IOT BASED WATER LEVEL MONITORING SYSTEM

A PROJECT REPORT

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in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

SHREE SATHYAM COLLEGE OF ENGINEERING AND TECHNOLOGY

SALEM 637 301

ANNA UNIVERSITY : CHENNAI 600 025

MAY 2023

ANNA UNIVERSITY : CHENNAI 600 025

BONAFIDE CERTIFICATE

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ACKNOWLEDGEMENT

Behind every achievement lies an unfathomable sea of gratitude to those who actuated it, without them it would never have into existence. To them we word of gratitude imprinted within us.

We wish to divulge ours heartfelt thanks to our honorable Chairman, Shree Sathyam college of Engineering and Technology, Sankari for providing all the facilities to develop my project successfully.

We wish to express our sincere thanks to our respected Founder Chairman cum Principal **Dr. V. SUJATHA., M.E., Ph.D.,** Who has been ours constant source of inspiration.

We also thank **Prof.Dr. S. SELVARAJAN B.E., M.E., M.S., Ph.D., MISTE.,** Dean-Academics and Head of Department, Department of the Computer Science and Engineering, for providing adequate laboratory facilities to complete the project and we are indebted for his constant help and creative ideas over he provider of project work.

We would like to express my heartfelt thanks to my project guide **Mrs. M. PRESITHA AARTHI M.E,** Computer Science and Engineering for this continuous guidance, motivation and support during the course of this project.

We express our sincere words of gratitude of other faculty members and staff members of the Department of Computer Science and Engineering.

Our family and friends were always rooting me and my batch members on to finish. We also extend our warmest thanks to all our lab technicians for helping me in this venture.

We are thankful to and fortunate enough to get constant encouragement , support and guidance from all Teaching staffs of computer Science and Engineering department which helped us in successfully completing our project work.

ABSRACT

In today's life water is very necessary. Looking toward the need of water, liters of water is wasted in daily life. To stop the wastage of water IOT based water level monitoring and controlling system which will save liters of water from wastage by automatically controlling the level of the water in the tank and prevent it from overflowing is developed. Water level monitoring system solves this problem, it will give right information about water level and it will avoid wastage water in tank using Ultrasonic Sensor which will senses the liquid level and compare it with the depth of the tank. The system also uses Esp32, Ultrasonic sensor , Blynk Iot, LCD screen to display the level of water in the tank and the state of motor.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

IOT	INTERNET OF THINGS
RFID	RADIO- FREQUENCY IDENTIFICATION
HMI	HUMAN MACHINE INTERFACE
LCD	LIQUID CRYSTAL DISPLAY

CHAPTER 1

1. INTRODUCTION

One of the major problems faced by most of the countries is the issue of water scarcity in the world and wastage during transmission has been identified as a major culprit; this is one of the motivations for this research, to deploy computing techniques in creating a barrier to wastage in order to not only provide more financial gains and help the environment as well as the water cycle which in turn ensures that save water for our future. IOT based Water Level Monitoring system is an innovative system which will inform the users about the level of liquid and will prevent it from overflowing. To demonstrate this the system makes use of containers, where the ultrasonic sensors placed over the containers to detect the liquid level and compare it with the container's depth.

1.1 IOT(INTERNET OF THINGS)

- This Technology Allows For The Collection And Sharing Of Data From A Vast Network Of Devices, Creating Opportunities For More Efficient And Automated Systems.
- The Term 'Internet Of Things' Was Coined In 1999 By The Computer Scientist Kevin Ash ton.
- While Working At Protector And Gamble, Ash ton Proposed Putting Radio-Frequency Identification (RFID) Chips On Products To Track Them Through A Supply Chain.
- In 2015, The Government Of India Had Formulated A Draft IOT Policy With A Vision To Develop Connected And Smart IOT Based System For Our Country's Economy, Society, Environment And Global Needs.
- In 1989, David Nichols And His Colleagues At MIT Invented The First IOT Device And Simon Hackett Creating The Internet Toaster In 1991.

1.1.1 EXAMPLES OF IOT

- IOT Examples :(Vehicles , Plant Electronic Systems, Roofs, Lighting, Etc.)
- IOT Applications Are Used To Address Many Real World Issues-Traffic Congestion, City Services, Economic Development, Citizen Engagement And Public Safety And Security.

1.2 BLYNK IDE

- ✧ Blynk Iot Platform Is A White-Label, Multi-Tenant Software Solution That Allows You To Build Personal And Commercial Iot Projects Connected Products.
- ✧ With Blynk You Can Start With Building A Prototype Or Personal Project And Then Scale It Up To Millions Of Commercial Connected Devices.

- ✧ Blynk Is An Iot Platform For Ios Or Android Smart phones That Is Used To Control Arduino, Raspberry Pi And Node mcu Via The Internet.

- ✧ This Application Is Used To Create A Graphical Interface Or Human Machine Interface (HMI) By Compiling And Providing The Appropriate Address On The Available Widgets.'

CHAPTER 2

2. PROBLEM STATEMENT

Need of this system is to avoid wastage of water. Sometimes people forget to off the motor when the tank is full, because of that water get wasted. To avoid wastage of water this project came into picture. By using this water level controller system we can monitor water level and consumption of water.

2.1 LITERATURE SURVEY

An automatic water level controller is developed and implemented[1]. Arduino UNO is used to automate the process of water pump[1]. Water level detection in both source and overhead tanks, switch on/off the pump accordingly are the main controlling signals the circuit[1]. Liquid Crystal Display (LCD) is used to show the data on the screen[1]. Moreover, a micro controller based automated water level sensing and controlling is proposed that covers both design and implementation issues[1].

Hani and Myaing (2011) developed a micro controller -based water flow control system. In this system, automatic water flow control system is implemented, and can be used as process control system[2]. A sensing unit, photo interrupter, and slotted disk are used to produce pulse train for frequency input of the micro controller [2]. Explained Agricultural land management practices are compatible with the preservation of water resources[3]. Hydrological diagnoses are needed in order to choose the alternative land uses, cultivation practices and their spatial arrangements[3].

Olambimpe, (2010) worked on the design and construction of an automatic water pump control with level indicator[4]. The design consists automatic control, with digital circuitry, for switching ON and OFF the pump, and an indicator to notify the user about the level of water in the overhead tank[4]. Another feature of the design was the use of an alarming circuit to alert the user whenever there is absence of water in the underground tank[4].

CHAPTER 3

3. HARDWARE DESCRIPTION

3.1 NEED OF THE SYSTEM

As know that IOT based water level monitoring system is an innovative system which will inform the users about the level of liquid and will prevent it from over flowing. Web design the system for this following problems;

1) Over flow problems
2) To prevent wastage of water.
3) To prevent wastage of energy.
4) Attenuation and observation.

By installing the IOT based water level indicator system in all the import ant municipal water tank the local government can know the level of water in real time and they can fill the tank on time and also can understand the consumption of water in the area.

3.2 COMPONENTS REQUIRED

Name of the components:

1) ESP32
2) RELAY
3) ULTRASONIC SENSOR MODULE
4) SOFTWARE ARDUINO IDE

3.2.1 ESP 32

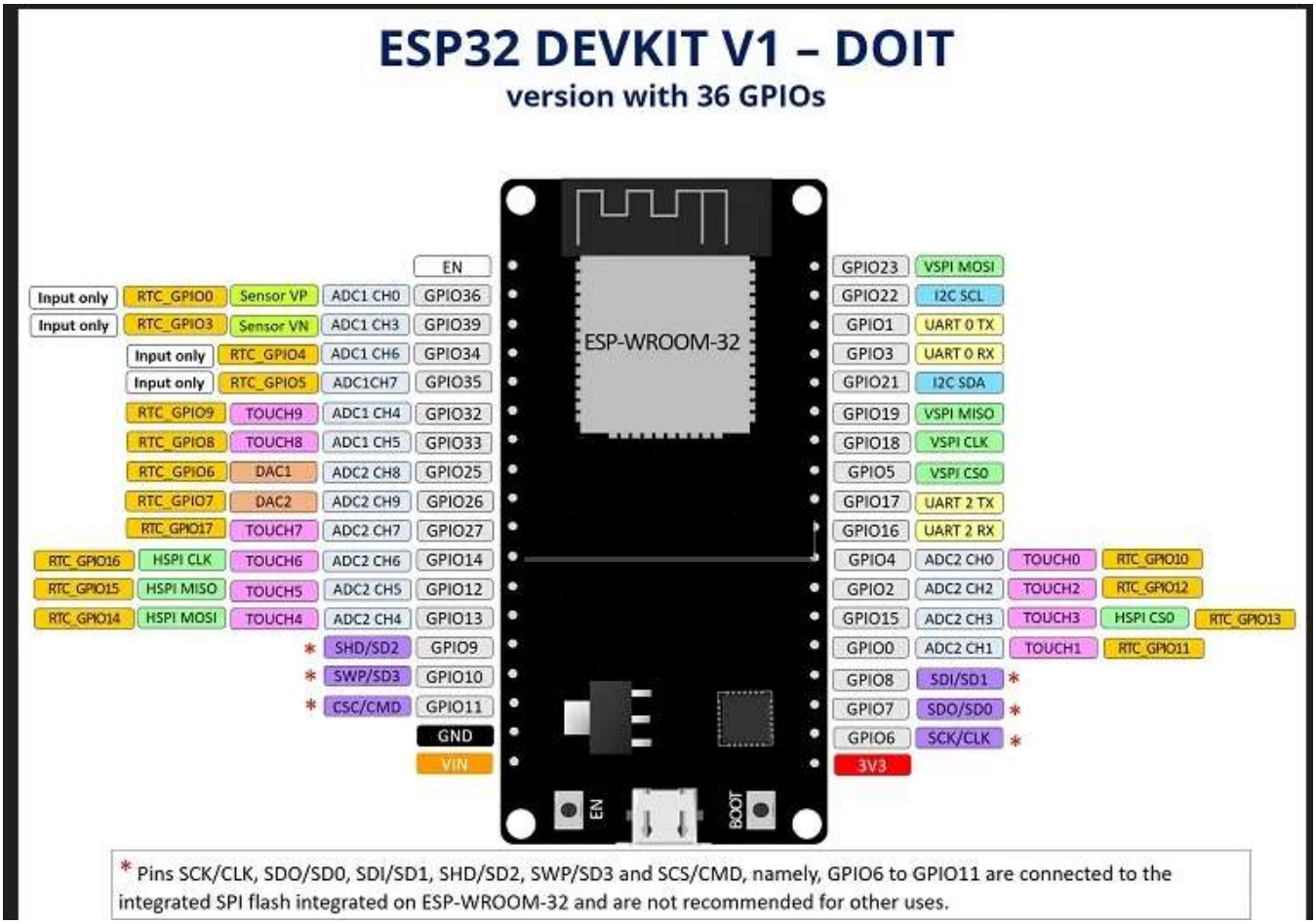

Fig 3.1 ESP 32

3.2.2 RELAY

Fig 3.2 Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contractor . Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to performs witching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from still called "protective relays".

Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to overload or faults; in modern electric power systems these functions are performed by digital instruments move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts. Magnetic latching relays can have either single or dual oils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset when the polarity is reversed. One dual coil device, when polarized voltage is applied to the reset coil the contacts will transition.

3.2.3 ULTRASONIC SENSOR MODULE

Fig 3.3 Ultrasonic Sensor Module

Ultrasonic sensor hc-sr04is used to measure distance in range of 2cm- 400cm with accuracy of 3mm. the sensor module consists of ultrasonic transmitter, receiver and the control circuit. The ultrasonic sensor module works on the natural phenomenon of echo of sound. A pulse is sent for about 10us to trigger the module. After which the module automatically sends 8 cycles of 40 kHz ultrasound signal and checks its echo. The signal after striking with an obstacle ere turns back and is captured by the receiver.

Thus the distance of the obstacle from the sensor is simply calculated by the formula given as distance= (time x speed)/2. Here we have divided the product of speed and time by 2 because the time is the total time it took to reach the obstacle and return back. Thus the time to reach obstacle is just half the total time taken. The requirement for electronic signal processing circuitry can be used to make the ultrasonic sensor an intelligent device. Ultrasonic sensors can be designed to provide point level control, continuous monitoring or both.

PIN DESCRIPTION:

VCC - +5Volt Supply

TRIG - Trigger input of sensor

ECHO - Echo is the output of the sensor.

GND - Ground

CHAPTER 4

4. BLOCKDIAGRAM

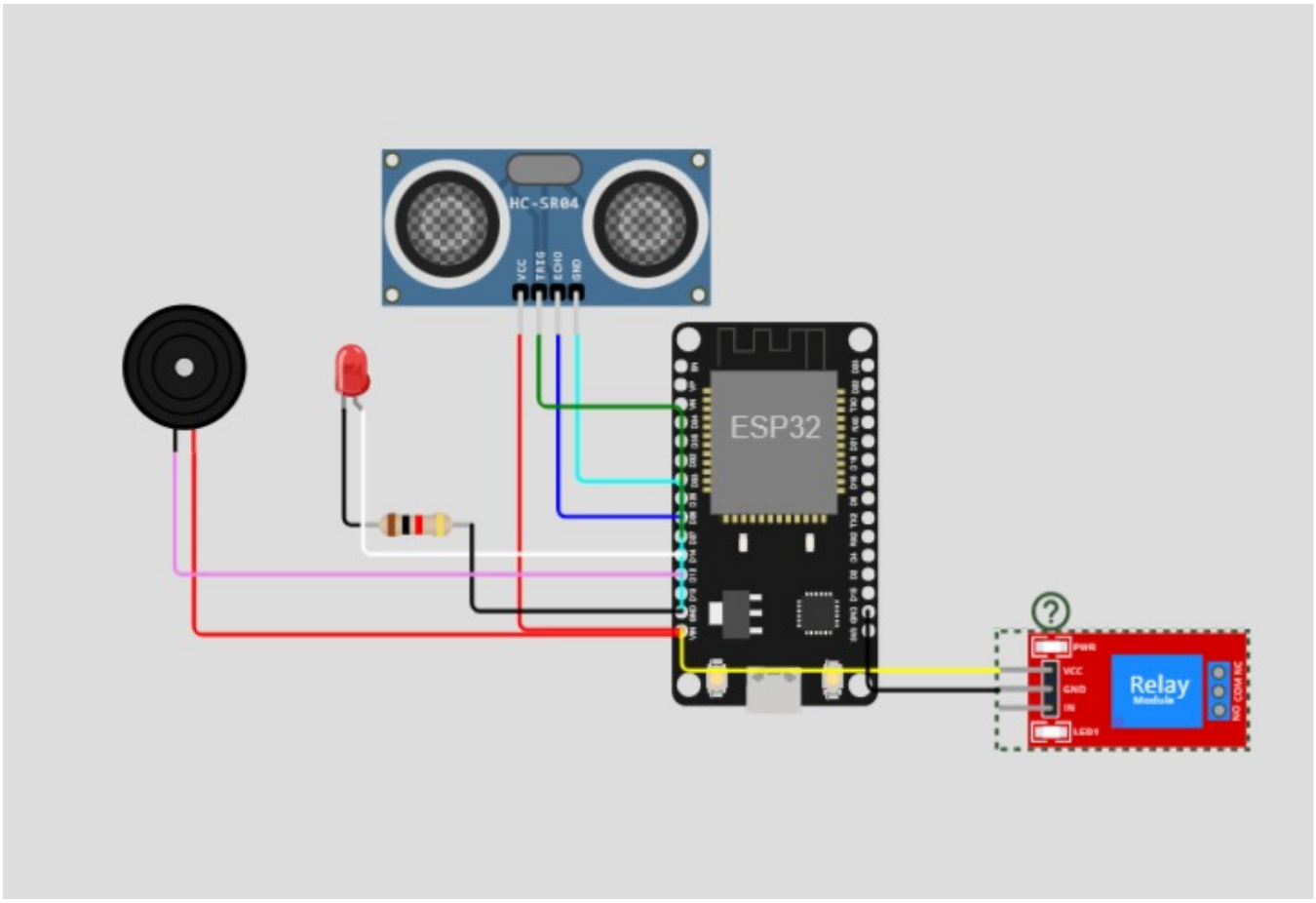

Fig 4.1 Block Diagram

CHAPTER 5

5. WORKING PRINCIPLE

Working of this project is very simple where Ultrasonic sensor module sends the sound waves in the water tank and detects reflection of sound waves that is ECHO.

First of all, The ultrasonic sensor module to transmit signal by using and then wait to receive ECHO is Triggered. Arduino reads the time between triggering and received ECHO.

The speed of sound is around 340 m/s. so distance is calculated by using given formula: Distance= (travel time/2) * speed of sound Where speed of sound is approximately 340m per second. By using this methods, distance is calculated from sensor to water surface.

After it water level is calculated. Now need to calculate the total length of water tank. As the length of water tank then we can calculate the water level by subtracting resulting distance coming from ultrasonic from total length of tank. And will get the water level distance. Now can convert this water level in to the percent of water, and can display it on LCD.

5.1PICTORIAL REPRESENTATION

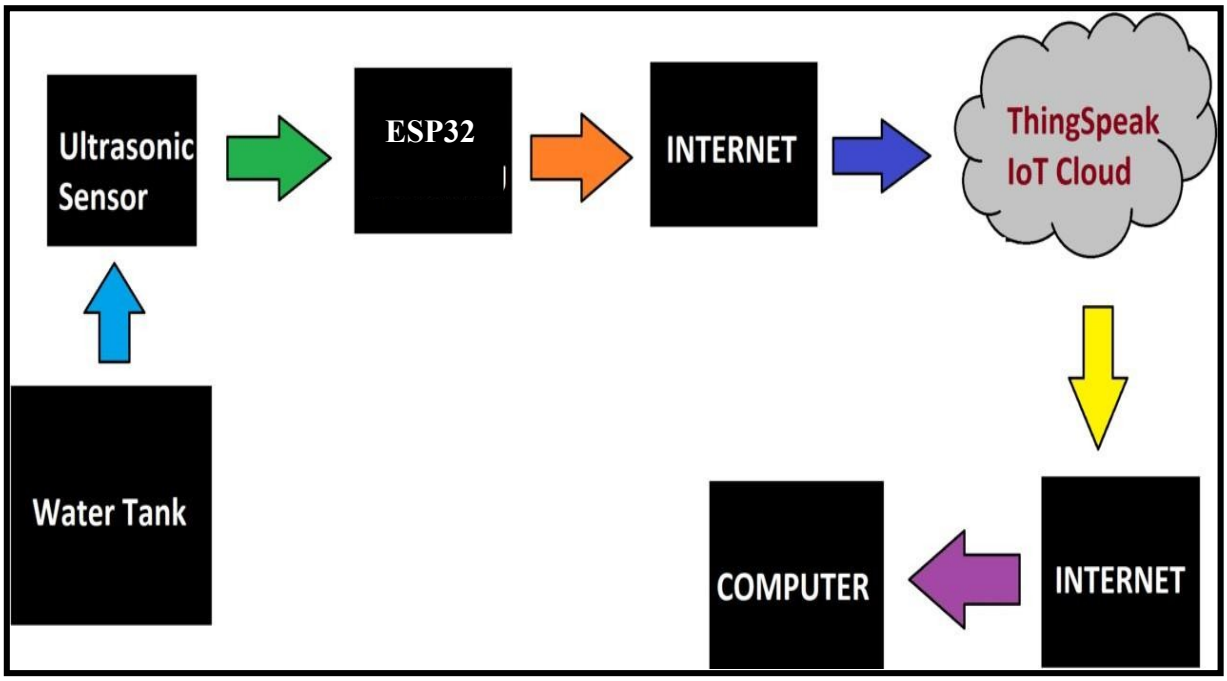

Fig 5.1 Technical Architecture

CHAPTER 6

6. PROGRAM (SOURCECODE):

PROCEDURE OF PROJECT

- This project will monitor the water level indicator in tank
- If the water level is full relay will below and motor will be off even if You try to push it On it won't start.
- If water level is half empty half full. You can switch on off motor from blynk apps Pery our requirement.
- If water level of tank is empty then relay will trip automatically and motor will start.

```
/* Fill-in your Template ID (only if using Blynk.Cloud) */

#define BLYNK_TEMPLATE_ID "TMPL3yeQDPrXO"

#define BLYNK_TEMPLATE_NAME "Esp32Waterlevel"

#define BLYNK_AUTH_TOKEN
"92Ji1eJwj0JSCHLwMWQFlRNC_DUULsOt"

// Your WiFi credentials.

// Set password to "" for open networks.

char ssid[] = "sd";

char pass[] = "61242010@sd";

//Set Water Level Distance in CM

int emptyTankDistance = 30 ;  //Distance when tank is empty

int fullTankDistance =  10 ;  //Distance when tank is full

//Set trigger value in percentage

int triggerPer =   10 ;  //alarm will start when water level drop below triggerPer

#include <Adafruit_SSD1306.h>
```

```
#include <WiFi.h>
#include <WiFiClient.h>
#include <BlynkSimpleEsp32.h>
#include <AceButton.h>
using namespace ace_button;
// Define connections to sensor
#define TRIGPIN    27  //D27
#define ECHOPIN    26  //D26
#define wifiLed    2   //D2
#define ButtonPin1 12  //D12
#define BuzzerPin  13  //D13
#define GreenLed   14  //D14
//Change the virtual pins according the rooms
#define VPIN_BUTTON_1    V1
#define VPIN_BUTTON_2    V2
#define SCREEN_WIDTH 128 // OLED display width, in pixels
#define SCREEN_HEIGHT 32 // OLED display height, in pixels
// Declaration for an SSD1306 display connected to I2C (SDA, SCL pins)
#define OLED_RESET     -1 // Reset pin # (or -1 if sharing Arduino reset pin)
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire,
OLED_RESET);
float duration;
float distance;
int   waterLevelPer;
bool  toggleBuzzer = HIGH; //Define to remember the toggle state
char auth[] = BLYNK_AUTH_TOKEN;
```

```
ButtonConfig config1;
AceButton button1(&config1);
void handleEvent1(AceButton*, uint8_t, uint8_t);
BlynkTimer timer;
void checkBlynkStatus() { // called every 3 seconds by SimpleTimer
  bool isconnected = Blynk.connected();
  if (isconnected == false) {
    //Serial.println("Blynk Not Connected");
    digitalWrite(wifiLed, LOW);
  }
  if (isconnected == true) {
    digitalWrite(wifiLed, HIGH);
    //Serial.println("Blynk Connected");
  }
}

BLYNK_CONNECTED() {
  Blynk.syncVirtual(VPIN_BUTTON_1);
  Blynk.syncVirtual(VPIN_BUTTON_2);
}
void displayData(int value){
  display.clearDisplay();
  display.setTextSize(4);
  display.setCursor(8,2);
  display.print(value);
```

```
  display.print(" ");
  display.print("%");
  display.display();
}
void measureDistance(){
  // Set the trigger pin LOW for 2uS
  digitalWrite(TRIGPIN, LOW);
  delayMicroseconds(2);
  // Set the trigger pin HIGH for 20us to send pulse
  digitalWrite(TRIGPIN, HIGH);
  delayMicroseconds(20);
  // Return the trigger pin to LOW
  digitalWrite(TRIGPIN, LOW);
  // Measure the width of the incoming pulse
  duration = pulseIn(ECHOPIN, HIGH);
  // Determine distance from duration
  // Use 343 metres per second as speed of sound
  // Divide by 1000 as we want millimeters
  distance = ((duration / 2) * 0.343)/10;

  if (distance > (fullTankDistance - 10)  && distance < emptyTankDistance ){
    waterLevelPer = map((int)distance ,emptyTankDistance, fullTankDistance, 0,
100);
    displayData(waterLevelPer);
    Blynk.virtualWrite(VPIN_BUTTON_1, waterLevelPer);
    Blynk.virtualWrite(VPIN_BUTTON_2, (String(distance) + " cm"));
```

```
    // Print result to serial monitor
    Serial.print("Distance: ");
    Serial.print(distance);
    Serial.println(" cm");
    if (waterLevelPer < triggerPer){
      digitalWrite(GreenLed, HIGH);
      if (toggleBuzzer == HIGH){
        digitalWrite(BuzzerPin, HIGH);
      }
    }
    if (distance < fullTankDistance){
      digitalWrite(GreenLed, LOW);
      if (toggleBuzzer == HIGH){
        digitalWrite(BuzzerPin, HIGH);
      }
    }
    if (distance > (fullTankDistance + 5) && waterLevelPer > (triggerPer + 5)){
      toggleBuzzer = HIGH;
      digitalWrite(BuzzerPin, LOW);
    }
  }
  // Delay before repeating measurement
  delay(100);
}
void setup() {
```

```
  // Set up serial monitor
  Serial.begin(115200);

  // Set pinmodes for sensor connections
  pinMode(ECHOPIN, INPUT);
  pinMode(TRIGPIN, OUTPUT);
  pinMode(wifiLed, OUTPUT);
  pinMode(GreenLed, OUTPUT);
  pinMode(BuzzerPin, OUTPUT);
  pinMode(ButtonPin1, INPUT_PULLUP);
  digitalWrite(wifiLed, LOW);
  digitalWrite(GreenLed, LOW);
  digitalWrite(BuzzerPin, LOW);
  config1.setEventHandler(button1Handler);
  button1.init(ButtonPin1);
  if(!display.begin(SSD1306_SWITCHCAPVCC, 0x3C)) {
    Serial.println(F("SSD1306 allocation failed"));
    for(;;);
  }
  delay(1000);
  display.setTextSize(1);
  display.setTextColor(WHITE);
  display.clearDisplay();
  WiFi.begin(ssid, pass);
  timer.setInterval(2000L, checkBlynkStatus); // check if Blynk server is
connected every 2 seconds
```

```
  Blynk.config(auth);
  delay(1000);
}
 void loop() {
  measureDistance();
  Blynk.run();
  timer.run(); // Initiates SimpleTimer
  button1.check();
}
void button1Handler(AceButton* button, uint8_t eventType, uint8_t buttonState)
{
  Serial.println("EVENT1");
  switch (eventType) {
    case AceButton::kEventReleased:
      //Serial.println("kEventReleased");
      digitalWrite(BuzzerPin, LOW);
      toggleBuzzer = LOW;
      break;
  }
```

CHAPTER 7

7.1 ADVANTAGES:

1. Power Saver.

2. Money Saver.

3. Easy installation

4. The automatic water level controller ensures no overflows or dry running of

pump there by save select ricity and water.

5. Avoid seepage of roofs and walls due to over flowing tanks.

6. fully automatic, save man power.

7.2 COST OF THE PROJECT

NAME OF THE COMPONENT	QUANTITY REQUIRED	COST
ESP32	1	360
Ultrasonic sensor	1	160
Relay	1	50
9voltbattery	1	20
Connectors	4	20
		Total:-610rs

Table 7.1 Cost Of The Project

CHAPTER 8

8. APPLICATIONS

1. It is use to measure underground storage of water
2. It is use to predict the arrivals off loods.
3. It Is use in hostels, factory, home apartments etc.
4. Fuel level indicator in vehicles.

8.1 FUTURE SCOPE

- The IOT based water kevel indicator for hotels, homes apartments, commercial complexes, drainage, etc.,
- It can be fixed for single phase motor, single phase submersibles, three phase motors and open well, bore well and sump Many models available in different ranges.
- Increase in the need of production requires proper supply of water in field this system can provide help to the farmers.

CHAPTER 9

9. OUTPUT

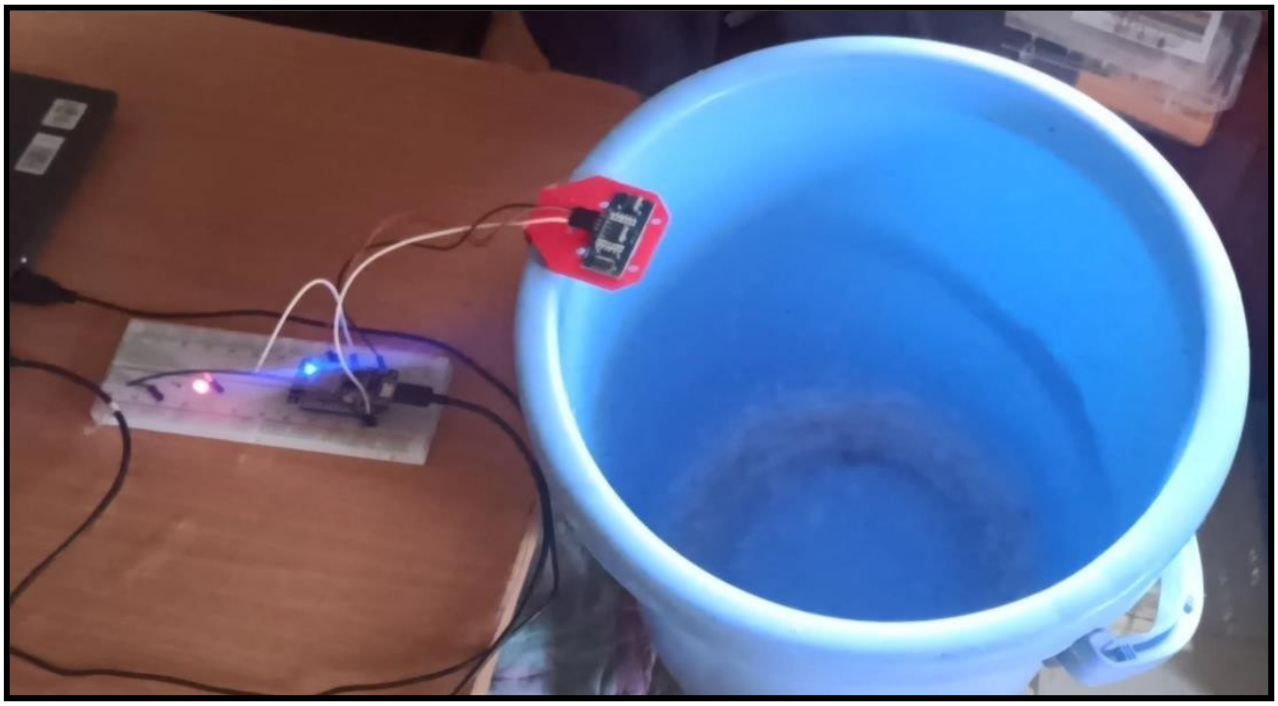

Fig 9.1 workflow

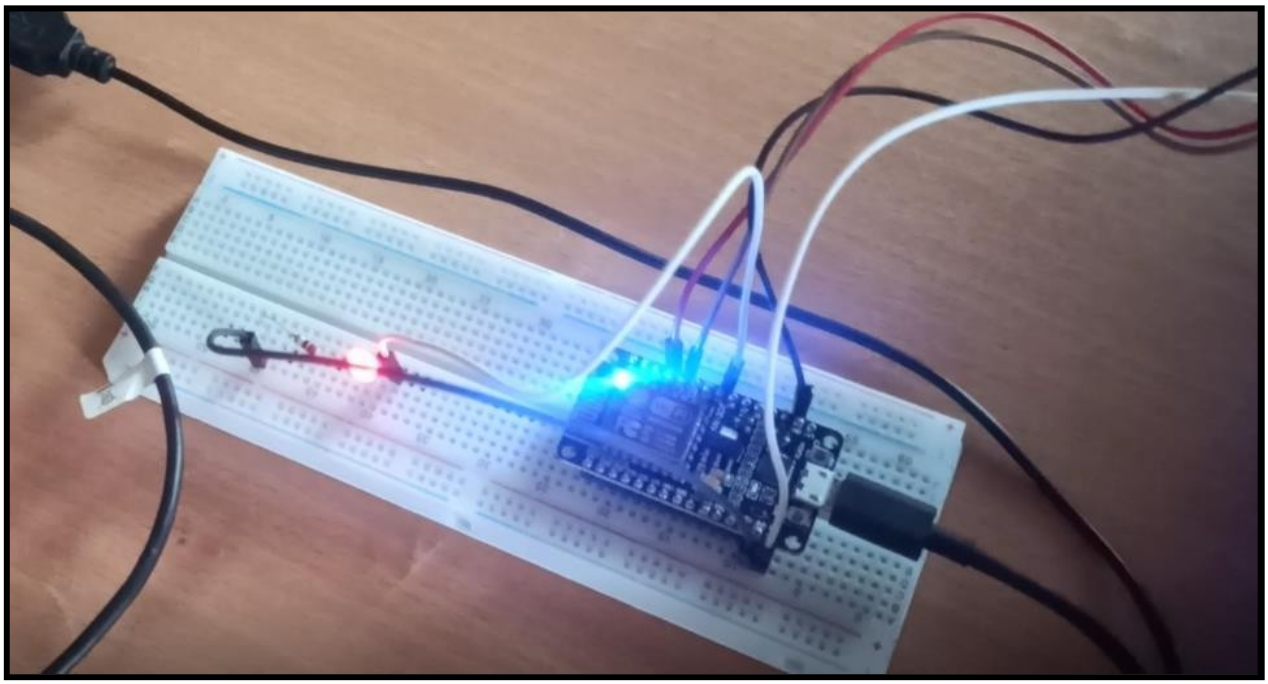

Fig 9.2 circuit

Fig 9.3 Result

CHAPTER 10

CONCLUSION

Thus we conduct that this technology will definitely to help for people. Save the man power. it is the water level indicator pump control circuit that indicates the different in a particular tank.

A connection runs to underground tank to check the availability of water in tank before operating the pump and the pump operates when there is a water in the under-ground tank with the help of the Blynk app.

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