Automatic & Touch-free Hand Sanitizer Dispenser machine with real-time high body temperature detector.

Field of the Invention

This is an era of villainous COVID19. Avoiding physical contact is the most trusted weapon against it. So, we have tried to develop an **Automatic & Touch-free Hand Sanitiser Dispenser machine with a real-time high body temperature detector.**. Our innovation aims towards affordable healthcare products, without having any compromises on the build, as well as design.
We have tried to develop a circuit board that contains an open-sourced *ATmega328p PU* microcontroller and its substituent components. If we get an affirmative answer, run the motor automatically, which results in self dispense of sanitizing liquid.

In addition to this, we have added an IR temperature sensor with a buzzer alarm and LCD screen to signal the high fevered person with a buzzing sound.

Our objective is to develop an *economic design* which should be :

Affordable · Reliable · Customizable · Energy-Efficient · Noise-Free

Background of Invention

One evening I went to buy groceries. The shopkeeper looked very much irritated and tensed. On being asked he said he wanted to buy an automatic dispenser machine but unfortunately he could not afford it. After the return, I and my friends scraped the whole of various e-commerce websites. To our surprise, we found that not a single dispenser is below Rs 3000 even one with a capacity of 1L. We all know necessity is the mother of invention. After an exhaustive thought process and multiple debates, we decided to develop a machine that can automatically dispense sanitizer without any contact and with an additional zeal of **Make in INDIA**. An innovative idea to synchronize this device with a high body temperature detector was also brought up so that we can check the contamination at ground level.

At first, we decided on the **finite automata** of the machine implemented using open-sourced *JFLAP* software. Then our concentration was focused on the prototype of the model. Empowered with basic knowledge of Microcontroller and Microprocessor we tried to develop a CPU that can *1. receive a high input signal and its ALU can convert it into the distance* and *2. receive a high input signal and its ALU can convert it into Temperature*. And that Logic system can be able to compare it with threshold according to our automata diagram. After a long failure, we designed an **ALU** which can compute our requirement. For this, we take the help of open-sourced software *Logisim*.

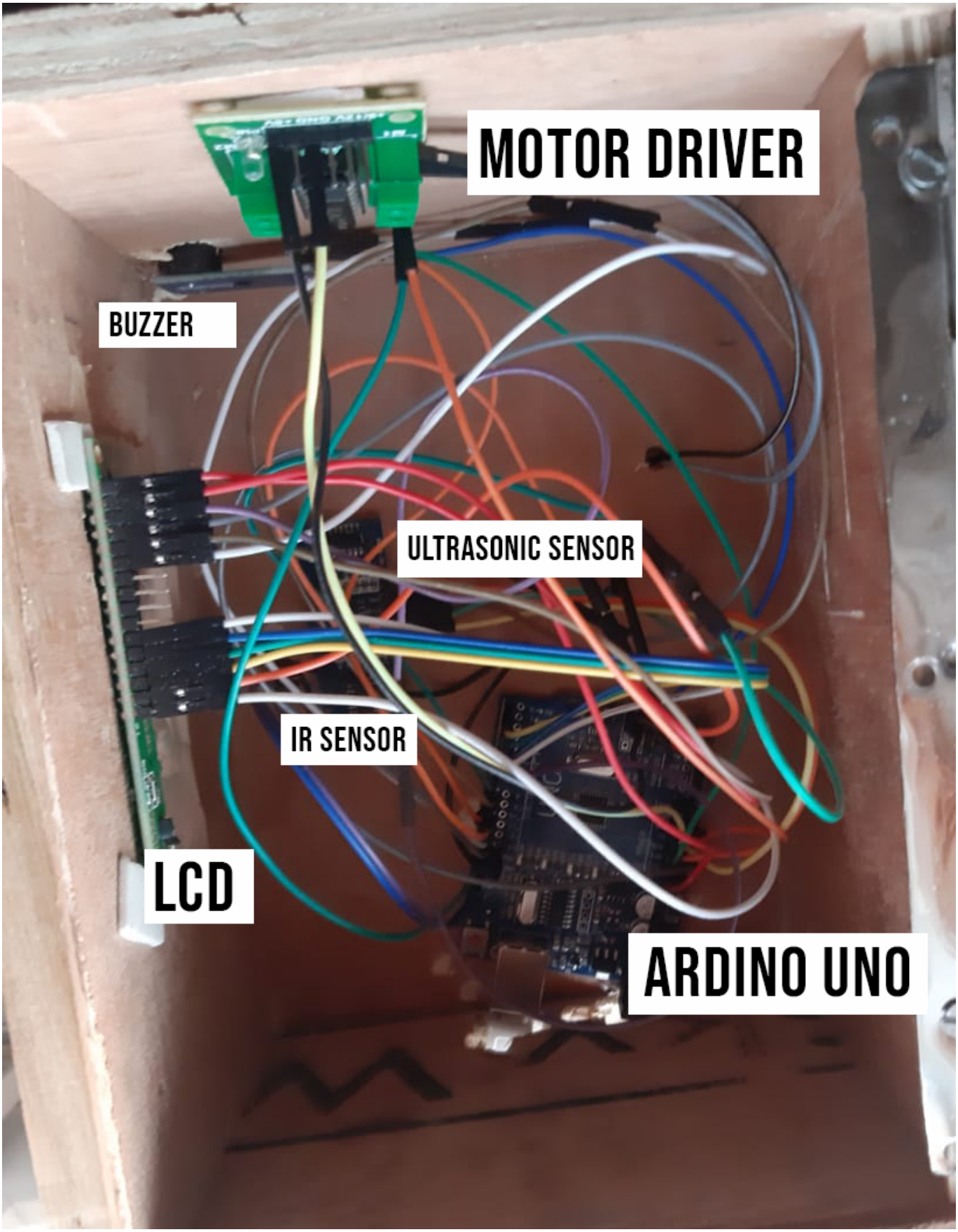
Then comes the time of prototype test, the test of our accuracy. For this, we have used an open-sourced *Arduino UNO board, a motor driver, an ultrasonic sensor, an infrared temperature sensor, a submersible motor, buzzer alarm, an LCD screen, and a 5V battery*. Before the actual performance test, we tried to run our Arduino C program in an online simulator *TinkerCAD*, where we can easily import the .obj file. At the end of the day, we were able to simulate. After this, we tried the code in our actual prototype and we were successful.

After the initial installation of the prototype, Our mentor Dr. Kamlesh Dutta, a senior faculty expert in Computer Architecture and NLP advised us to upgrade our model to serve a variety of purposes. A thorough discussion of feedbacks and innovative ideas lead us to merge an **automatic temperature detector** to sort out a person with high body temperature. It also helps to remove the extra workload of the security executive.

With the success of the prototype, we pushed the limit of *our goal to industrial production**. A customized PCB is modeled based on the designed Schematic Diagram of our chip for large scale production.

The Online *Easy EDA* tool is used for design purposes. In our innovative and economic design, we have used ATmega328p PU microcontroller, L293D motor driver, Infrared sensor, LCD screen, Piezoelectric Buzzer alarm, Ultrasonic sensor, 5V submersible motor, FTDI- USB to TTL driver, 16Mz oscillator, and few capacitors for the safety of the circuit for smooth working in an unsimulated environment. In addition to these, we have designed a 3D model for the container almost similar to the prototype model.

Protoype



Prior Art details(Novelty)

Price Comparasion

In the current market, broadly! there is two-division of a dispenser based on capacity:

1. above 3 L
2. below 3L.

Their market value varies a lot with the different brand names attached to them, but all of them cost above 5000 rupees in the Indian market. One with above 3L capacity can never be found below Rs 8000. In some cases, the price peaked at Rs 40000 with a capacity of the only 5L. *Not a single dispenser was found below Rs3000* Even after going through a lot of e-commerce websites and physical searches in the vast market of Delhi we were unsuccessful to find an affordable dispenser.

If we look into Temperature gun it will burden a common man with an additional price of Rs 1000 -2000 that too with extra manpower to handle.

Whereas the overall cost of our prototype was Rs 2000. After consulting certain business persons in the field and our domain expert professors, we concluded that the predicted cost of our whole design would be Rs 2000 at max(dependent on stock market situation). This low production cost can be easily achieved in bulk order. After adding certain Logistics and labor costs with little miscellaneous charges, we can easily launch this product in the Indian market at Rs 2000. It is approximately 30 % of the current market rate.

Hardware

Sensor

One of the major differences is in the sensor. In all of the marketed product, they have used an infrared sensor with sensitivity radii of 15-20 cm. But we have used the Ultrasonic sensor and have fixed its threshold radii of 5-8cm.

To be clear our targetted market region is the whole country. And the fact u can find that weather varies frequently with the changes of the state-border. Keeping this constraint in mind we can claim that our Ultrasonic sensor is better than the IR sensor, and much more reliable. An ultrasonic wave can even detect at the night. But a frequent variation in light can significantly reduce the sensitivity of our competitor sensor.

For temperature sensing, we have used an effective NON-contact infrared temperature sensor with the ability to give digital output. It basically compares the temperature difference from the surrounding.

Power

We don't need higher threshold radii since we using a motor with a low potential requirement of 5 v at max in comparison to the 15-20 V motor used in the market. Thus they consume 20-40 W of power, ten times higher than our product(2W).

> In our prototype, only 3 ml comes out in every flow.

FTDI USB to TTL driver

This plays a major booster in our design. We can easily customize our circuit, like changing the sensitivity radii. And easily reinstall the program if the microcontroller gets affected by the uncertain magnetic activity.

Atmega328p PU

This microcontroller is one of the promising CPUs for embedded systems in the current era. Its RISCV Harvard architecture provides us a great deal of computation power with time efficiency.

Circuit design

We have customized the circuit and its PCB design according to our requirements keeping in mind the minimum PCB production cost.

3D model

For all of the above changes, we have compromised with our container design. Although our wireframing has documented an ISI marked material but we have broadened the base of our container so that we can work with minimum power and low voltage motor. But the positive side of this compromise is that it can be easily installed in a high place. With the lower center of gravity(due to less height of container) comes higher stability.

There is a sense of Multi-use in the Indian market. We can easily satisfy our customers since they can install it easily anywhere as per their wish. There will be no need for extra stress to mount it on the wall.

Capacity

Since we are using a low powered motor we have wireframed our model for max 3L capacity.

Noise

In our testing with a lot of variation in power and voltage, we have concluded that it is also Noise free. So a better alternative to being installed inside a room or hall.

But it makes a buzzing sound if high body temperature is detected and must be turned off manually.

Uniqueness

The mentioned product will be unique in its way. We have searched a significant number of web pages and browsers but there was none like this. The unique fusion of Temperature detection with an automatic hand dispenser is exciting.

After a thorough comparison, we can conclude that our product can make a significant presence in the Indian market. We have a positive sense of vibes that we can efficiently deliver our goal of

Affordable · Reliable · Customizable · Energy-Efficient · Noise-Free product.

This can be a great initiative under the **MAKE in INDIA** movement, strongly led by our *Honorable Prime Minister Shri Damadordas Narendra Modi*.

Feature of a current model in the market with less than 3L capacity

Weight	1.04 Kg
Volume	1000 ml
Liquid output	1- 1.5 ml
Material	High Grade ABS Plastic
Output Method	Automatic induction
Sensing range	8-10 cm
Operation	Size C* 4 pcs / AC adapter (Not Included)
Rated power	~ 1.9 W
Installation Method	Wall Mounted

Feature of a current model in the market with more than 3L capacity

Product Generic Name	Hand Sanitiser
Product Colour	White
Mounting	Wall-mounting
Electrical Input	230 V AC
Capacity of Sanitiser	12 L
Dispensing Qty.	Adjustable amount(1-1.5 ml)
Working Voltage	24 V DC-1.5 A
Auto Sensing Distance (range required)	200 mm to 250 mm
Sensing Time	200mS typical between sensing 3 seconds gap is required
Sensor Type	Infrared Sensor
Hands to be used(Single or Multi)	Will work with both options
Net Weight	7.7 kg
Dimensions (mm)	405 (L) X 330 (W) X 470 (H)
Total Power Consumption	40 W

Objects of Invention

Every one of us knows that an ideal machine is just a hypothetical concept. Our design is not an exception. But we will first discuss our objective.

We have intended to make the most *efficient product* with the least number of components so that it gives the most efficient performance, with the least chance of failure. And customizable enough to change only the

basic required parts like power supply, sanitizer but not the chipset itself. Our goal is to make a system, in which price does not vary in huge amounts with further scaling up.

And we are capable of achieving a markable portion of objective like affordability, customizable and more reliable product. There is also a certain scope of improvement like better container design that will take less space. A high strength motor or the capacity for scaling up the liquid stored must be viewed from point of perfection.

A detailed description of the Innovation

Software used :

JFLAP

> open sourced software

JFLAP is software considered for experimenting with formal language topics including NFA, DFA, Turing Machine, etc. It is extremely popular in the College lab for it's easy to use feature.

Logisim

> open sourced software

Logisim is an educational tool for designing and simulating digital logic circuits. It has a simple toolbar UI and simulation of circuits as one build them, it is simple and great to facilitate learning the most basic concepts related to logic circuits.

Tinker CAD

> open community for students and creator

Tinkercad uses a simplified constructive solid geometry method of constructing models. A design is made up of primitive shapes that are either "solid" or "hole".

Atmel Studio 7

> deugging tool

Atmel Studio 7. Studio 7 is the integrated development platform (IDP) for developing and debugging all AVR R and SAM microcontroller applications.

Online Easy EDA

> Online free tool for development

EasyEDA is a web-based EDA tool suite that enables hardware engineers to design, simulate, share - publicly and privately - and discuss schematics, simulations, and printed circuit boards.

Program used:

ARDUINO C

Arduino is the hardware platform used to teach the C programming language as Arduino boards are available worldwide and contain the popular AVR microcontrollers from Atmel.

Atmel Studio is used as the development environment for writing C programs for AVR microcontrollers. It is a full-featured integrated development environment (IDE) that uses the GCC C software tools for AVR microcontrollers and is free to download.

Assembly Language

In computer programming, assembly language (or assembler language),[1] often abbreviated asm, is any low-level programming language in which there is a very strong correspondence between the instructions in the language and the architecture's machine code instructions.

Components Used in prototype:

Arduino UNO R3

> open sourced product

The reason we used Arduino was that it is one of the most reliable microcontrollers today, it was a separate IC from power management, which ensures that during prototyping we do not damage Arduino or the attached components. The good amount of pins allows us to interface multiple sensors, and the availability of I2C ports allows us to interface a variety of sensors, like the infrared temperature sensor we've used.

Arduino Uno is an open-source microcontroller board. Arduino Uno R3 uses the ATmega328P, which is an 8-bit microprocessor. Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started and is programmable with the Arduino IDE (Integrated Development Environment). The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. To interface with the MPU6050 sensors, we use the SDA and SCL ports along with A4, A5 ports for I2C communication as the newer version of Arduino Uno R3 supports more than one pair of SCL, SDA ports.

Pulse Width Modulation or PWM is a common technique used to vary the width of the pulses in a pulse-train. PWM has been used to servos and speed controllers, limiting the effective power of motors and LEDs.

The usual mode of communication UART (Universal Asynchronous Reception and Transmission) is a simple communication protocol that allows the Arduino to communicate with serial devices. The asynchronous serial protocol has several built-in rules. These rules are nothing but mechanisms that help ensure robust and error-free data transfers. These mechanisms, which we get for eschewing the external clock signal, are –

- Synchronization bits
- Data bits
- Parity bits
- Baud rate We will not go into the details of these.

The key reason to use Arduino over any other microcontroller is mainly due to its durability and reliability. Arduino Uno R3 uses a separate chip for power management, which makes it unlikely to cause damage to the sensor or Arduino in the process of prototyping/testing. Apart from this Arduino has been a very prominent microcontroller in the industry for a very long time with a respected reputation. Along with this, we have the advantage of the Arduino IDE that was initially made just for the Arduino.cc devices, and even though other microcontrollers and IoT devices take advantage of it, Arduino still gets the most reliable code/libraries that are even easy to find.

Submersible Pump

A submersible pump is a mini-device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitation. Submersible pumps push fluid to the surface as opposed to jet pumps which create a vacuum and rely upon atmospheric pressure. Submersibles use pressurized fluid from the surface to drive a hydraulic motor downhole, rather than an electric motor and are used in heavy oil applications with heated water as the motive fluid.

Ultrasonic Sensor

An ultrasonic sensor is a device that measures the distance of an object by emitting ultrasonic sound waves and transform the reflected sound into an electrical signal.

The formula for this calculation is D = 0.5 T x C (where D is the distance, T is the time, and C is the speed of sound 343 meters/second).

Infrared Temperature Sensor

MLX90614 Contactless Temperature Sensor Module is a unique module with the ability to digitalize the input signal. It can detect a range or -70 to 380-degree Celcius. It has also high medical level accuracy calibrated of 0.01 degrees celcius.

Buzzer Alarm

Robocraze Active Buzzer Module (3.3-5V) is easily compatible with Arduino, Arm. It is a piezoelectric based system.

LCD Screen

An LCD is an electronic display module based on a liquid crystal to render a visible image. The 16×2 LCD is a very basic module. The 16×2 translates o a display of 16 characters per line in 2 such lines.

Hand Sanitizer

Hand sanitizer is a liquid, gel, or foam generally used to decrease infectious agents on the hands.

Jumping Wires

A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end.

L293D MOTOR DRIVER

L293D is the I.C. in the motor driver. The motor driver is needed to deliver power and input signal. It has 3 power supplies, one for 9v for the relay function, 5v for input from Arduino, Ground, and two inputs for each of the two motor circuits. We have given one pin motor driver to the ground and the other to a digital port so that we can dispense sanitizer using only a single digital port.

We have completed our project in four Step:

1. Automata of our process
2. Datapath design
3. Prototype

```
a. simulation
b. Physical model
```

4. Circuit Diagram

```
a. Schematic Diagram
b. PCB Board
```

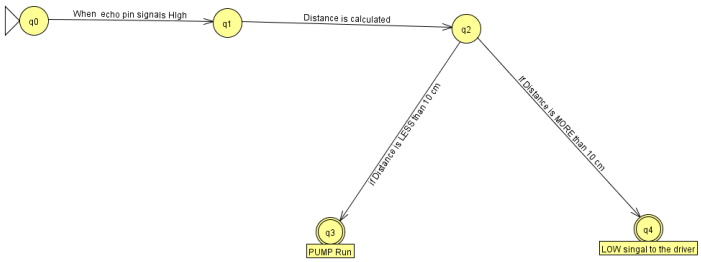
5. 3D model

1. Automata of our process

At the beginning of our process, we tried our knowledge gained in the theory of computation class. An automaton is designed to provide solid proof to an idea. Our idea was to create a machine that can *receive a high signal when an obstruction is detected and calculate the distance*. Then *compare it with threshold* and provides high signal to the driver when it is less. We have used open Sourced JFLAP software.

When it detects the high temperature provides a high signal to the Arduino to buzz the mobile phone.

Finite automata of machine

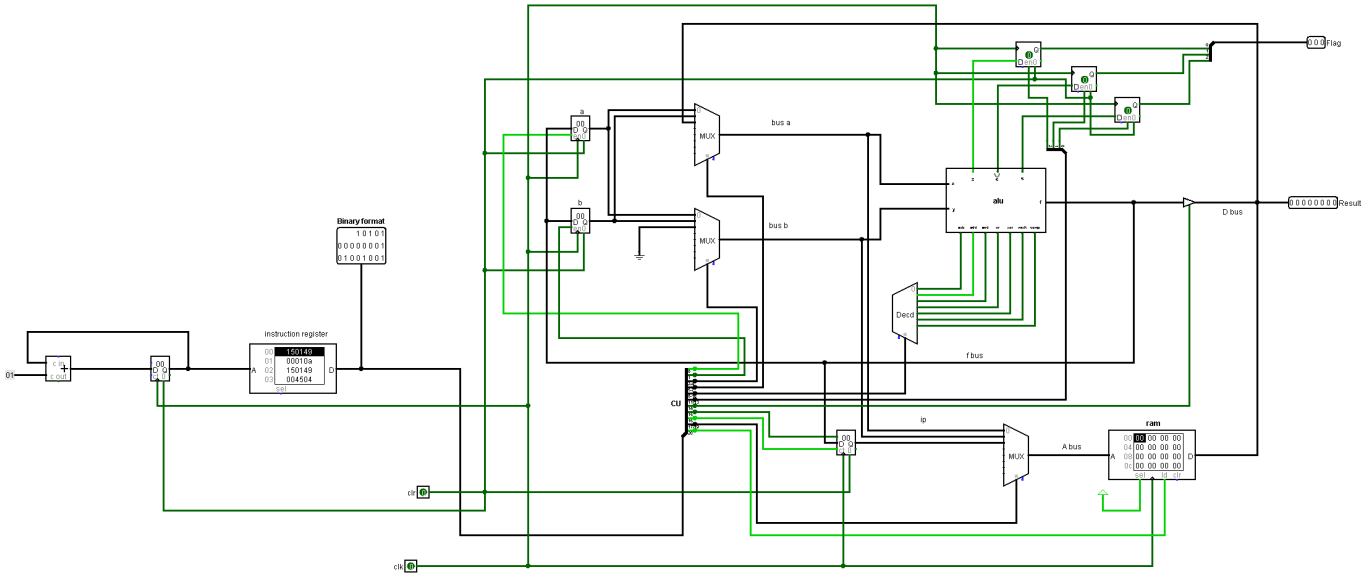


2. Datapath Design

Then comes the CPU design part. We have explicitly used open-sourced LOGISIM software.

We have designed a **21-bit width instruction register** stored in ROM which commands the *8bit* RAM data to compute according to the control provided by the control unit and provide the signal to the motor.

Datapath map



Control Unit

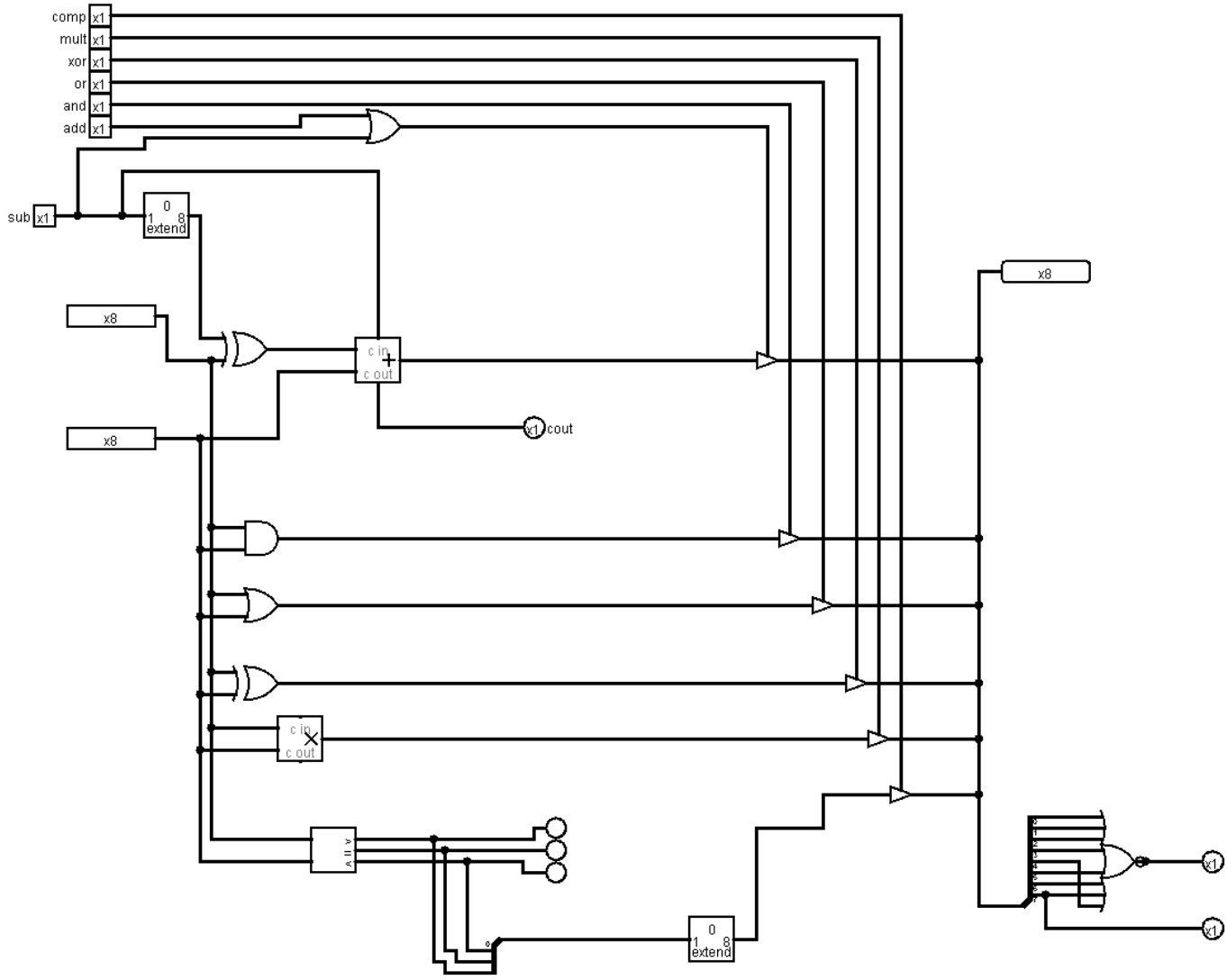
The Control Unit is the part of the computer's central processing unit (CPU), which directs the operation of the microcontroller. Control Unit to tell the computer's memory, arithmetic/logic unit, and input and output devices how to respond to the instructions that have been sent to the processor. CU fetches internal instructions of the programs from the main memory to the processor instruction register, and based on this register contents, the control unit generates a control signal that supervises the execution of these instructions.

We have used a 21-bit width splitter for the Control unit since our instruction is of 21-bit width.

ALU

An arithmetic logic unit (ALU) is a digital circuit used to perform arithmetic and logic operations. It represents the fundamental building block of the central processing unit (CPU) of a computer. In our, design ALU perform basic operation like multiplication, addition, XOR, OR, and comparison of two 8 bit binary number. after computing, it provides the high signal accordingly.

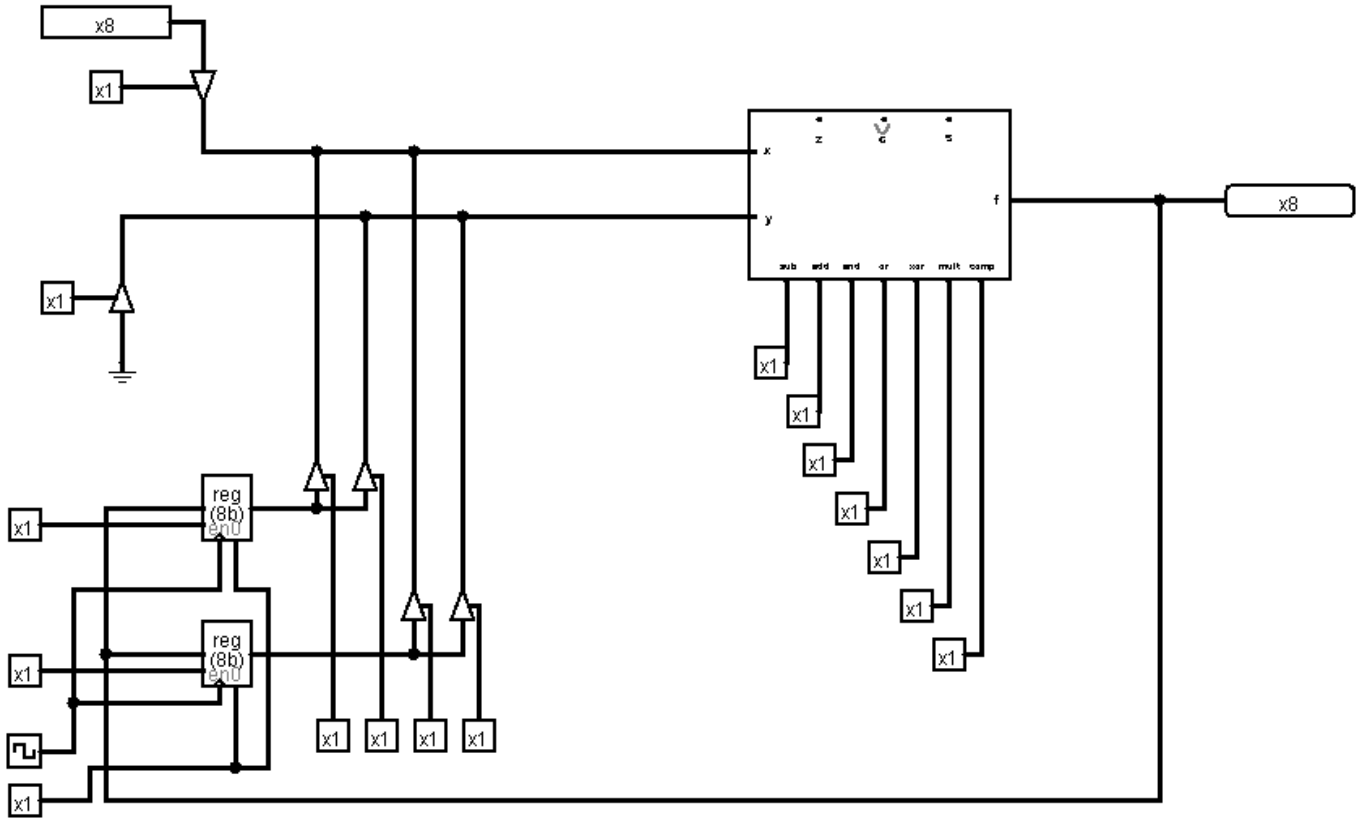
ALU



Algorithm for our ALU computation

```
150149  ldi a, data 10101000000101001001
10a     mov b, a    00000000000100001010
150149  ldi a, data
4504    mult a, b   00000100010100000100
150149  ldi a, result
10a     mov b,a
150149  ldi a, distance
4604    comp a, b   00000100011000000000
reutrn
```

Register



3. Prototype

In this model, when a person brings their hand in a distance of 3cms or less noted by Ultrasonic sensor, the infrared temperature sensor measures the object temperature and if the temperature is greater than our threshold temperature(99°F here) which can be changed, the buzzer alarm will go off until the device is reset. The display displays the ambient temperature at all times which keeps changing and shows the last object's temperature until reset. After this, sanitizer is dispensed irrespective of the temperature, using a motor driver to get the power supply from 5v of Arduino to the pump.

WORKING

Algorithm for our code.

> 1. set trig pin, echo pin, and buzzer pin to 0.

> 2. With the delay of 2 ms set the trig pin to 1.
> 3. When echo will get a high input signal, calculate the time using the clock cycle.
> 4. Then calculate distance using d= time*0.034/2.
> 5. If the distance is less than 5 cm give a digital high signal to pump through Vcc and low signal through the ground pin.
> 6. If the body temperature is greater than 99F then our alarm will buzz off.
> 7. And wait for 1750 ms.

our C code, Assembly code with Machine code C code :

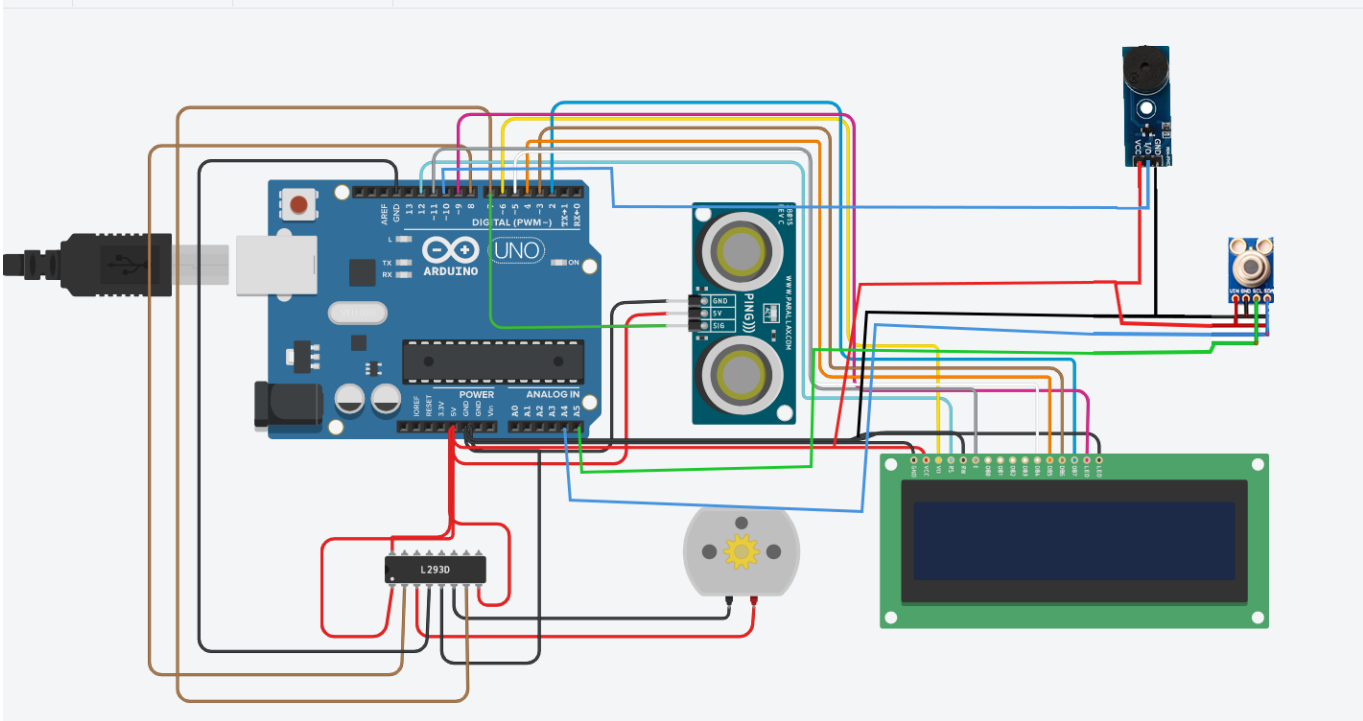
```
#include <Wire.h>
#include <LiquidCrystal.h>
#include <Adafruit_MLX90614.h>
Adafruit_MLX90614 mlx = Adafruit_MLX90614();
const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2, Contrast=150;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
#define echoPin 7
#define trigPin 8
#define pump 13
#define buzzerPin 10
int long duration;
int distance;
void setup()
{
  analogWrite(6, Contrast);
  lcd.begin(16, 2);
  Serial.begin(9600);
  Serial.println("Adafruit MLX90614 test");
  mlx.begin();
  pinMode(echoPin,INPUT);
  pinMode(trigPin,OUTPUT);
  pinMode(pump, OUTPUT);
}
void loop()
{
  digitalWrite(trigPin, LOW);
  delay(2);
  digitalWrite(trigPin, HIGH);
  delay(10);
  digitalWrite(trigPin, LOW);
  duration=pulseIn(echoPin, HIGH);
  distance=(duration*0.034/2);
  lcd.setCursor(0,0);
  lcd.print("Ambient="); lcd.print(mlx.readAmbientTempC()); lcd.print("*C");
  if(distance<=3)
  {
     delay(2000);
     lcd.setCursor(0, 1);
     lcd.print("Object="); lcd.print(mlx.readObjectTempF()); lcd.print("*F");
     if(mlx.readObjectTempF()>=99)
    {
      analogWrite(buzzerPin, 20);
```

```
        digitalWrite(pump, HIGH);
        delay(500);
        digitalWrite(pump, LOW);
        delay(500);
      }
      else if(mlx.readObjectTempF()>=90 && mlx.readObjectTempF()<99)
      {
        digitalWrite(pump, HIGH);
        delay(500);
        digitalWrite(pump, LOW);
        delay(500);
      }
    }
    delay(500);
  }
```

Simulation

For the initial testing of the proposed model, we have used the Arduino IDE simulator and import a .obj file from Tinkercad software. Then we load the above program. After several bugs finding and debugging, finally, our simulator works according to our visualization.

Simulation



Prototype

Successful implementation paves the way for prototype testing. After collecting the required component with assembled them and connect it properly using jump wire. Then we upload the program in the bootloader connecting its USB port with our computer. There is a point to be noted that the C program is converted into a .hex file that is written in assembly language. Arm GCC compiler converts the C program into assembly code.

For the container, we used a common container that can be easily found anywhere. It was a eureka moment when the first drop of liquid pumped out from the tiny nozzle.

We have also tested the prototype with artificially increased temperature of the body. It worked perfectly with the buzzer alarm buzzing loudly.

Protoype

4. Circuit Diagram

This phase of development is subdivided into two parts:

- Schematic Diagram
- PCB board design concept

Component used:

In our designed circuit we have used:

Atmega328P-PU

It is a high-performance Microchip 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general-purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

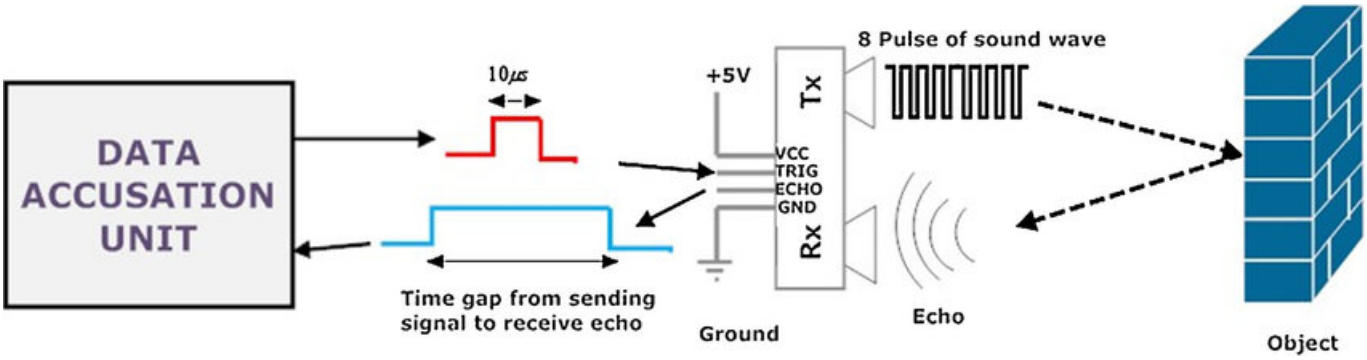
L293D Motor Driver

The L293D is a popular 16-Pin Motor Driver IC. A single L293D IC is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently. So if you have motors which have an operating voltage less than 36V and operating current less than 600mA, which are to be controlled by digital circuits like Op-Amp, 555 timers, digital gates, or even Micron rollers like Arduino, PIC, ARM, etc.. this IC will be the right choice for us.

Ultrasonic Sensor (HC-SR04)

the HC-SR04 Ultrasonic (US) sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo, and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required.

Ultrasonic Sensor Working



Submersible Pump

A submersible pump is a device which has a hermetically sealed motor close-coupled to the pump body.

FTDI USB to TTL serial converter

The TTL-232R cables are a family of USB to TTL serial UART converter cables incorporating FTDI's FT232RQ USB to Serial UART interface IC device which handles all the USB signaling and protocols. The cables provide a fast, simple way to connect devices with a TTL level serial interface to USB.

Infrared sensor

GY-906 MLX90614-BAA Non-Contact Infrared Temperature Sensor is an infrared thermometer designed for contactless temperature detection. An internal 17-bit ADC and a powerful DSP contribute to the MLX90614's high accuracy and resolution. The sensor has a field of view of 90 degrees and returns the average temperature value of all objects within this field of view. It has a range of around 1cm.

Buzzer alarm

Piezoelectric sounders are sound components that generate sound suitable for use as input signals without built-in oscillation circuits.

LCD module

An LCD is an electronic display module that uses liquid crystal to produce a visible image. The 16×2 LCD is a very basic module commonly used in DIYs and circuits. The 16×2 translates o a display of 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

Basic Circuit components:

Capacitor

The capacitors are there to resonate with the crystal inductance and cause the crystal to oscillate on its fundamental parallel-resonant mode. The reason that there are two capacitors in series is to create a network that creates a 180-degree phase inversion at resonance because the amplifier (inverter) has a 180-degree phase inversion between its input and output. This makes the loop gain have a net phase shift of 360 degrees, which is what causes it to oscillate

Resistor

A 10-ohm resistor is used with the 1uF capacitor to enable the RC circuit thus providing safety in unstimulated conditions.

Oscillator

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a precise frequency.

Power source

A 5v of the power supply is provided to the whole circuit.

Ground Source

All of the components are effectively grounded with the ground pin.

Wires

Wires and connectors are provided for the external components of our circuit.

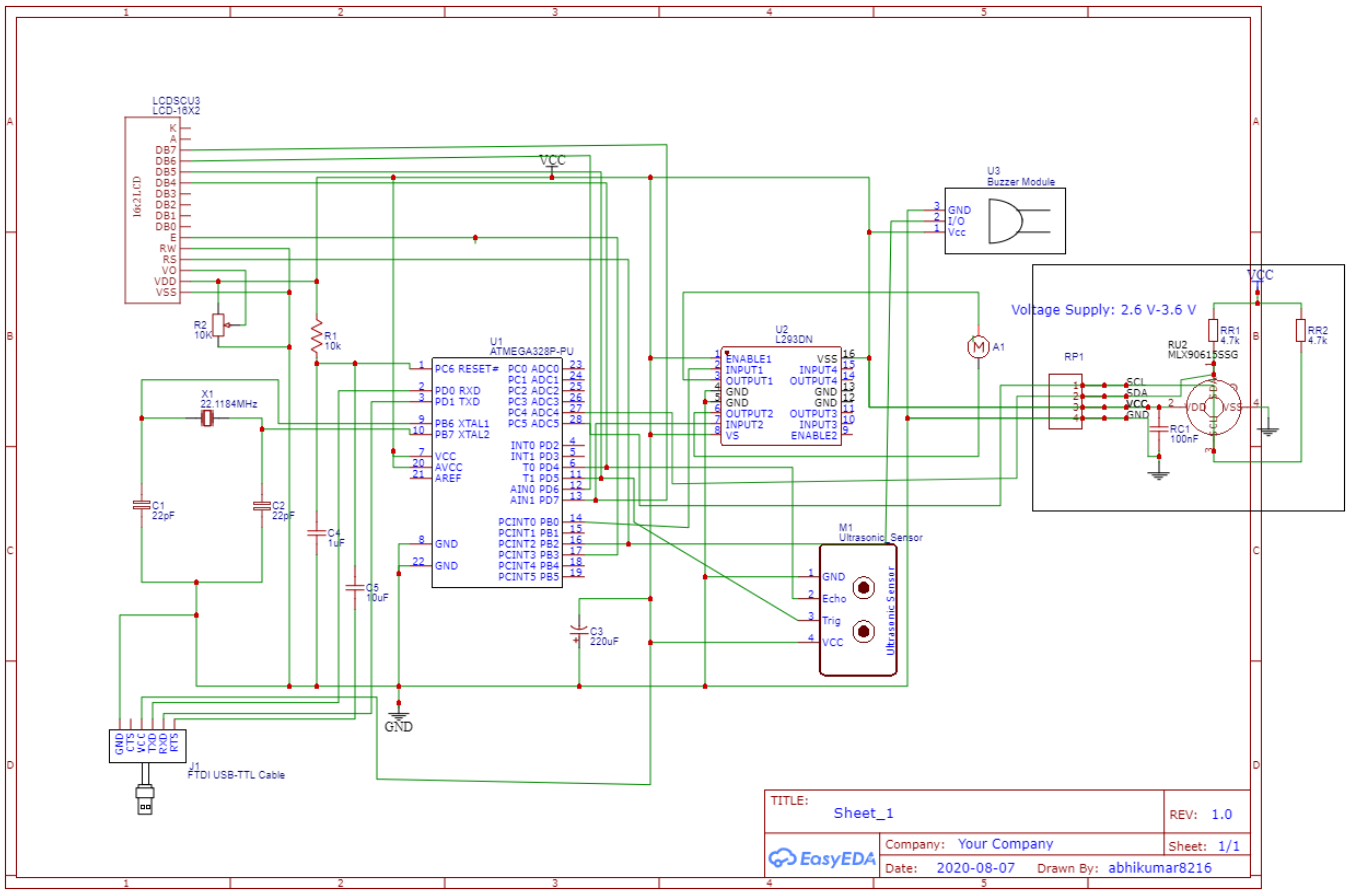
Schematic Diagram :

Software: *Easy EDA online*

For demonstrating a clean representation of our circuit and maintaining transparency in our design, we have used an online Editor called **EasyEDA online**.

We have efficiently designed the schematic diagram of the circuit used in our design.

Schematic Diagram

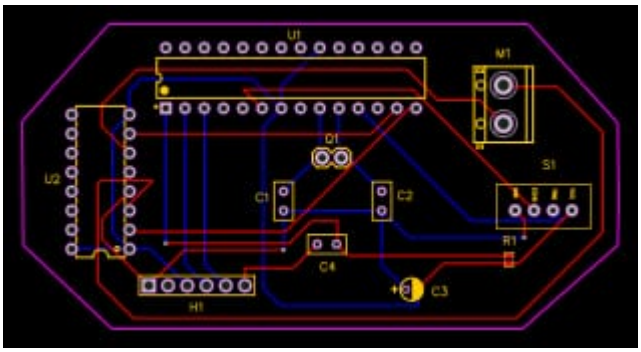


PCB Design

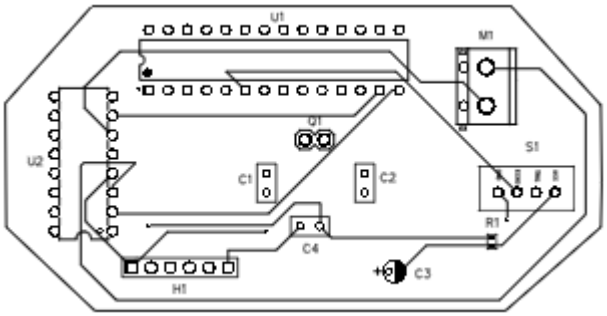
We have used a doubled layered PCB board. In this project, a thin layer of directing material, similar to copper is connected to both the best and base sides of the board. A 3D rendered model is provided below for the initial version of our prototype i.e automatic hand sanitizer.

A new design for the PCB board after the upgrading of the project is in the process.

PCB 3D rendered



PCB 2D rendered

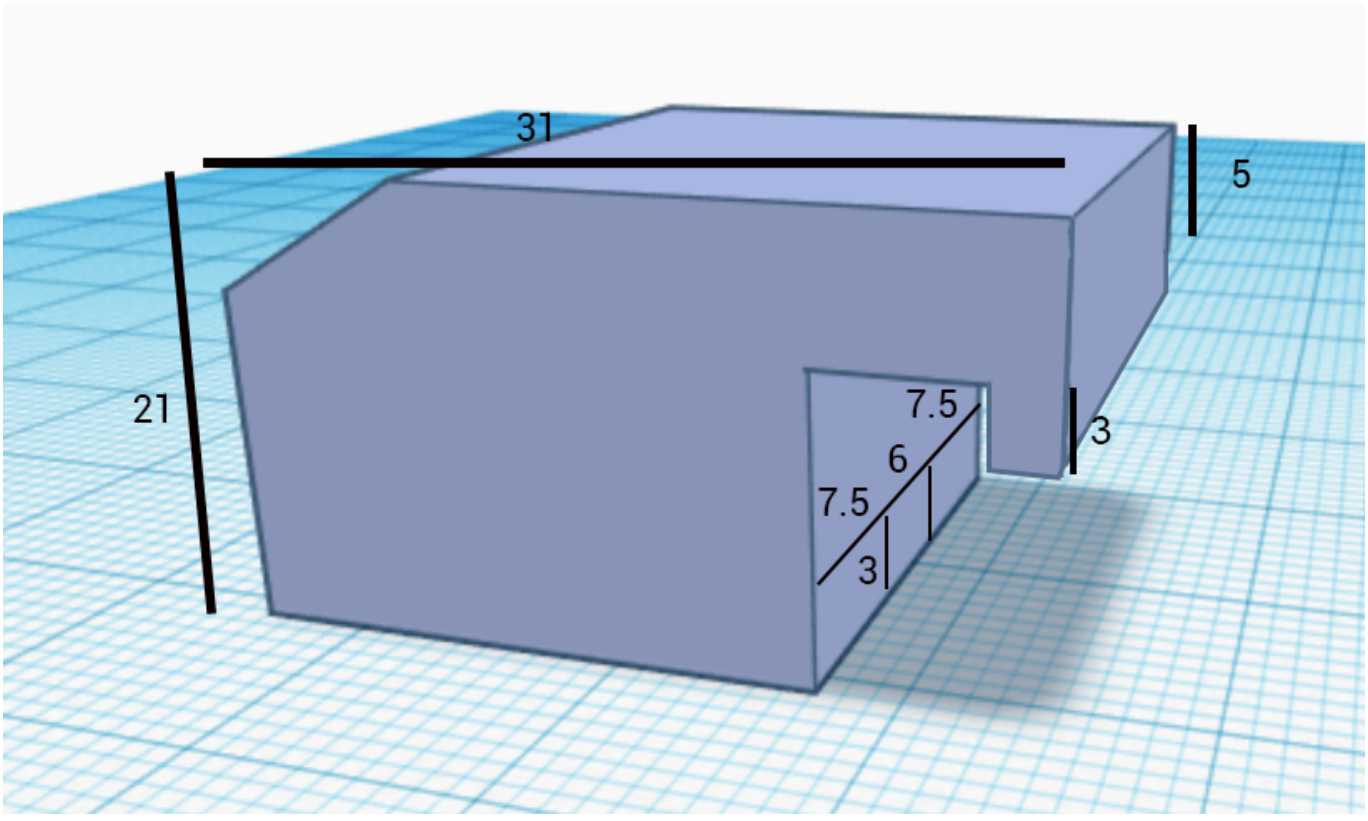



```
U1: ATmega328p PU
U2: L293D driver
C1 & C2 : Capacitor 22uF
C3 : 10 uF
C4 : 1uF
S1 : USB pin
H1 : USB to TTL pin
M1 : motor pin
Q1 : register
```

5. 3D model:

A 3D model is designed with the help of Tinkercad. In this design, we provide a space for a motor in the bottom portion like an efficient structure to obstruct the self flow of liquid due to gravity.

Motor



Unique well design :

We have a unique well design that allows us to continue the flow of sanitizer, even when the quantity remaining is low. We have a small volume for liquid at the bottom where the pump is, relative to the top thus preventing wastage and increasing efficiency.