HYGIENIC TOUCH-FREE AUTOMATIC WATER VENDING MECHINE

AIM: The innovative sensor technology ensures that women can obtain a napkin quickly and **hygienically**, by simply placing their hands beneath the vending machine. This eliminates the need for physical contact or the use of buttons or handles, promoting a safe and hassle-free experience.

PROBLEM STATEMENT:

Now a days water vending machines are available and operated on only one coin but our aim is to design water vending machine which is operated on different coins. In India there is problem of safe drinking water therefore we are going to provide mineral water.

Water has become the most commercial products of the century. This may sound bizarre, but true. The stress on the multiple water resources is a result of a multitude of factors. On the one hand, the rapidly rising population and changing lifestyles have increased the need for fresh water. If opportunity costs were taken into account, it would be clear that in most rural areas, households are paying far more for water supply than the often-normal rates charged in urban areas. Also, if this cost of fetching water which is almost equivalent. To 150 million women days each year, is covered into a loss for the national exchequer, it translates into a whopping 10 billion rupees per year.

2. Personal devices for touchless interaction

Touchless interaction is possible by using personal smartphone devices to allow for scanning QR Codes [9] for taking over a screen, connecting by Bluetooth and to pay using NFC.

Using mobile devices for proxemic interactions can help to stop the spread of infections [10]. This touch-free experience is actually very simple and intuitive to get control over screens without the need of

downloading any applications. Many businesses are considering replacing interactive touchscreens with a touch free interface to provide a better customer experience.

2.1. Gesture recognition & hand interaction

Hand gesture is a well adopted touchless interaction allowing humans to interact with machines and it is the next level in the evolution of motion-sensors. Devices like Leapmotion, kinect, Azure kinect and deep learning based developments like Google Mediapipe and Manomotion provide the ability of gesture based touchless interfaces or more enhanced real-time hand interaction.

2.2 Touchless typing

Touchless typing allows typing without touching the keyboard or keypad. It is mostly known as a special assistive technology to enable operation of standard electronic equipment or typical computers. Just like Airwriting technology that allows writing text messages or composing emails by writing in the air.

2.3 Touchless interfaces progress during COVID-19 in different industries

In every field of life where public interaction is required such as in health, education, workplaces, travel and social life, touchless technology has gained attention as a potential future solution during the COVID-19 pandemic.

PROJECT DESIGN SPECIFICATIONS:

1.1 PROGRAMMABLE LOGIC ONTROLLER

A Programmable Logic Controller is a solid-state industrial controller that performs discrete sequential logic in a factory environment. It is originally developed to mechanical relays, timers and counters. PLCs are used to perform difficult control operations in a plant. A sequence of instructions is performed by the user to the PLC memory and when the program is executed, the controller operates a system to the correct operating specifications. A Programmable Logic Controller is currently defined by the National Electrical Manufactures

Association (NEMA) as a digital electronics device that uses a programmable memory to store instructions and to implement specific functions such as logic, sequence, timing, counting and arithmetic operations to control machine.

Figure 1 Programmable Logic Controller

1.2 PROGRAMMABLE LOGIC ONTROLLER

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1.3 COIN SENSOR

Coin sensor is the device which is used to detect the correct coin. The coin sensor uses the thickness, diameter and fall time of the coins to identify them. CH-926 is a multi-coin selector, can accept up to 6 kinds of different coins at the same time. This type of coin selector is widely used in Vending machine, Arcade Game, Message chair, and other self–management system. CH-926 is mainly based on material, weight and size to identify coins.

It has the most up to date algorithm to design software. Therefore, CH-926 is very stable and accurate even when environment changes such as temperature, and humidity etc. In order to increase the accuracy, we suggest different version of coins use different channel to set up.

Figure 3 Coin Sensor

1.4 RFID SENSOR

A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader.RFID is a technology similar in theory to bar codes. However, the RFID tag does not have to be scanned directly, nor does it require line-of-sight to a reader. The RFID tag it must be within the range of an RFID reader, which ranges from 3 to 300 feet, in order to be read. RFID technology allows several items to be quickly scanned and enables fast identification of a particular product, even when it is surrounded by several other items.RFID tags have not replaced bar codes because of their cost and the need to individually identify every item.

1.5 PUMP

This water pump is use to take water from water tank or well. This water pump is connected between the water tank or well and tap where we can get water. In our project we use 0.5 HP, 0.37 kw monoblock water pump. Featuring brass impeller and copper winding, the special

motor design of this water pump can work on UPS as well. This water pump is capable of priming up to 3 meters static suction lift without a foot valve at rated head and discharge. Well known for high performance, durability, efficiency, and reliability, this water pump can withstand with wide voltage fluctuation from 180 to 240 volts. With 33.6 LPM water flow and 50 hertz frequency, this water pump is applicable for use at household as well as commercial places.

Figure 6 Pump

LCD

A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7- segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

Figure 7 LCD

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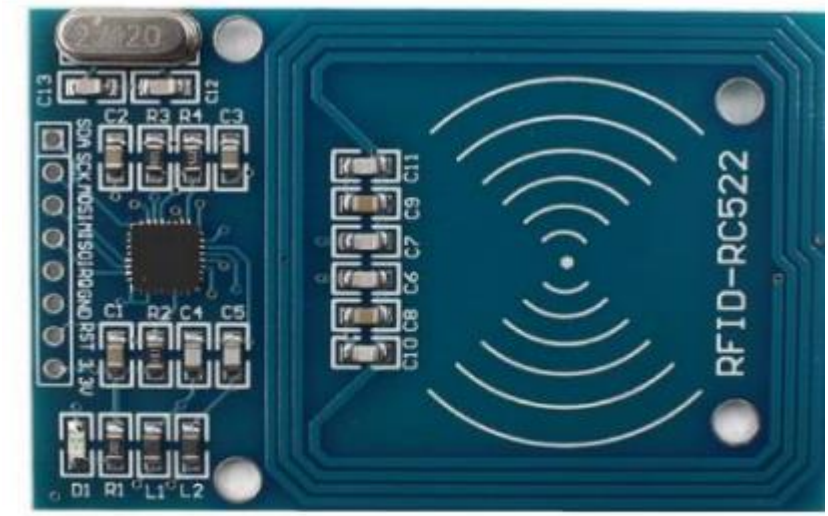


Figure 4 RFID sensor

PROJECT ARCHITECTURE:

RFID card and get water. Whereas the coin sensor operated machine is use every public place like Bus station, Railway station, garden or highways. They use coin of Rupee 1, 5 or 10.

A customer has to be insert coin in machine or RFID card is scan on sensor. The coin is checked whether the coin is correct or not by the coin sensor. The coin sensor uses the thickness, diameter and fall time of the coins to identify them. The RFID card is sense by the RFID sensor. Now, when inserted coin or RFID card are appropriate or right the Programmable Logic Controller gives signal to the relay and relay will switch the R.O pump which is connected to the water tank. So the R.O pump will lift the water from water tank. Then water is flowing through the flow sensor. Flow sensor is sensing devices which continuously measure the amount of water. When flow sensor measures that amount of water which is defined for different coins, it will give signal to PLC and PLC give signal to the solenoid valve so valve will be off and water flow is stop. water automatically.

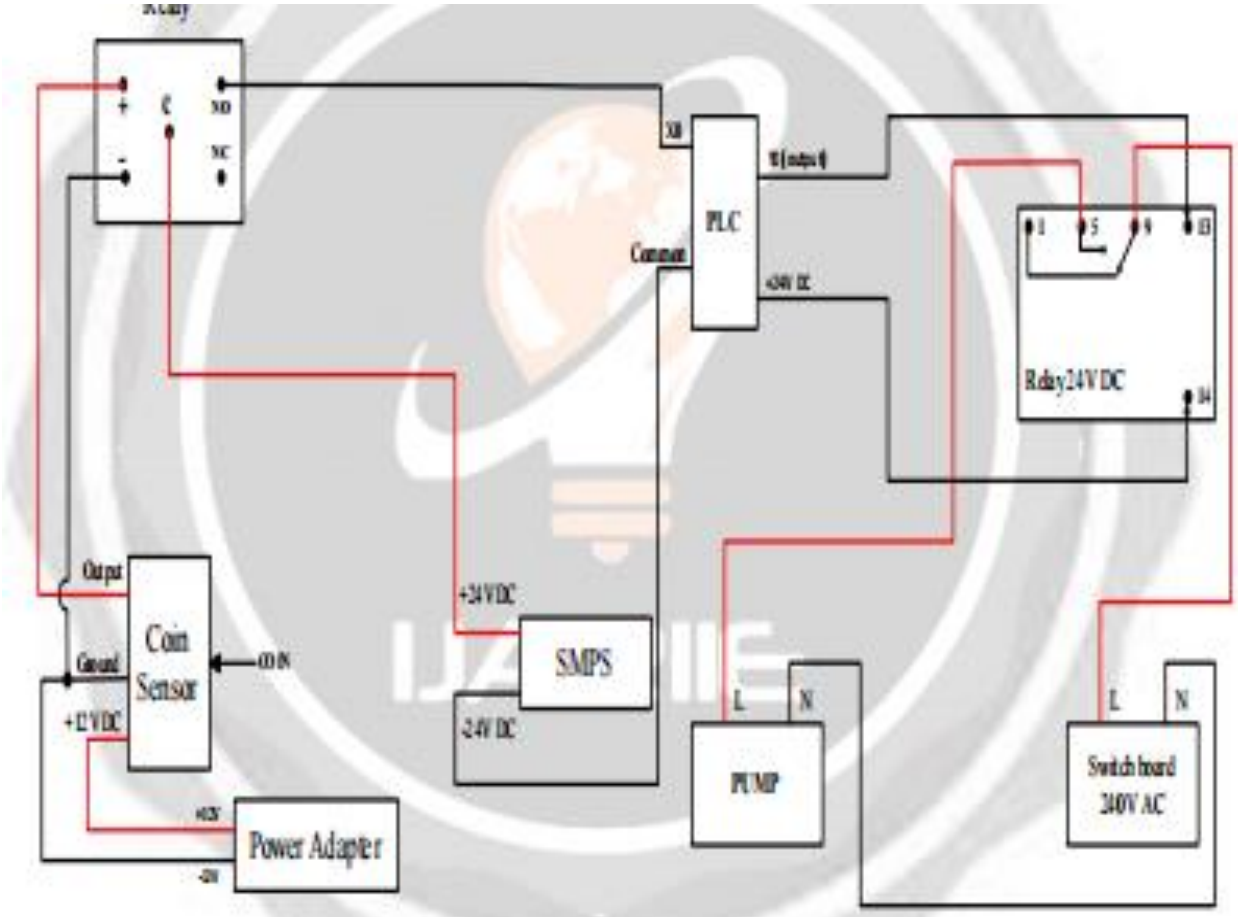


Figure 8 Connection Diagram

FLOW EXPLANATION:

The flow chart of water vending machine is shown as above. First machine check the status of the water in the water tank if there is no water then the LCD is displaying “Fill tank and No water available” and if water is available then the LCD is displaying “Select the amount of water”. Customer will select the amount of water that are one litre, five litre or ten litre. After that insert coin or scan the RFID card for selected amount of water. Now if the coin is correct then system will check the glass, bottle or jug is placed or not. So system will check whether glass or jug is placed or not. If jug is not placed then LCD displaying message “Place bottle/jug” and if the jug is place properly then water is dispatch into that jug. This way customer will get water and system is complete.

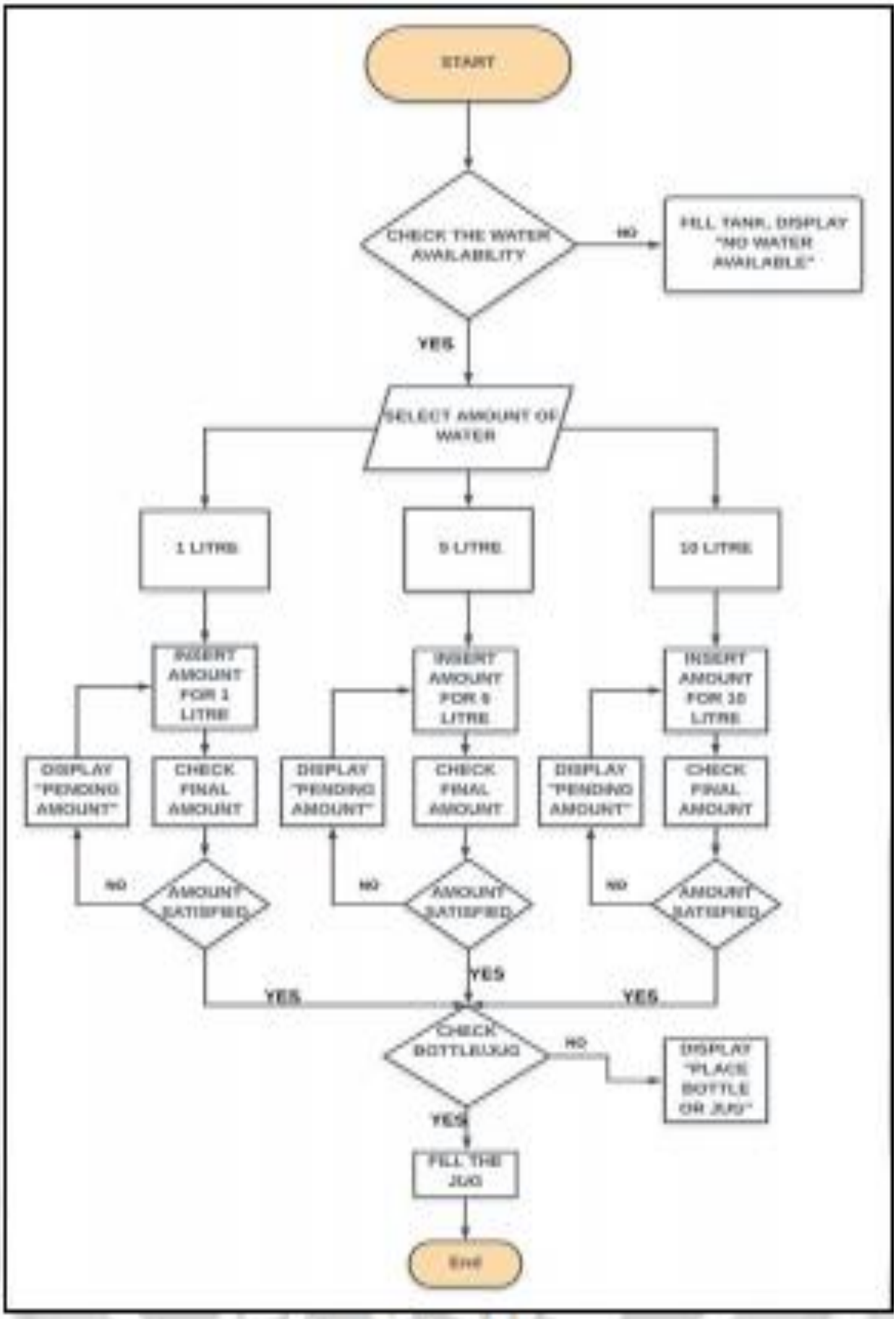
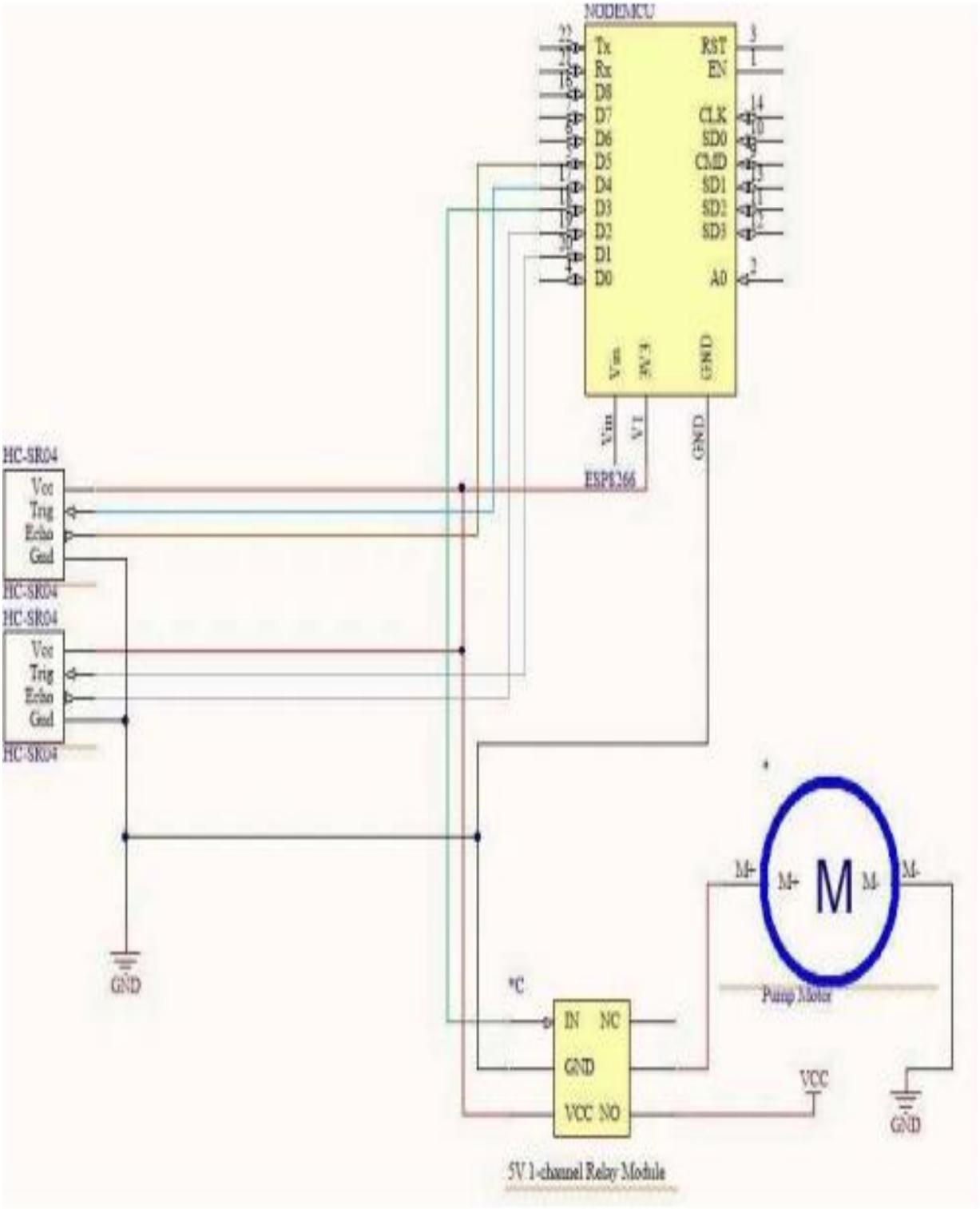
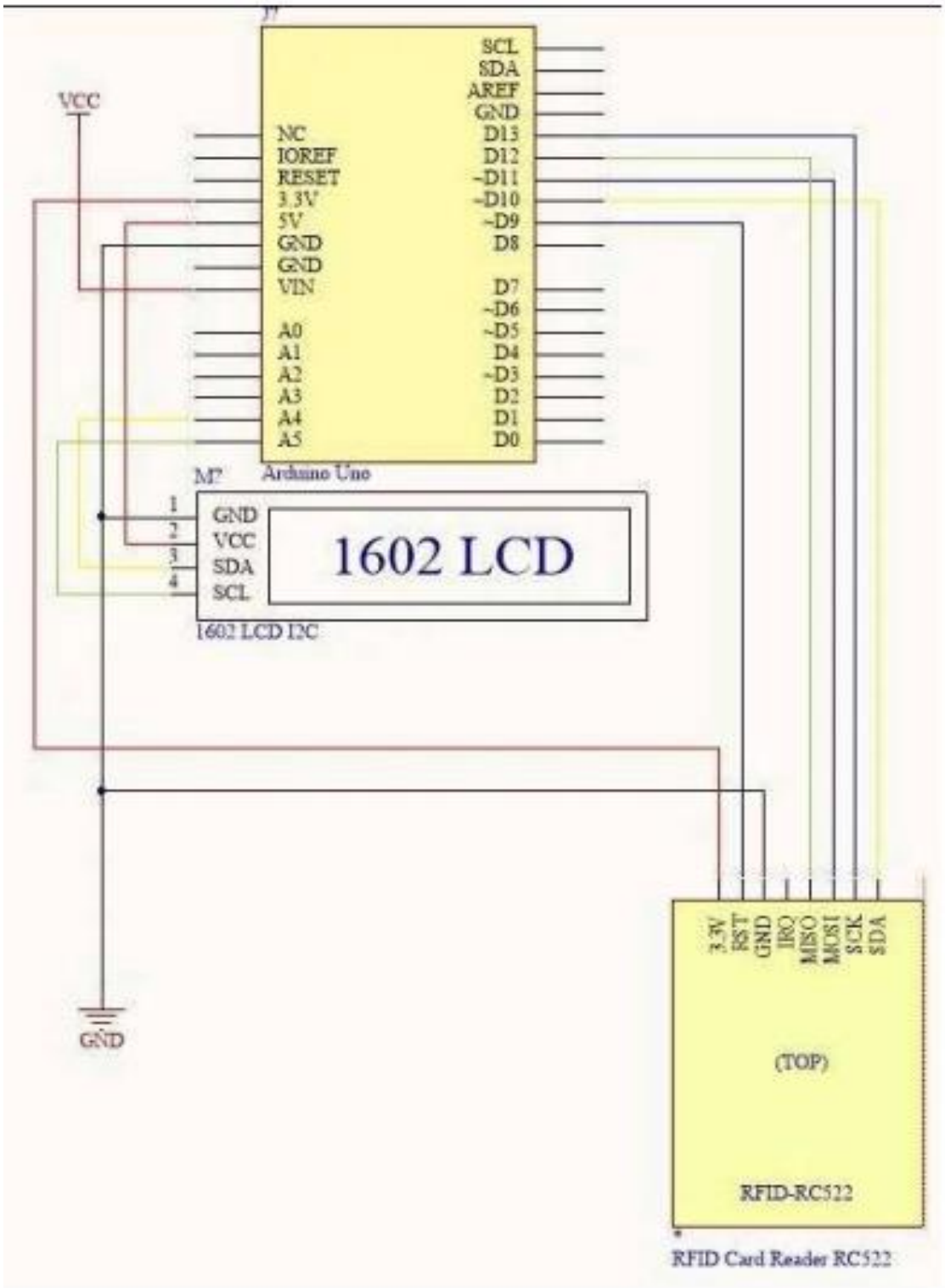


Figure 9 Flow Chart

WIRING DAIGRAM:



KICAD PCB DESIGN:



Pin 13 to 9 will be used for the RFID. FOR the LCD we will use I2C to connect to the microcontroller. LCD SDA a nd SCL pin is connected to the Analog pin in the Arduino SDA->A4 and SCL->A5. Because the voltage uses for RFID and LCD are different. we connected 3.3V to RFID and 5V to LCD.

In the code includes library SPI and Wire for the communication protocol used by RFID, MRFC522 library is also included because the component that we use as RFID reader is MRFC522, and then we include LiquidCrystal_I2 C library because the LCD we use are solder with I2C module, by using I2C LCD module we will reduce the usag e of the pin that is being used for the Arduino. In this project, we mainly use the I2C communication protocol to re duce the cost of wiring the components.

In order to use the SPI communication and LCD & RFID. In the setup function, it is needed to add
SPI.begin();

LCD.begin();

mfrc522.PCD_Init();

```
#include <SPI.h>
#include <MFRC522.h>
#include <LiquidCrystal_I2C.h>
#include <Wire.h>

#define SS_PIN 10 // SDA pin
#define RST_PIN 9

MFRC522 mfrc522(SS_PIN, RST_PIN);   // Create MFRC522 instance.
LiquidCrystal_I2C lcd(0x27, 16, 2);
```

```
void setup()
{
  Serial.begin(9600);   // Initiate a serial communication
  SPI.begin();      // Initiate  SPI bus
  lcd.init();
  lcd.backlight();
  mfrc522.PCD_Init();   // Initiate MFRC522
  Serial.println("Put your card to the reader...");
}
```

in this code below is the main program for the Arduino microcontroller. The RFID will scan the tag/card that has b een authorized and shown the user of the card by LCD.

PICC_IsNewCardPresent() this function is used to check either there is a tag/card that is currently in the range of the RFID sensor.

PICC_ReadCardSerial() this function is used to check either the card data could be read or not.

The card/ tag that is being read by the RFID sensor will use the data UID to check either it is Authorize or not. If t he card or tag is not authorized it will return an error message through LCD.

```
void loop()
{
  // Look for new cards
  if ( ! mfrc522.PICC_IsNewCardPresent())
  {
    return;
  }
  // Select one of the cards
  if ( ! mfrc522.PICC_ReadCardSerial())
  {
    return;
  }
  //Show UID on serial monitor
  Serial.print("UID tag :");
  String content= "";
  byte letter;
  for (byte i = 0; i < mfrc522.uid.size; i++)
  {
     Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
     Serial.print(mfrc522.uid.uidByte[i], HEX);
     content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " "));
     content.concat(String(mfrc522.uid.uidByte[i], HEX));
  }
  Serial.print("\n Message : ");
  content.toUpperCase();
  if (content.substring(1) == "59 F7 14 E8") //change here the UID of the card/cards that you want to give access
  {
     lcd.setCursor(0,0);
     lcd.print("Access Authorized");
     lcd.setCursor(0,1);
     lcd.print("Hello Vincent");
     delay(100);
  }
  else if (content.substring(1) == "D5 97 A7 23")
  {
     lcd.setCursor(0,0);
     lcd.print("Access Authorized");
     lcd.setCursor(0,1);
     lcd.print("Hello Gilbert");
     delay(100);
  }
  else   {
     lcd.clear();
     lcd.setCursor(0,0);
     lcd.print("Error");
     lcd.setCursor(0,1);
     lcd.print("Access Denied");
     delay(100);
```

Step 9: Problem Encounter and Data Gathering

ght water in the dispenser	
	Water height(cm)
	4.6
	4.8
	5
	5.1
	5
	4.8
	5
	4.7

ptimal Distance to RFID MFRC522	
	RFID distance (cm)
	2.4
	2.35
	2.5
	2.5
	2.4
	2.4
	2.5
	2.4
	2.3
	2.5

The optimal Volume water of the tank for the dispenser to pump the water

The optimal distance of the card/tag and RFID reader to detect

CONCLUSION:

In conclusion, this project could be build using microcontroller ESP8266 as the hardware and Blynk as software i ntegration to build the application. As the additional Feature, we use an Arduino Uno microcontroller that is conne cted to the LCD and RFID.

For suggestion, even though using ESP8266 microcontroller could work functionally. It is better to have a microc ontroller that has more available pins so that it is not needed to use two microcontrollers as in the project above. Another suggestion is to make a better casing such as using 3D print, as a card box is not a good option for casi ng a project that involved liquid.