AUTOMATED IRRIGATION SYSTEM

MINIPROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this mini project report titled **AUTOMATED IRRIGATION SYSTEM** is the bonafide work of C. PRATHAPAN (**Reg. No. 202002102**) and B. RAGHU ADHITHYA (**Reg. No. 202004107**) who carried out the mini project under our supervision in **the 19CS451 Microprocessors and Microcontrollers Laboratory.**

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1. PROBLEM STATEMENT

In modern agriculture, irrigation is one of the major problems faced by farmers, it is hard to manually track the moisture in the soil and irrigate the land accordingly. To this we have come up with a solution to automate the sensing of soil moisture and irrigating the land.

The proposed system is developed to automatically water the plants when the soil moisture sensor has detected the soil is insufficient of water by using the Arduino as the center core. The automated irrigation system is a fully functional prototype which consists of a soil moisture sensor; an LCD display to show the moisture percentage and pump status; a relay module which used to control the on and off switch of the water pump; and a water pump. When the soil moisture sensor sense the dry soil, it will show the moisture percentage on the LCD display, and the relay module will switch on the water pump automatically to start the watering process, or vice versa. Hardware testing is conducted to ensure the proposed system is fully functional.

Our system senses the moisture in the soil and automatically irrigates the land until an adequate moisture level is achieved. We have also added IoT features in our system, in which the soil moisture data can be tracked using Wi-Fi.

2. INTRODUCTION

Freshwater is needed for crop and energy production, industrial fabrication as well as human and ecosystem needs. According to AQUASTAT database (AQUASTAT, 2016), 69% of the total extracted freshwater is used by agriculture sector, whereas 19% is used by industrial sector and the rest in used by domestic segment. Therefore, water can be considered as a critical need in agriculture sector for future global food security However, continued increase in demand for water by domestic and industrial sectors and greater concerns for environmental quality have create a challenge to every country to reduce the farm water consumption and sustain the fresh food requirement. Consequently, there is an urgent need to create strategies based on science and technology for sustainable use of water. Industrialist and researchers are working to build effecient and economic automatic systems to control water usage in order to reduces much of the wastage.

Irrigation is an artificial application of watering the land for agricultural production. The requirement of water to the soil depends on soil properties such as soil moisture and soil temperature. Effective irrigation can influence the entire growth process and automation in irrigation system using modern technology can be used to provide better irrigation management. In general, most of the irrigation systems are manually operated. These traditional techniques can be replaced with automated techniques of irrigation in order to use the Internet of Things. Conventionally, farmers will present in their fields to do irrigation process. Nevertheless, nowadays farmers need to manage their agricultural activity along with other occupations. A sensor based automated irrigation system provides promising solution to farmers where the presence of a farmer in field is not compulsory during irrigation process. In this system, a soil moisture sensor is used to detect and check the soil humidity of the plant. Based on the soil moisture level from the soil, the system will let the water pump to automatic water the plant when it is too dry and turn off the water pump when the soil of the plant is wet.

3. SYSTEM REQUIRMENT

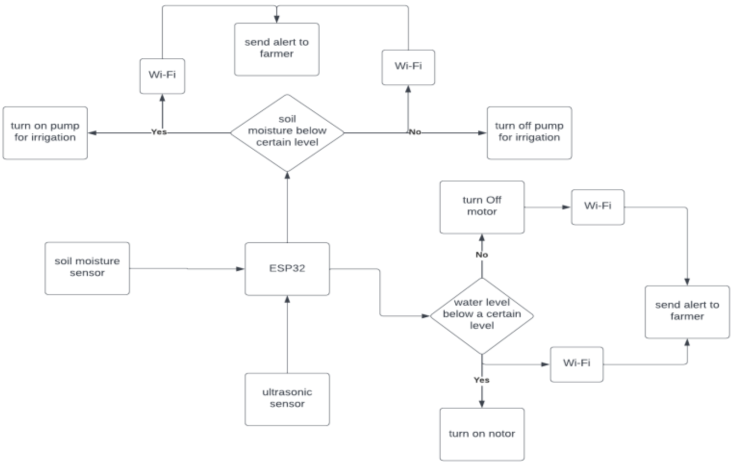
HARDWARE REQUIREMENT

- ESP32 Module
- Relays
- Solenoid pump
- Motor
- Ultrasonic sensor
- Soil moisture sensor

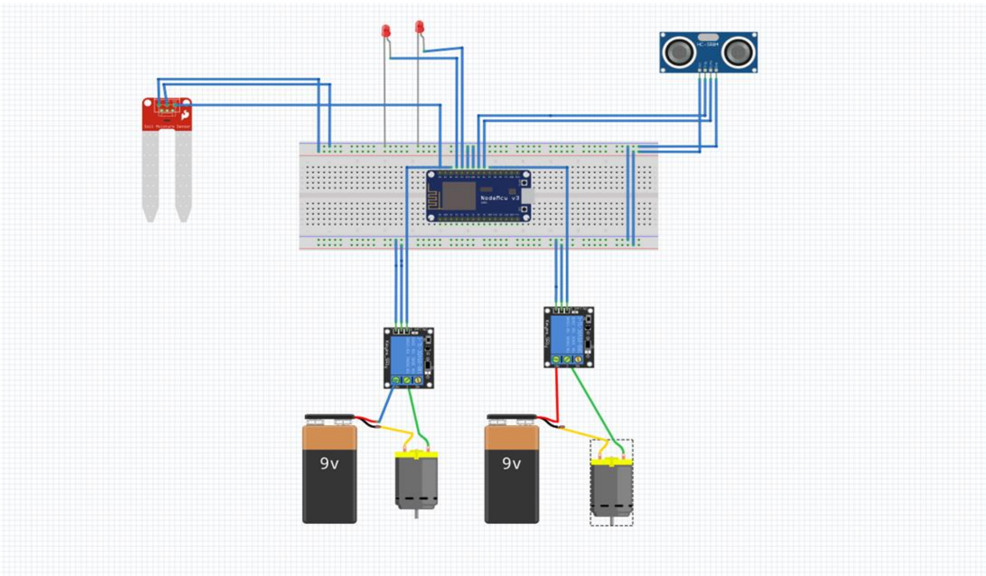
SOFTWARE REQUIREMENT

- Arduino Master

4. SYSTEM DESIGN

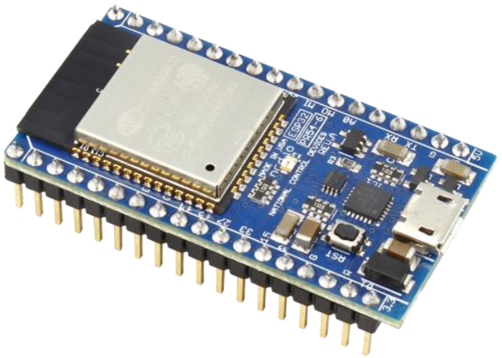


CIRCUIT DIAGRAM



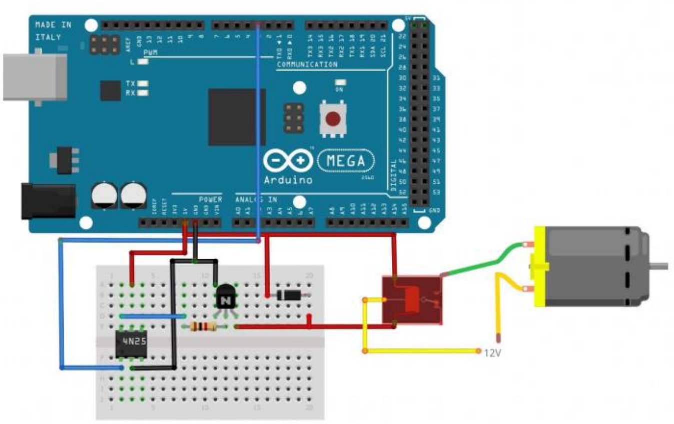
HARDWARE SPECIFICATIONS

1. ESP2 Module



ESP32 **can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor**. ESP32 can interface with other systems to provide Wi-Fi and Bluetooth functionality through its SPI / SDIO or I2C / UART interfaces.

2. Relay



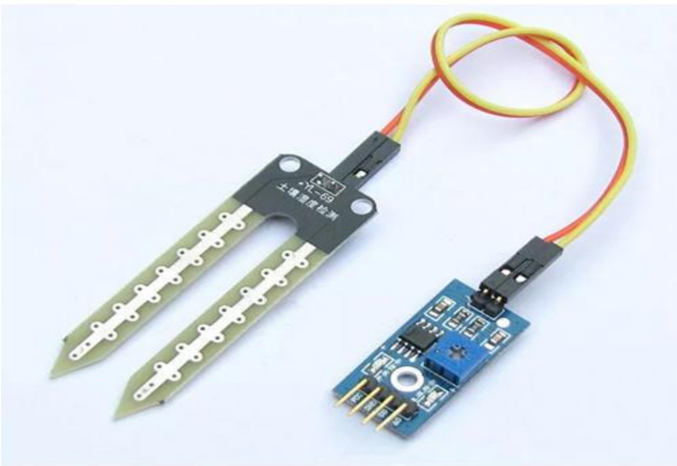
A relay is a programmable electrical switch, which can be controlled by Arduino or any micro-controller. It is used **to programmatically control on/off the devices, which use the high voltage and/or high current**.

3. Ultrasonic Sensor

The HC-SR04 is an affordable and easy to use distance measuring sensor which has a range from 2cm to 400cm (about an inch to 13 feet).

The sensor is composed of two ultrasonic transducers. One is transmitter which outputs ultrasonic sound pulses and the other is receiver which listens for reflected waves. It's basically a SONAR which is used in submarines for detecting underwater objects.

4. Soil moisture Sensor



Soil moisture sensors measure the water content in the soil and can be used **to estimate the amount of stored water in the soil horizon**. Soil moisture sensors do not measure water in the soil directly. Instead, they measure changes in some other soil property that is related to water content in a predictable way.

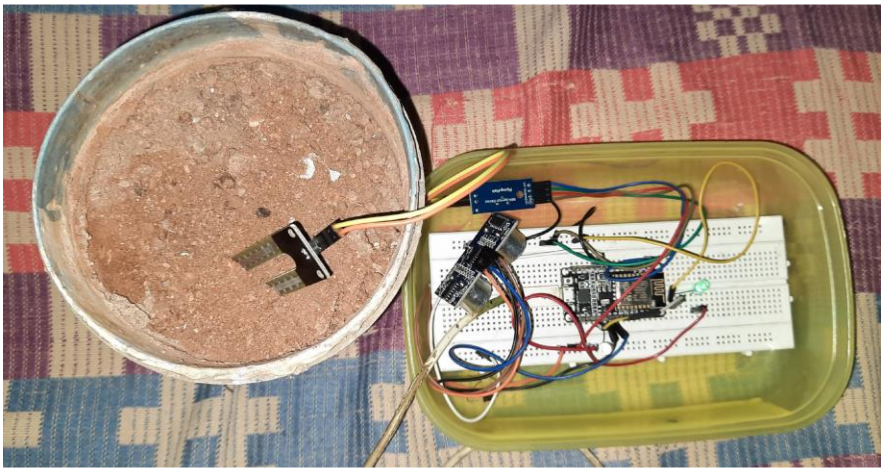
5. IMPLEMENTATION

```
#include <dummy.h>

#include <EEPROM.h>

#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include <ESP8266WebServer.h>

// Replace with your network credentials
const char* ssid = "vishnu's Galaxy F41";
const char* password = "vishnu57";

ESP8266WebServer server(80);   //instantiate server at port 80 (http port)
float moisture_percentage;
String page = "";
double data;
long duration;
int distance;
const int trigPin = D5;
const int echoPin = D6;
const int motorPin = D7;
const int valvePin = D8;
String moisture_level;
String water_level;
void setup(void){

  pinMode(A0, INPUT);
  const int sensor_pin = A0;
  pinMode(D5, OUTPUT);
  pinMode(D6, INPUT);
  pinMode(D7, OUTPUT);
  pinMode(D8, OUTPUT);
   delay(1000);
  Serial.begin(115200);
  WiFi.begin(ssid, password); //begin WiFi connection
  Serial.println("");


  // Wait for connection
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.print("Connected to ");
```

```
  Serial.println(ssid);
  Serial.print("IP address: ");
  Serial.println(WiFi.localIP());
  server.on("/", [](){
    page = "<h1>Smart Agriculture Monitoring
System</h1><h3>Moisture_Percentage:</h3>
<h4>"+String(moisture_percentage)+"</h4><h4>"+String(moisture_level)
+"</h4>" "<h2>Ultra sonic Sensor output </h2><h3>Water_Level:</h3>
<h4>"+String(distance)+"</h4><h4>"+String(water_level)+"</h4>";



    server.send(200, "text/html", page);l
  });

  server.begin();
  Serial.println("Web server started!");
}

void loop(void){
  data = analogRead(A0);
  delay(1000);
  server.handleClient();

  int sensor_anal
  og;
  sensor_analog = analogRead(A0);
  moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 ) );
  Serial.print("Moisture Percentage = ");
  Serial.print(moisture_percentage);
  Serial.print("%\n\n");
digitalWrite(D5, LOW);
delayMicroseconds(2);

// Sets the trigPin on HIGH state for 10 micro seconds
digitalWrite(D5, HIGH);
delayMicroseconds(10);
digitalWrite(D5, LOW);

// Reads the echoPin, returns the sound wave travel time in microseconds
duration = pulseIn(D6, HIGH);

// Calculating the distance
distance= (duration/2)/29.1;

if(moisture_percentage<30){
  digitalWrite(valvePin, HIGH);
}
else digitalWrite(valvePin, LOW);
```

```
if(distance>5){
  digitalWrite(motorPin, HIGH);
}
else digitalWrite(motorPin, LOW);

if (data>900) {
      moisture_level="Dry Soil";
    }
      else if (data<300) {
     moisture_level="Wet Soil";
      }
      else {
     moisture_level="NORMAL";
      }

          if (distance>7) {
      water_level="Tank Empty";
    }
      else if (distance<3) {
     water_level="Tank Full";
      }
      else {
     water_level="NORMAL";
      }
// Prints the distance on the Serial Monitor
Serial.print("Distance: ");
Serial.println(distance);
delay(2000);
}
```

6. RESULT:



7. CONCLUSION

Thus, the Automated Irrigation System has been designed and tested successfully. The system has been tested to function automatically. The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the Arduino board which triggers the Water Pump to turn ON and supply the water to respective plant. When the desired moisture level is reached, the system halts on its own and the Water Pump is turned OFF. Thus, the functionality of the entire system has been tested thoroughly
and it is said to function successfully.

8. REFERENCES

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3] https://www.tutorialspoint.com/arduino/arduino_board_description.htm
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