WATER RESOURCE MANAGEMENT

COMMUNITY SERVICE PROJECT

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Under the Guidance of

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BONAFIDE CERTIFICATE

Certified that this Community Service Project report entitled **"AUTOMATIC PLANT WATERING SYSTEM"** is the bonafide work of **"S.DURGA SRINIVAS PRASAD (21UEEC0298), B. MANIKANTA(21UEEC0033) "** who carried out the project work under my supervision.

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

In an era of increasing environmental awareness and the need for sustainable water resource management, the development of an automated plant watering system using a NodeMCU and the Blink software platform is an innovative and practical solution. This project leverages technology to efficiently care for your plants while conserving precious water resources.By combining the capabilities of NodeMCU, a versatile microcontroller board, and Blink, a user-friendly IoT platform, you can create a system that not only automates plant care but also contributes to responsible water management.

To get started, you'll need the following components: a NodeMCU or ESP8266, a soil moisture sensor, a relay module, a water pump, a power supply for the water pump, a smartphone with the Blink app, jumper wires, and, of course, potted plants. The process begins with setting up the NodeMCU and configuring it with the Arduino IDE, making it ready for IoT integration. You'll create an Arduino sketch that interfaces with the soil moisture sensor to monitor the moisture level in the plant's soil. The system is programmed to activate a relay module and water pump when the soil moisture falls below a predetermined threshold, ensuring your plants are adequately watered.

In conclusion, the automated plant watering system using NodeMCU and Blink software exemplifies the synergy between IoT technology and responsible water resource management. By automating plant care and allowing remote monitoring and control, this project not only simplifies the task of maintaining healthy plants but also promotes the efficient use of water resources. Whether you're a gardening enthusiast or an environmental advocate, this innovative system represents a step forward in sustainable plant care and contributes to a more responsible and eco-conscious approach to water management.

Key Words: NodeMCU, BLYNK Software,Moisture sensor,7805 Regulator ,Dc pump.

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CHAPTER 1

INTRODUCTION

Water resource management is a critical concern in a world facing escalating water scarcity and increasing environmental awareness. In this context, the development of an automated plant watering system utilizing NodeMCU and the Blink software platform emerges as an innovative and pragmatic solution. The synergy between these technologies not only simplifies plant care but also plays a pivotal role in water conservation efforts.

With the global population on the rise and climate change intensifying, water resources are under constant pressure. Efficient water management is imperative to ensure a sustainable future. The traditional approach to plant care, reliant on human intervention and fixed schedules, often leads to water wastage, as plants are watered irrespective of their actual needs. This is where the automated plant watering system steps in to revolutionize the landscape of water resource management.

The NodeMCU, a versatile microcontroller board, forms the core of this system. Paired with a soil moisture sensor, relay module, and water pump, it allows for precise monitoring of soil conditions. The system's intelligence lies in its ability to activate the water pump only when the soil moisture falls below a predefined threshold, ensuring that water is delivered to the plants precisely when required. This dynamic threshold can be easily adjusted through the Blink app on a smartphone, offering a tailored solution for plant enthusiasts and professionals seeking an eco-conscious approach.

One of the most remarkable facets of this project is its contribution to water conservation. Rather than following a rigid watering schedule, the system adapts to the specific moisture needs of the plants, delivering water only when necessary. This dynamic approach optimizes water use, significantly reducing waste and promoting responsible water management. The importance of this water-saving innovation cannot be overstated, given the growing challenges posed by water scarcity and the urgent need to reduce consumption.

Figure 1.1: Water Conservation

In a world where every drop of water counts, the automated plant watering system is not just about convenience; it's about embracing sustainability. By fostering a more responsible and efficient approach to plant care, this technology makes a substantial impact on water resource management. It encourages a shift from conventional, water-intensive practices towards a more conscious and eco-friendly approach that aligns with the principles of sustainability. This project is not merely a horticultural endeavor; it's a testament to the power of technology to drive environmental stewardship.

In conclusion, the automated plant watering system using NodeMCU and Blink software represents an intersection of technological innovation and water conservation, addressing a global need for more responsible water resource management. By automating plant care, enabling remote monitoring, and reducing water wastage, this system contributes to the larger goal of sustainability and ecological consciousness. It exemplifies the potential of technology to revolutionize everyday practices and align them with the urgent imperative of water conservation in a rapidly changing world.

CHAPTER 2

LITERATURE SURVEY

A literature survey on water resource management in agriculture highlights the critical role of water in food production, the challenges faced by the agricultural sector, and the diverse strategies and technologies employed to address these challenges. Here are key themes and insights drawn from this extensive literature:

Water Scarcity and Agriculture:
Water scarcity is a pervasive challenge in agriculture, as this sector consumes the largest share of global freshwater resources. Research emphasizes the need for efficient water use to ensure food security.

Irrigation Technologies:
Various irrigation methods are extensively studied, including traditional techniques like flood and furrow irrigation, as well as modern approaches like drip and sprinkler systems. Researchers assess their effectiveness in conserving water and improving crop yields.

Precision Agriculture:
Precision agriculture leverages technology, such as sensors, GIS, and remote sensing, to optimize water use. This approach enables precise water application based on crop needs and field variability.

Water Quality Management:
Maintaining water quality is essential for agriculture. Studies focus on preventing water contamination from agrochemicals, as well as on the treatment of agricultural runoff.

Farmer Education and Training:
Empowering farmers with knowledge and training on efficient water use and conservation practices is recognized as a crucial component of successful water resource management in agriculture.

CHAPTER 3

AUTOMATIC PLANT WATER SYSTEM PROJECT DETAILS

3.1 OVERVIEW

The Automatic Plant Watering System (APWS) aims to provide an innovative and efficient solution for automating the watering of plants, ensuring they receive the appropriate amount of moisture and care. By integrating technology and the Blynk app, APWS offers an intelligent and remotely controllable system that caters to the needs of plants in both indoor and outdoor environments. [1] [4].

3.1.1 KEY FEATURES

Integration: APWS leverages IoT technology to connect plant watering components to the internet, enabling real-time monitoring and control from anywhere.
Blynk App Control: The project utilizes the Blynk app as a user-friendly interface for users to manage and customize watering schedules, ensuring plants receive the right amount of water at the right time.
Sensor Feedback: APWS incorporates environmental sensors to gather data on soil moisture level. This data is used to make informed decisions about when and how much to water the plants.
Water Efficiency: The system is designed to conserve water by preventing overwatering, contributing to both plant health and environmental sustainability.
Customizable Settings: Users have the flexibility to set up custom watering schedules and parameters through the Blynk app, tailoring the system to the specific needs of their plants.
Notifications: APWS can send alerts and notifications to users through the app, ensuring they stay informed about the status of their plants and the system's performance.

3.1.2 EQUIPMENT REQUIRED

NodeMCU: The NodeMCU in the Automatic Plant Watering System is the brain of the system, responsible for IoT connectivity, data acquisition, control, communication with the user, and energy management. It is a key component that enables the automation and remote control features that make APWS a smart and efficient solution for plant care.

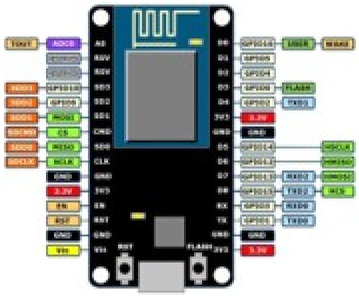


Figure 3.1: NodeMCU Board

Soil moisture sensor: Moisture sensors, often referred to as soil moisture sensors, are invaluable tools in various applications, particularly in agriculture, gardening, and environmental monitoring. They are used to measure the moisture content of soil or other substrates.

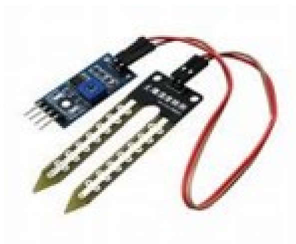


Figure 3.2: Soil moisture sensor

Relay module: A relay module is used to control the water pump or valve in our APWS. When it's time to water the plants, the relay module acts as a switch to activate the water pump or valve. The relay module is often connected to the microcontroller (e.g., NodeMCU) and receives commands from it.

Figure 3.3: Relay module

LCD display with I2C controller: The LCD display with an I2C (Inter-Integrated Circuit) controller can serve as a user interface and provide essential information about the APWS. It can display real-time data such as soil moisture levels, system status, and notifications, enhancing user interaction and understanding of the system's operations.

Figure 3.4: LCD with I2C

DC Water Pump: The water pump is an integral part of the IoT system in APWS and ensures that the right amount of water is delivered to the plants. By controlling the water flow, the DC mini water pump helps in water conservation. It prevents wastage of water by only providing what is necessary for the plants, promoting sustainable and efficient use of this resource. It can be remotely controlled and monitored through the Blynk app.

Figure 3.5: DC Water Pump

Others: Jumper wires for connecting the various components and a 9V battery to turn on the water pump.

Figure 3.6: Jumper Cables

Figure 3.7: Battery

3.2 CIRCUIT DIAGRAM

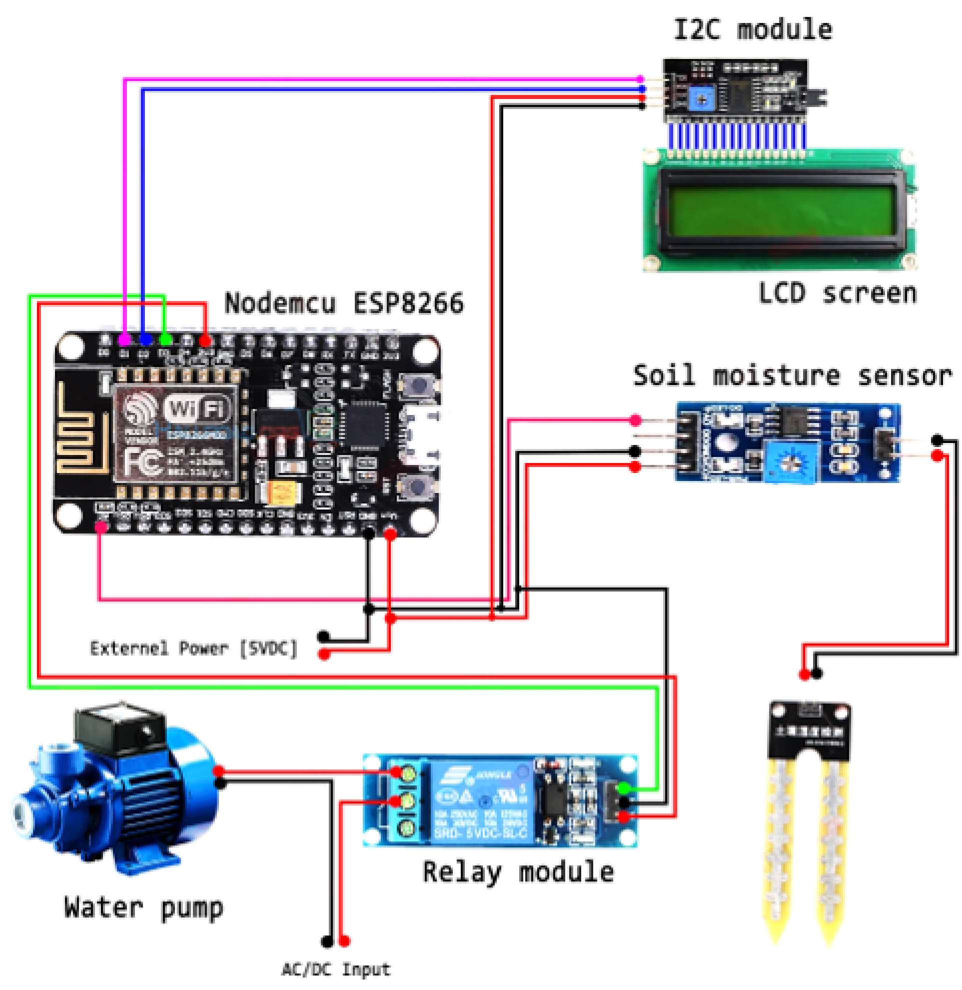


Figure 3.8: Circuit Diagram

3.3 PROCEDURE

- Begin by situating the NodeMCU board onto the breadboard, making sure to connect the VIN and GND pins to the breadboard.
- Subsequently, establish connections between the LCD display, relay module, and the NodeMCU board.
- The next step involves the creation of the Blynk web dashboard for your project, which can be achieved by following the steps outlined below:

  1. Initially, visit the Blynk website and register a new account using your Gmail address. Then, log in to your account and click the "New Template" button. Provide a project name of your choice and confirm by clicking "Done."

2. Proceed to the "Datastreams" section and create two data streams using the following specifications: - Virtual PIN: V0 Name: Moisture value MIN: 0 MAX: 100 - Virtual PIN: V1 Name: Water pump MIN: 0 MAX: 1

3. Navigate to the "Web dashboard" tab and add a button and a Gauge widget to your dashboard. Arrange these widgets as desired.

4. Customize the settings of these widgets one by one and link them to the data streams created earlier. Save your settings.

5. Click the search icon button and create a "New device," selecting the template you previously generated.

6. Connect the project to your computer and proceed to upload the program designed for this project.

- Now, let's create the Blynk mobile dashboard. Follow these instructions:

  1. Initially, download and install the Blynk app on your mobile device. Sign in to your account and select the template you generated in the Blynk web dashboard.

  2. Add widgets to the mobile dashboard by clicking the "+" icon in the top-right corner. Include one button and one gauge widget.

  3. Arrange these widgets according to your preferences and link them individually to the data streams you established in the Blynk web dashboard.

- With the Blynk mobile dashboard set up, proceed to connect the water pump to the relay module using the provided circuit diagram. Afterward, insert the soil moisture sensor into the soil.

3.4 PROGRAM FOR APWS PROJECT

```
#include <LiquidCrystal_I2C.h>
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

// Initialize the LCD display
LiquidCrystal_I2C lcd(0x27, 16, 2);

char auth[] = "e3IELGNl8FhcLIQPId_DwIJIUn8geJId"; // Enter your Auth token
char ssid[] = "iQOO"; // Enter your WIFI name
char pass[] = "ranjith128"; // Enter your WIFI password
```

```
BlynkTimer timer;
bool Relay = 0;

// Define component pins
#define sensor A0
#define waterPump D3

void setup() {
  Serial.begin(9600);
  pinMode(waterPump, OUTPUT);
  digitalWrite(waterPump, HIGH);
  lcd.init();
  lcd.backlight();

  Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);

  lcd.setCursor(1, 0);
  lcd.print("System Loading");
  for (int a = 0; a <= 15; a++) {
    lcd.setCursor(a, 1);
    lcd.print(".");
    delay(500);
  }
  lcd.clear();

  // Call the function
  timer.setInterval(100L, soilMoistureSensor);
}

// Get the button value
BLYNK_WRITE(V1) {
  Relay = param.asInt();

  if (Relay == 1) {
    digitalWrite(waterPump, LOW);
    lcd.setCursor(0, 1);
    lcd.print("Motor is ON ");
  } else {
```

```
    digitalWrite(waterPump, HIGH);
    lcd.setCursor(0, 1);
    lcd.print("Motor is OFF");
  }
}

// Get the soil moisture values
void soilMoistureSensor() {
  int value = analogRead(sensor);
  value = map(value, 0, 1024, 0, 100);
  value = (value - 100) * -1;

  Blynk.virtualWrite(V0, value);
  lcd.setCursor(0, 0);
  lcd.print("Moisture :");
  lcd.print(value);
  lcd.print(" ");

  if (value < 30) { // Change 30 to your desired moisture threshold
    digitalWrite(waterPump, LOW);
    lcd.setCursor(0, 1);
    lcd.print("Motor is ON ");
    Blynk.virtualWrite(V1, 1); // Update the Blynk app button state
  } else {
    digitalWrite(waterPump, HIGH);
    lcd.setCursor(0, 1);
    lcd.print("Motor is OFF");
    Blynk.virtualWrite(V1, 0); // Update the Blynk app button state
  }
}

void loop() {
  Blynk.run(); // Run the Blynk library
  timer.run(); // Run the Blynk timer
}
```

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 RESULTS

The implementation of the Automatic Plant Watering System (APWS) yielded several noteworthy results that demonstrate its effectiveness in automating plant care. The system successfully integrated with technology, the Blynk application, and various components such as NodeMCU, soil moisture sensors, relay modules, and a water pump to create a sophisticated plant watering solution. Through the APWS, we were able to achieve the following key outcomes:

4.1.1 REMOTE MONITORING AND CONTROL

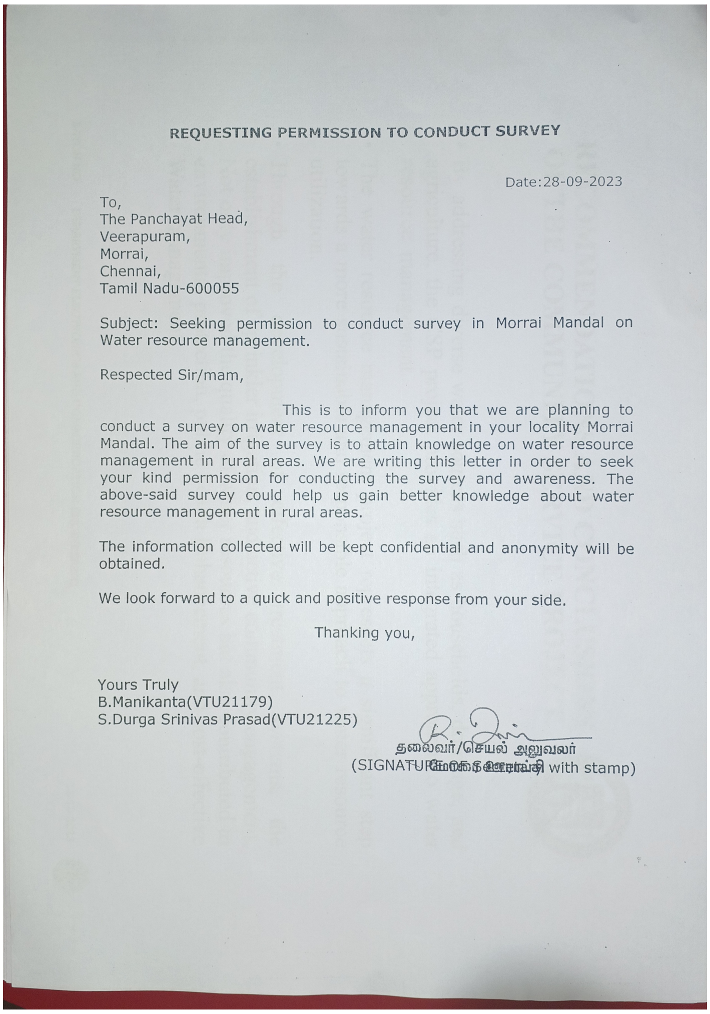
The APWS enabled users to remotely monitor and control the watering schedule of plants through the Blynk application. Real-time data on soil moisture levels were collected and analyzed, facilitating informed decision-making regarding the watering needs of the plants.

4.1.2 WATER EFFICIENCY AND CONSERVATION

By utilizing soil moisture sensors and a controlled water pump, the APWS effectively optimized water usage, ensuring that plants received the appropriate amount of water without wastage. The system's automated features prevented overwatering and minimized water consumption, contributing to sustainable and efficient resource management.

4.1.3 USER FRIENDLY INTERFACE

The integration of the Blynk application provided a user-friendly interface for managing and customizing watering schedules. The mobile dashboard facilitated easy access to real-time data, notifications, and control of the water pump, enhancing the overall user experience and system usability.



REQUESTING PERMISSION TO CONDUCT SURVEY

Date:28-09-2023

To,
The Panchayat Head,
Veerapuram,
Morrai,
Chennai,
Tamil Nadu-600055

Subject: Seeking permission to conduct survey in Morrai Mandal on Water resource management.

Respected Sir/mam,

This is to inform you that we are planning to conduct a survey on water resource management in your locality Morrai Mandal. The aim of the survey is to attain knowledge on water resource management in rural areas. We are writing this letter in order to seek your kind permission for conducting the survey and awareness. The above-said survey could help us gain better knowledge about water resource management in rural areas.

The information collected will be kept confidential and anonymity will be obtained.

We look forward to a quick and positive response from your side.

Thanking you,

Yours Truly
B.Manikanta(VTU21179)
S.Durga Srinivas Prasad(VTU21225)

தலைவர்/செயல் அலுவலர்
(SIGNATURE [illegible] with stamp)

Figure 4.1: Premission Letter

4.2 DISCUSSION

The results obtained from the implementation of the APWS underscore the significant advantages of integrating technology in agriculture, particularly in the context of plant care and water management. The following discussions elucidate the broader implications of the project.

4.2.1 ENHANCED PLANT HEALTH AND GROWTH

The APWS's ability to deliver the precise amount of water required by the plants contributed to their overall health and growth. By maintaining optimal soil moisture levels, the system promoted robust root development and improved nutrient absorption, resulting in healthier and more productive plants.

4.2.2 SUSTAINABLE PRACTICES

The water-efficient design of the APWS exemplifies sustainable farming practices, emphasizing the importance of conserving water resources while ensuring the optimal growth of crops. By preventing water wastage and minimizing environmental impact, the system aligns with the principles of eco-friendly agriculture and contributes to long-term sustainability.

4.2.3 SCALABILITY AND ADAPTABILITY

The modular design of the APWS allows for scalability and adaptability, making it suitable for various agricultural settings, including small-scale home gardens and large commercial farms. Its integration with the Blynk application further enhances its adaptability, providing users with the flexibility to customize watering schedules and parameters according to specific plant requirements.

In summary, the successful implementation of the APWS demonstrates the potential of driven solutions in revolutionizing traditional farming practices. Its ability to optimize water usage, promote plant health, and provide a user-friendly interface highlights the significant role of technology in promoting sustainable and efficient agriculture.

CHAPTER 5

CONCLUSION

The implementation of an automated plant watering system using NodeMCU and Blink software for water resource management represents a significant stride towards sustainable and responsible water use in plant care. This innovative system, which combines IoT technology with ecological stewardship, offers a range of benefits that extend beyond the realm of horticulture. As we conclude our exploration of this technology, it is clear that its contributions to water conservation and management are profound.

First and foremost, this automated system exemplifies the potential of technology to enhance our environmental practices. By leveraging the capabilities of NodeMCU and the Blink software platform, it empowers individuals and organizations to monitor and control their plant watering processes remotely. This not only reduces the labor and time required for plant care but also ensures that water is applied precisely when and where it is needed, minimizing water waste and promoting responsible resource management.

Furthermore, the ease of integration with the Blink software platform facilitates not only the control and monitoring of the system but also the collection of data. This data can be valuable in gaining insights into plant water requirements, moisture trends, and overall water consumption. Such information can inform decision-making processes and enable more data-driven approaches to water management.

In conclusion, the automated plant watering system using NodeMCU and Blink software is a testament to the marriage of technology and ecological consciousness. It not only simplifies the task of plant care but also plays a significant role in water resource management. As water scarcity and sustainable resource management become increasingly critical issues in our rapidly changing world, this technology embodies a responsible and forward-thinking approach. By embracing this innovation, we are not only nurturing our green spaces but also contributing to the greater goal of environmental stewardship, a vital component of our path to a more sustainable and resilient future.

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