8 Asepsis

Is a process where the chemical agents (antiseptics) are applied on to the body surface (skin), which kill or inhibit the microorganisms present on skin.

1.2.9 Contact time

Time a disinfectant is in direct contact with the surface or item to be disinfected. For surface disinfection, this period is framed by the application to the surface until complete drying has occurred.

1.3 Project Objectives

- It disinfects in a very short time at the points where people enter and pass frequently.
- It will be prevented the virus, that is infected to the clothes and hair, from transmitting to both carriers and those with whom it will interact

1.4 Summary

The summary of the project is more particularly focusing on the multipurpose disinfectant tunnel and hand sanitization system for hygienic purpose. There are not many products of disinfectant tunnel and hand sanitization system at market equipped with some additional function. Therefore for the final product, we expected that this product will come out with at least 2 functions which are Disinfectant dispenser mechanism, Alcohol dispenser mechanism.

CHAPTER 2

HARDWARE COMPONENT

2.1 Arduino Nano

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. it can tell that board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language and the Arduino Software (IDE), based on Processing.



Fig 2.1: Arduino Nano

2.1.1 ATmega328PMicrocontroller

The microcontroller is a low-power CMOS (Complementary Metal Oxide Semiconductor) 8-bit microcontroller based on the AVR enhanced RISC (Reduced Instruction Set Computer)architecture. The powerful execution of instructions in a single clock cycle leads to the achievement of 1 MIPS per MHz throughputs allowing the designer to optimize power consumption versus processing speed.



Fig 2.2: ATmega328P Microcontroller

Reprinted from Datasheet of ATMega328 the internal architecture of the microcontroller is shown in Fig 2.3.3 (02). The central processing unit (CPU) is the brain of the microcontroller which controls the execution of the program. The MCU (Microcontroller unit) consists of 4K/8K bytes of in-system programmable flash with read-while-write capabilities, 256/412/1K bytes EEPROM along with the 512/1K/2K bytes of SRAM. Along with this, the MCU consists of many other features

- 14 general purpose I/O lines and 32general purpose working registers
- flexible timer/counters with compare modes, internal and external interrupts and a serial programmable USART
- A byte-oriented 2-wire serial interface, an SPI serial port, a 6-channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages), a programmable watch-dog timer with an internal oscillator and 5 software-selectable power saving modes.

The five, software selectable, power saving modes are idle mode, Power-down mode, Power-save mode, ADC Noise Reduction mode and the Standby mode. As mentioned in section 2.1.2, the CPU is the brain of the microcontroller which controls the execution of the program. Therefore the CPU is able to access the memories, perform calculations, control peripherals and handle interrupts. The AVR uses the Harvard architecture with separate memories and buses for program and data to maximize the performance as well as the parallelism. The principle of execution of instructions in the program memory is the single-level pipelining. The concept of pre-fetching the next instruction while executing one instruction enables the instructions to be executed in every clock cycle and the program memory is in the System Reprogrammable Flash memory.

Reprinted from Datasheet of ATMega328,The block diagram of AVR CPU Core architecture is shown in figure 3. The fast-access Register File contains 32 x 8 bit general-purpose working registers with a single cycle access time which results in a single-cycle ALU operation. The arithmetic and logical operations between the registers or between the constant and a register are supported by the ALU. The status register is updated to reflect information about the result of the operation after an arithmetic operation. The boot program section and the application program section are the two main sections of the program flash memory. Stack stores the return address of the program counter during the interrupts and subroutine calls which is allocated in the general data SRAM. The size of the stack is limited by the total size and usage of the SRAM. The data SRAM is accessible through five different addressing modes supported in the

AVR architecture while the stack pointer is read/write accessible in the I/O space. The memory spaces in the AVR architecture are all linear and regular memory maps

2.2 IR Temperature Sensor

The MLX90614 is a Contactless Infrared (IR) Digital Temperature Sensor that can be used to measure the temperature of a particular object ranging from -70° C to 382.2°C. The sensor uses IR rays to measure the temperature of the object without any physical contact and communicates to the microcontroller using the I2C protocol.



Fig 2.3: IR Temperature Sensor

The key feature of MLX90614 is that it is a contactless IR temperature sensor with high accuracy. So it can be used in industries to measure the temperature of moving objects like a rotating motor shaft. Due to its high accuracy and precision, it is also used in a wide range of commercial, health care, and household applications like room temperature monitoring, body temperature measurement, etc.

Features and Benefits:

- Small size, low cost
- Mounted on a breakout board with two types of pins
- 10k Pull up resistors for the I2C interface with optional solder jumpers
- Easy to integrate
- Factory calibrated in wide temperature range:
- -40…+125°C for sensor temperature and
- -70…+380°C for object temperature.

- High accuracy of 0.5°C over wide temperature range (0…+50°C for both Ta and To) High (medical) accuracy calibration
- Measurement resolution of 0.02°C
- Single and dual zone versions
- SM Bus compatible digital interface
- Customizable PWM output for continuous reading
- Simple adaptation for 8…16V applications
- Sleep mode for reduced power consumption
- Different package options for applications and measurements versatility
- Automotive grade

Applications Examples:

- High precision non-contact temperature measurements
- Thermal Comfort sensor for Mobile Air Conditioning control system
- Temperature sensing element for residential, commercial and industrial building air conditioning Windshield defogging
- Automotive blind angle detection
- Industrial temperature control of moving parts
- Temperature control in printers and copiers
- Home appliances with temperature control
- Healthcare
- Livestock monitoring
- Movement detection
- Multiple zone temperature control – up to 127sensors can be read via common 2 wires
- Thermal relay / alert
- Body temperature measurement

2.3 Relay switch

The Microcontroller operates at 5V it can't control these higher voltage devices directly, here we use a 4 Channel 5V Relay Module to switch the 120-240V current and use the Microcontroller to control the relay. This is a 5V 4-channel relay interface board, and each channel needs a 15-20mA driver current. It can be used to control various appliances and equipment with large current. It is equipped with high-current relays that work under AC250V

10A or DC30V 10A. It has a standard interface that can be controlled directly by microcontroller.

2.3.1 Principle

From the picture below, you can see that when the signal port is at low level, the signal light will light up and the optocoupler 817c (it transforms electrical signals by light and can isolate input and output electrical signals) will conduct, and then the transistor will conduct, the relay coil will be electrified, and the normally open contact of the relay will be closed. When the signal port is at high level, the normally closed contact of the relay will be closed. So, you can connect and disconnect the load by controlling the level of the control signal port. The SRD-05VDC-SL-C relay has three high voltage terminals (NC, C, and NO) which connect to the device you want to control. The other side has three low voltage pins (Ground, Vcc, and Signal) which connect to the Wemos D1 R1.

- NC: Normally closed 120-240V terminal
- NO: Normally open 120-240V terminal
- C: Common terminal
- Ground: Connects to the ground pin on the Arduino
- 5V Vcc: Connects the Arduino 5V pin
- Signal: Carries the trigger signal from the Wemos D1 R1 that activates the relay

Inside the relay is a 120-240V switch that's connected to an electromagnet. When the relay receives a HIGH signal at the signal pin, the electromagnet becomes charged and moves the contacts of the switch open or closed.



Fig 2.4: Channel 5V Relay Module

2.3.2 Pin Description and Features

INPUT	OUTPUT
VCC: Positive supply voltage GND: Ground IN1--IN4: Relay control port	Connect a load, DC 30V/10A, AC 250V/10A

Table no 2.1: Arduino Pin Description

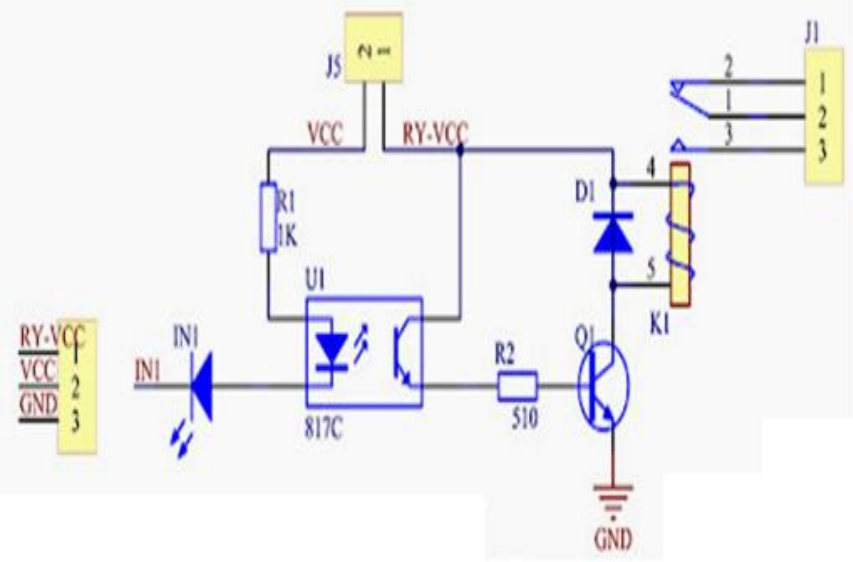


Fig 2.5: 5V Relay Module circuit diagram

2.3.3 Features

- Size: 75mm (Length) * 55mm (Width) * 19.3mm (Height)
- Weight: 61g
- PCB Color: Blue
- There are four fixed screw holes at each corner of the board, easy for install and fix. The diameter of the hole is 3.1mm
- High quality Single relay is used with single pole double throw, a common terminal, a normally open terminal, and a normally closed terminal

2.3.4 Relay Operation

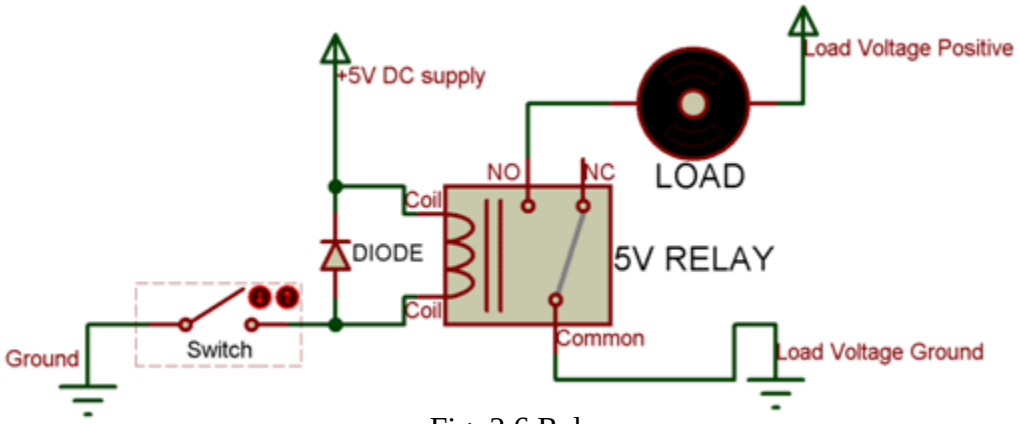


Fig: 2.6 Relay

The above circuit shows a bare-minimum concept for a relay to operate. Since the relay has 5V trigger voltage we have used a +5V DC supply to one end of the coil and the other end to ground through a switch. This switch can be anything from a small transistor to a microcontroller or a microprocessor which can perform switching operating. We can also notice a diode connected across the coil of the relay, this diode is called the Fly back Diode. The purpose of the diode is to protect the switch from high voltage spike that can produced by the relay coil. As shown one end of the load can be connected to the Common pin and the other end is either connected to NO or NC. If connected to NO the load remains disconnected before trigger and if connected to NC the load remains connected before trigger.

2.3.5 Applications of Relay

- Commonly used in switching circuits.
- For Home Automation projects to switch AC loads
- To Control (On/Off) Heavy loads at a pre-determined time/condition
- Used in safety circuits to disconnect the load from supply in event of failure
- Used in Automobiles electronics for controlling indicators glass motors etc.

2.4 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs.

The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc.



Fig 2.7: 16*2 LCD Display

2.4.1 Features of LCD Display

5 x 8 dots with cursor

Built-in controller (KS 0066 or Equivalent) + 5V power supply (Also available for + 3V) 1/16 duty cycle B/L to be driven by pin 1, pin 2 or pin 15, pin 16 or A.K (LED) N.V. optional for + 3V power supply.

2.5 Obstacle Sensor

Infrared technology addresses a wide variety of wireless applications. The main areas are sensing and remote controls. In the electromagnetic spectrum, the infrared portion is divided into three regions: near infrared region, mid infrared region and far infrared region.



Fig 2.8: Obstacle Sensor

The wavelengths of these regions and their applications are shown below.

- Near infrared region — 700 nm to 1400 nm — IR sensors, fiber optic
- Mid infrared region — 1400 nm to 3000 nm — Heat sensing
- Far infrared region — 3000 nm to 1 mm — Thermal imaging

The frequency range of infrared is higher than microwave and lesser than visible light.

For optical sensing and optical communication, photo optics technologies are used in the near infrared region as the light is less complex than RF when implemented as a source of signal. Optical wireless communication is done with IR data transmission for short range applications.

An infrared sensor emits and/or detects infrared radiation to sense its surroundings. The working of any Infrared sensor is governed by three laws: Planck's Radiation law, Stephen – Boltzmann law and Wien's Displacement law.

Planck's law states that "every object emits radiation at a temperature not equal to 0^0K". Stephen – Boltzmann law states that "at all wavelengths, the total energy emitted by a black body is proportional to the fourth power of the absolute temperature". According to Wien's Displacement law, "the radiation curve of a black body for different temperatures will reach its peak at a wavelength inversely proportional to the temperature".

The basic concept of an Infrared Sensor which is used as Obstacle detector is to transmit an infrared signal, this infrared signal bounces from the surface of an object and the signal is received at the infrared receiver.

There are five basic elements used in a typical infrared detection system: an infrared source, a transmission medium, optical component, infrared detectors or receivers and signal processing. Infrared lasers and Infrared LED's of specific wavelength can be used as infrared sources. The three main types of media used for infrared transmission are vacuum, atmosphere and optical fibers. Optical components are used to focus the infrared radiation or to limit the spectral response.

Optical lenses made of Quartz, Germanium and Silicon are used to focus the infrared radiation. Infrared receivers can be photodiodes, phototransistors etc. some important specifications of infrared receivers are photosensitivity, detectivity and noise equivalent power. Signal processing is done by amplifiers as the output of infrared detector is very small.

2.5.1 Comparator

Comparator is a device, which compares two input voltages and gives output high or low. In circuit diagram it is normally represented by a triangle having-Inverting (negative) Input, Non-Inverting (positive) Input (+), Vcc, Ground, Output.

Properties of comparator:

If V+ > V- then Vo=Vcc (Digital High Output is 1)

If V+ < V- then Vo=0 (Digital Low Output is 0)

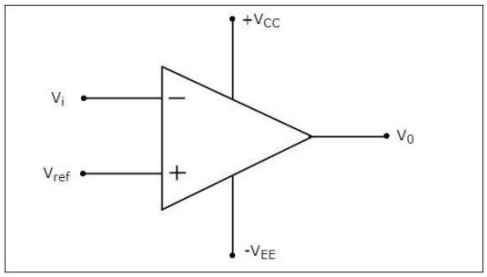


Fig 2.9: Schematic of Comparator Logic

2.6 Disposer Pump

The motor was powered from the 5 V dc output from the power supply circuit. The pump was able to supply 660 cm3 of water in 10 seconds. The pump used was constructed using a miniature dc motor powered by the output of the power supply unit. The mechanical output point of the motor was loaded with miniature bidirectional fan blades and secured firmly using glue. The pumping was achieved by placing the fan blades in an enclosure made from two cylindrical plastic stoppers.



Fig 2.10: Disposer Pump

The motor was also inserted into a stopper to protect it from contact with water. The electrical connections to the motor were passed through a tight hole in the side of the stopper. The stopper containing the motor was then taped with a water-tight cellophane tape to the pumping enclosure to make the pumping system one single unit. When placed in water (the pump has to be lying horizontally) and connected to the power from the power supply unit, water is taken through the hole at the top of the pump, the blades attached to the rotor spin the water around in the pumping enclosure and the water exits through the pipe attached to the hole at the side of the enclosure.

2.7 Soldering wire

Solder is basically metal wire with allow melting point where low for our purposes means low enough to be melted with a soldering iron. For electronics it is traditionally a max of tin and lead .when the soldering wire cooled off an electrical connection will conduct. This is getting a good mechanical connection between the wires. The filaments of each wire should be twisted together behave more like a single entity. First step is to prepare the wires then tinning the wears next to join the wires and solder splice together.

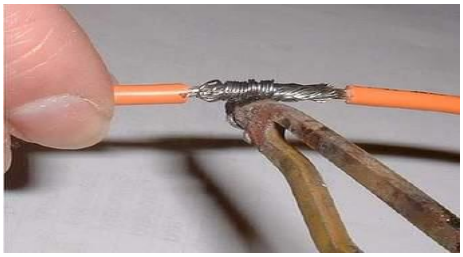


Fig 2.11 Soldering wire

2.8 Diode

The symbol of a diode is shown below, the arrowhead points in the direction conventional current flow.

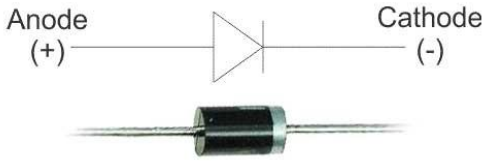


Fig 2.12: 4007 Diode

N-side will have a significant number of electrons, and very few holes (due to thermal excitation) whereas the p side will have a high concentration of holes and very few electrons. Due to this, a process called diffusion takes place. In this process free electrons from n side will diffuse (spread) into the p side and recombine with holes present there, leaving positive immobile (not moveable) ions in n side and creating negative immobile ions in p side of the diode.

Hence, there will be uncovered positive donor ions in n-type side near the junction edge. Similarly, there will be uncovered negative acceptor ions in p-type side near the junction edge. Due to this, numbers of positive ions and negative ions will accumulate on n-side and p-side respectively. This region so formed is called as depletion region due to the "depletion" of free carriers in the region. Due to the presence of these positive and negative ions a static electric field called as barrier potential is created across the pn junction of the diode. It is called as "barrier potential" because it acts as a barrier and opposes the further migration of holes and electrons across the junction.

3.9 Full wave rectifier

A Full wave rectifier is a circuit arrangement which makes use of both half cycles of input alternating current (AC) and converts them to direct current (DC). ... This arrangement is known as a Bridge Rectifier. It uses the entire AC wave (Both positive and negative sections). Each diode uses 0.7v when conducting and there are always two diodes conducting.

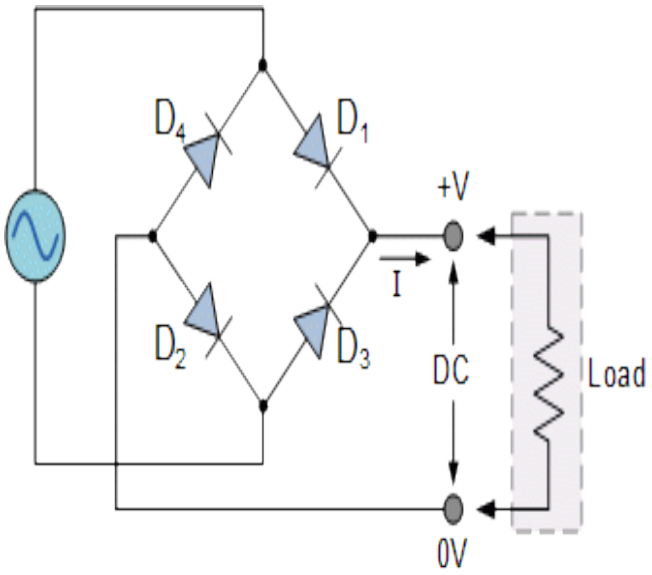


Fig 3.13: Full wave rectifier is a circuit diagram

2.10 Vero board

The original and best strip board available invented by Vero and resulting in a range of prototyping boards with copper tracks and punched component holes in Eurocard and non eurocard size. Products are available with single or double sided copper and as bare boards without copper.

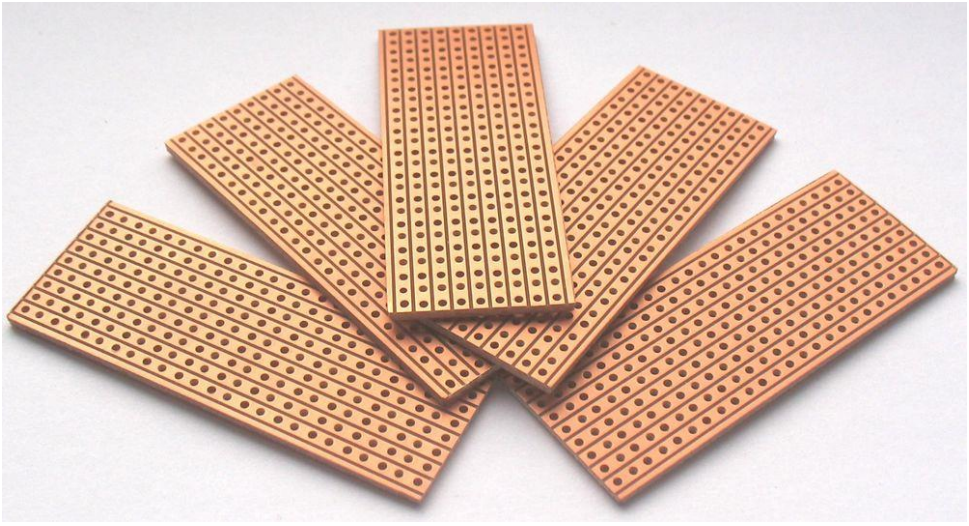


Fig: 2.14: Vero board

2.11 Buck Converter

A buck converter (step-down converter) is a DC-to-DC power converter, which steps down voltage from its input to its output. The basic operation of the buck converter has the current in an inductor controlled by two switches. In the idealized converter, all the components are considered to be perfect. Specifically, the switch and the diode have zero voltage drop when on and zero current flow when off, and the inductor has zero series resistance. Further, it is assumed that the input and output voltages do not change over the course of a cycle



Fig 3.15: DC-DC Buck Converter

2.12 Buzzer

A buzzer is an electrical device that makes a buzzing noise and is used for signaling. A buzzer has a piezo disc and an oscillator inside. When the buzzer is powered, the oscillator generates a frequency around 2-4 kHz and the piezo element vibrates accordingly to produce the sound. As soon as the gas leak is detected, the buzzer automatically rings to alert the users about the gas leak.

2.13 Summary

The chapter describes about some important equipment that related to the project. it also describes all equipment like IR sensor, diode, pump, resistor that works properly use for show data read related this project.

CHAPTER 3

DESIGN AND IMPLEMENTATION

3.1 Principle behind this Project

The basic idea behind the disposer is detection of object. In this project we use IR obstacle sensor to detect object. When any disposer get signal from the sensor then it sent signal to microcontroller and then microcontroller Measure temperature and operate Alcohol disposer pump.

3.2 Block Diagram

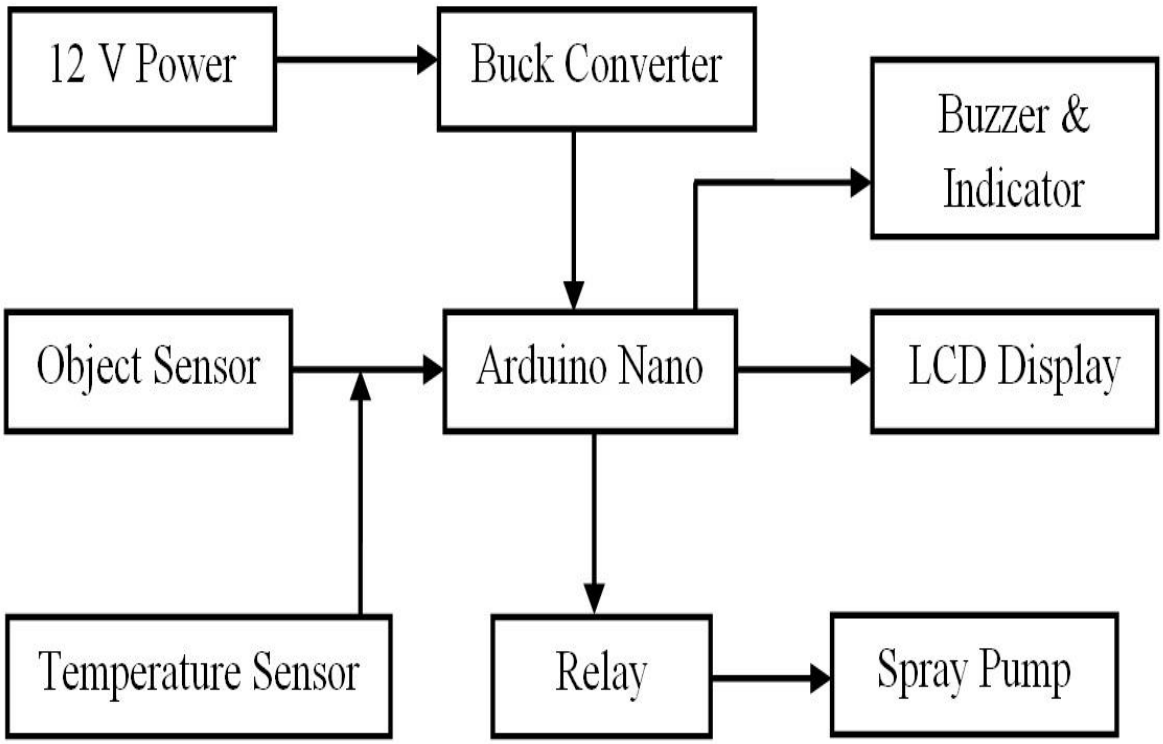


Fig 3.1: Block diagram of Hand sanitizer disposer

In the block diagram we see all components is connected to microcontroller. We use arduino Nano as the controller of the project. Sanitizer dispenser sensors are connected to arduino Nano whishes are input of microcontroller are obstacle sensor, temperature sensor beside this LED, buzzer, Pump and LCD are the output of the microcontroller.

3.3 Circuit Diagram

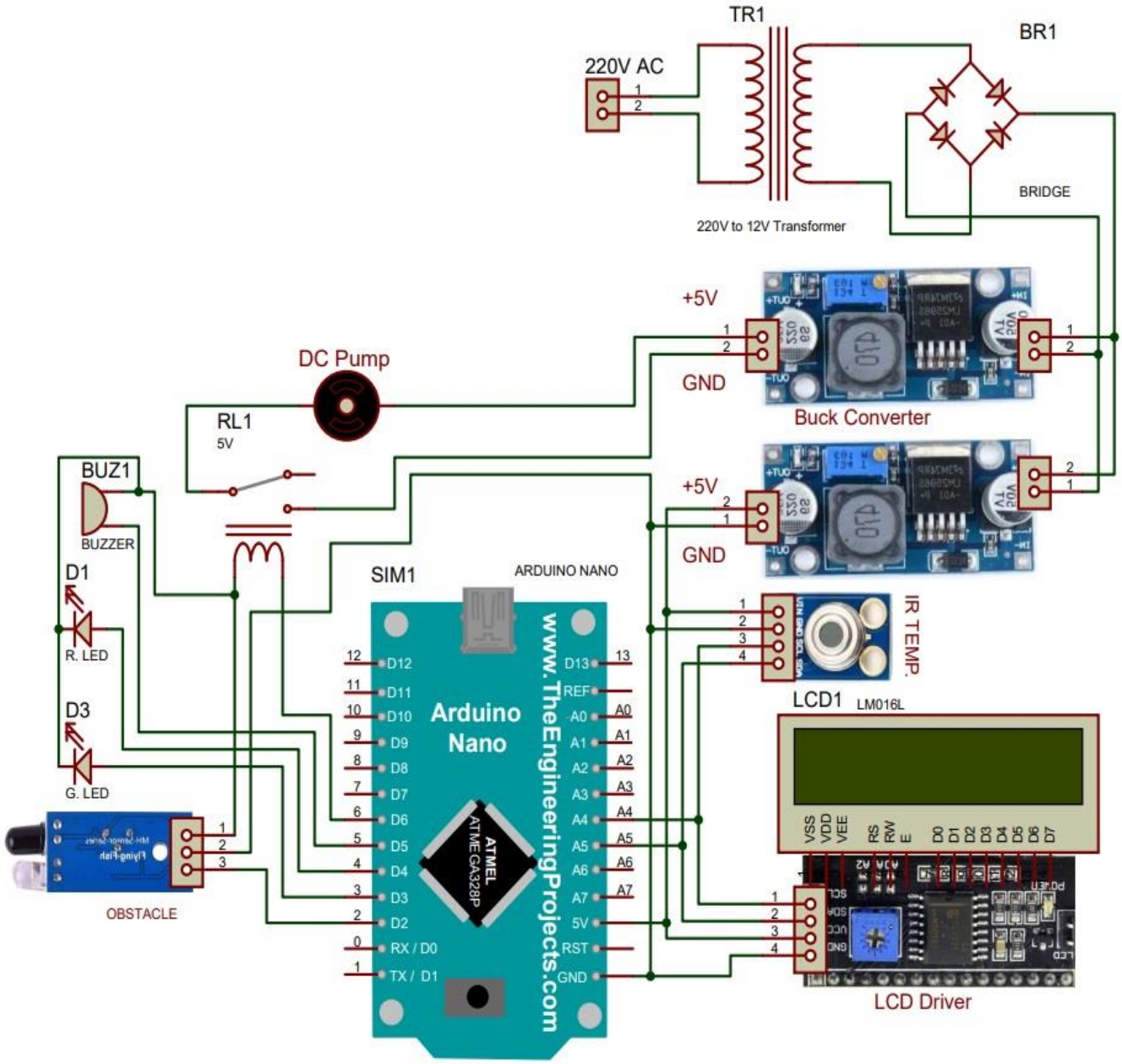


Fig 3.2: Schematic diagram of Hand sanitizer disposer

3.4 Working Principle

This Project is devided into two parts to reduce covid-19 pendemic. Firstly if anybody enter anywhere like office or home he needs to measure temperature and secondly he needs to sanitize hand by thus this project can ensure safety against Covid-19.

- This system consists of arduino Nano, IR Temperature sensor, IR obstacle sensor, relay, small water pump and LCD.
- When someone place hand in front of the IR obstacle sensor then sensor sent signal to the microcontroller and microcontroller measure body temperature by temperature sensor.
- If the temperature is less than 100°F then microcontroller activate relay to operate dc water pump which dispose liquid hand sanitizer and for higher temperature it will make a sound for alart.
- Arduino also sent Text information to the LCD so that user can see the body temperature.

3.5 Summary

In this chapter has discussed about principal of project. It has included relay Operation, Circuit Diagram & working, and physical appearance of this project. It has also explained operating system of the project.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

In this chapter, we see the final result. There are many steps to complete this project and there also has so many errors. We try our best to overcome error and make a hand sanitizer dispenser system.

4.2 Results

- It can measure temperature automatically
- It can dispence Hand sanitizer automatically

4.3 Limitation

- Hand sanitizer disposer is for indor use only.

4.4 Advantage

- Easy to Use.
- No need to measure temperature Manually.
- Low Maintenance cost.
- Automatic dispenser system.
- It can reduce covid-19 pandemic.

4.5 Application

- School
- University
- Office
- Industry
- Garments

4.6 Discussion

Due to the route of transmission being droplet infection, the transmissibility rate of COVID-19 can be higher than other infective viruses. Therefore, the fastest, easiest, and most effective way to halt or reduce the spread of SARSCoV-2 the virus resulting in the corona virus disease (COVID-19) is through surface disinfection and hand sanitize with sanitizer.

Corona viruses can remain infectious on inanimate surfaces for up to 9 days. Surface disinfection with 0.1% sodium hypochlorite or 62-71% ethanol significantly reduces corona-virus infectivity on surfaces within 1 minute exposure time, expecting a similar effect against the SARS-CoV-2. A study concludes that some disinfectant agents effectively reduce coronavirus infectivity within 1 minute such as, 62%-71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite. Compounds such as 0.05-0.2% benzalkonium chloride or 0.02% chlorhexidine digluconate are less effective. Therefore, an effective surface disinfection may help to ensure an early containment and prevention of further viral spread.

These, further highlight the role of appropriate disinfection strategies against COVID-19 pandemic. The current recommendations by the Government of Bangladesh, Institute of Epidemiology, Disease Control and Research (IEDCR) and World Health Organization (WHO) promote and highlight the very same need. Disinfection with appropriate and recommended physical or chemical disinfectants will not only reduce the spread of the disease but also play a significant part in flattening the curve. Hand washing and surface disinfection are therefore the need of the hour. Social distancing and use of face covers being other important parameters play an important role here as well. Proper knowledge regarding the correct disinfectant, technique of disinfection, its concentration and safe use is the key for the control of COVID-19 pandemic. Social issues and limitations the rapid spread of the COVID-19 pandemic resulted in panic, apathy and insecurity among the people. There have been instances of injudicious use and hoarding of disinfection substances as a result. This has resulted in indiscriminate and ineffective use of these important disinfectants. However, the knowledge regarding appropriate use is inadequate among the general public.

CHAPTER 5
CONCLUSION

5.1 Conclusion

Coronavirus disease 2019 (COVID-19) being an acute respiratory disease caused by a novel Coronavirus (SARS-CoV-2) is transmitted in most instances through respiratory droplets, direct contact with cases and also through contaminated surfaces/objects. Though the virus survives on environmental surfaces for varied period of time, it gets easily inactivated by chemical disinfectants. So, the correct and effective use of disinfectants, hand washing and washing using soap and water, hand disinfection with ABHRs are extremely important. Therefore, in order to curtail the spread of the disease there is an immense role of disinfection, more importantly its adequate knowledge and correct use.

5.2 Future work

- It can be add more disposer nozzle so that many person can use it at same time.
- Suction Type motor also can be use for proper dispose.
- Temperature recording system also can be implemented.

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Appendix

Program Code off hand Sanitization System:

```
#include <Adafruit_MLX90614.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27,16,2);
Adafruit_MLX90614 mlx = Adafruit_MLX90614();

int hightemp=101;
int object=2;
#define Pump 6 // Pump fan relay
#define redLed 4 // Red LED
#define Buzzer 5  //Buzzer
#define greenLed 3  // Green LED



void setup() {
  Serial.begin(9600);
     lcd.init();
  lcd.backlight();
  lcd.setCursor(4,0);
  lcd.print("WELCOME");
  while (!Serial);

  Serial.println("Adafruit MLX90614 test");

  if (!mlx.begin()) {
    Serial.println("Error connecting to MLX sensor. Check wiring.");
     lcd.setCursor(0,1);
  lcd.print("Sens. Error");
    while (1);
```

```
  };
pinMode(object, INPUT_PULLUP);
  Serial.print("Emissivity = "); Serial.println(mlx.readEmissivity());
  Serial.println("================================================");

pinMode(redLed, OUTPUT);
pinMode(Buzzer, OUTPUT);
pinMode(Pump, OUTPUT);
pinMode(greenLed, OUTPUT);
digitalWrite(redLed, LOW);  // Make sure led is off
digitalWrite(Buzzer, LOW);
digitalWrite(Pump, HIGH);
digitalWrite(greenLed, 0);
}

void loop() {
  lcd.setCursor(4,0);
  lcd.print("WELCOME");
  lcd.setCursor(0,1);
  lcd.print("Plz Place Hand..");



int hand = digitalRead(object);

if (hand == HIGH)
{
lcd.clear();
  lcd.setCursor(4,0);
  lcd.print("WELCOME");
  lcd.setCursor(0,1);
  lcd.print("Plz Place Hand..");
}
if (hand == LOW)
```

```
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Stand Stable");
  digitalWrite(Buzzer, HIGH);
  delay(30);
  digitalWrite(Buzzer, LOW);
  delay(1000);

   float temp=(mlx.readObjectTempF()-9);

if (temp>hightemp)
  {
    lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("High Temp.");
  lcd.setCursor(0,1);
  lcd.print("Temp:");
  lcd.setCursor(6,1);
  lcd.print(temp);
  lcd.setCursor(10,1);
  lcd.print("F ");
  digitalWrite(redLed, HIGH);
 digitalWrite(Buzzer, HIGH);
  digitalWrite(greenLed, LOW);
  digitalWrite(Pump, HIGH);
  delay(2000);
 digitalWrite(Buzzer, LOW);
 digitalWrite(redLed, LOW);
  }



if (temp<hightemp)
```

```
  {
  lcd.clear();
  lcd.setCursor(1,0);
  lcd.print("Thank You...");
  lcd.setCursor(0,1);
  lcd.print("Temp:");
  lcd.setCursor(6,1);
  lcd.print(temp);
  lcd.setCursor(10,1);
  lcd.print("F ");
  digitalWrite(redLed, LOW);
  digitalWrite(greenLed, HIGH);
  digitalWrite(Pump, LOW);
  digitalWrite(Buzzer, HIGH);
  delay(30);
  digitalWrite(Buzzer, LOW);
  delay(30);
  digitalWrite(Buzzer, HIGH);
  delay(30);
  digitalWrite(Buzzer, LOW);
  delay(140);
  digitalWrite(Pump, HIGH);
digitalWrite(greenLed, LOW);

delay(1000);

  }

}
  Serial.print("Ambient = ");
  Serial.print(mlx.readAmbientTempC());

  Serial.print("*C\tObject = ");
  Serial.print(mlx.readObjectTempC());
```

```
  Serial.println("*C");

  Serial.print("Ambient = ");
  Serial.print(mlx.readAmbientTempF());

  Serial.print("*F\tObject = ");
  Serial.print(mlx.readObjectTempF());
  Serial.println("*F");


  Serial.println();
  delay(500);
}
```