BMS COLLEGE OF ENGINEERING

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BULL TEMPLE ROAD, BENGALURU-560019

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INTRODUCTION TO ELECTRICAL ENGINEERING

(22EE2ESIEE)

AAT REPORT

on

PLANT WATERING SYSTEM USING ESP8266

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INTRODUCTION

With increasing urbanization and limited space for gardening, it becomes essential to develop automated systems that can efficiently water plants. Traditional manual watering methods are time-consuming, prone to human error, and may result in overwatering or underwatering, leading to plant health issues. This necessitates the development of an intelligent plant watering system capable of autonomously monitoring and maintaining optimal soil moisture levels.

COMPONENTS

- ESP8266 WiFi Module: The ESP8266 WiFi module provides wireless connectivity, allowing the system to connect to the internet and be remotely monitored and controlled.

- Moisture Sensor: A moisture sensor is used to measure the moisture content in the soil. It provides analog output proportional to the moisture level.

- Single Channel Relay Module: The relay module is utilized to control the mini water pump. It acts as a switch and can be triggered by the microcontroller to turn the pump on or off.

- 9V Battery: The 9V battery supplies power to the system and ensures uninterrupted operation even during power outages.

- Mini Water Pump: The mini water pump is responsible for delivering water to the plants when the moisture levels drop below the predefined threshold**.**

WORKING PRINCIPLE

1. **Power Up the System**:
    - The ESP8266, moisture sensor, relay, and pump are connected to a power source. Ensure the ESP8266 and other components are powered appropriately to avoid damage.
2. **Moisture Detection**:
    - The moisture sensor is inserted into the soil. It measures the soil's moisture level and outputs an analog signal proportional to the moisture content.
    - The ESP8266 reads the analog signal from the moisture sensor via its analog-to-digital converter (ADC) pin.
3. **Data Processing**:
    - The ESP8266 processes the moisture sensor data to determine the soil moisture level. This is typically done by comparing the sensor's reading to a predefined threshold value.
    - If the moisture level is above the threshold (indicating the soil is moist), no action is taken.
    - If the moisture level is below the threshold (indicating the soil is dry), the ESP8266 triggers the relay.
4. **Activating the Pump**:
    - The ESP8266 sends a signal to the relay module to close the circuit, thus powering the water pump.
    - The pump starts to operate, drawing water from a reservoir and watering the plants.

5. **Watering the Plants**:
    - The pump continues to run, delivering water to the plants.
    - The ESP8266 keeps monitoring the soil moisture level. Once the moisture sensor detects that the soil has reached a sufficient moisture level (above the threshold), the ESP8266 signals the relay to open the circuit and turn off the pump.

CODE

Here's the code used for the system using the Arduino IDE:

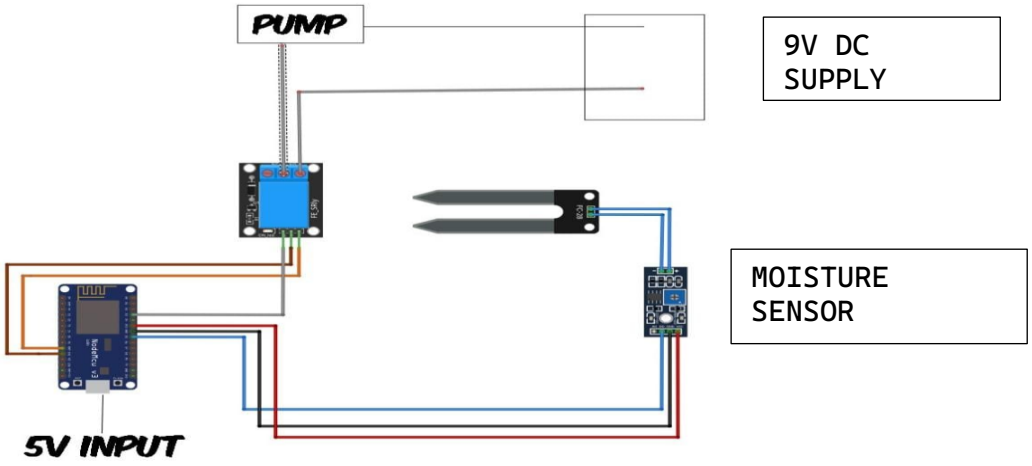
```
#define BLYNK_PRINT Serial

#define BLYNK_TEMPLATE_ID "TMPL3XcEpETBw"

#define BLYNK_TEMPLATE_NAME "plant watering system"



#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>



char auth[] = "CxcO8-GWtR-S4xRFeLpoJw7Rv3u6AY4_"; // the auth code that you got on your email

char ssid[] = "Supritha"; // username or ssid of your Wi-Fi

char pass[] = "sup12345"; // password of your Wi-Fi

int water;

int prevState = 0;



void setup()

{

Serial.begin(9600);

pinMode(D3, OUTPUT);
```

```
pinMode(D5, INPUT);
Blynk.begin(auth, ssid, pass);
}

void loop()
{
Blynk.run();

water = digitalRead(D5);
Serial.println(water);

if (water == HIGH && prevState == 0)
{
Serial.println("Pump Started, Water Flowing");
digitalWrite(D3, LOW);
Blynk.logEvent("pump_started", "Pump Started, Water Flowing");
prevState = 1;
delay(400);
}
else if (water == HIGH && prevState == 1)
{
Serial.println("Pump Stopped, Water Not Flowing");
delay(400);
}
```

```
else {

digitalWrite(D3, HIGH);

prevState = 0;

}

delay(100);

}
```

This code continuously monitors the soil moisture level and turns the water pump on or off based on the threshold value.

CIRCUIT DIAGRAM



- **5V (Vin)**: Connected to the positive terminal of the 5V power supply.
- **GND**: Connected to the ground terminal of the 5V power supply.
- **D0 (GPIO16)**: Connected to the input pin of the relay module.
- **A0**: Connected to the analog output pin of the soil moisture sensor mo

- **VCC**: Connected to the 5V pin of the microcontroller.
- **GND**: Connected to the GND pin of the microcontroller.
- **IN**: Connected to D0 (GPIO16) of the microcontroller.
- **NO (Normally Open)**: One terminal connected to the positive terminal of the water pump.
- **COM (Common)**: Connected to the positive terminal of the power source for the pump (usually another 5V or 12V power suply:

- **VCC**: Connected to the 3.3V or 5V pin of the microcontroller (depending on the sensor's requirements).
- **GND**: Connected to the GND pin of the microcontroller.

- **AO**: Connected to the A0 pin of the microcontroller (Analog Out)

- **Positive Terminal**: Connected to the NO terminal of the relay module.
- **Negative Terminal**: Connected to the GND of the power source for the pump

APPLICATIONS

- **Automatic Plant Watering System**: Automatically waters plants when the soil moisture level falls below a certain threshold, ensuring plants receive adequate water.

- **Smart Gardening**: Can be part of a larger smart gardening system where multiple sensors and actuators are used to automate various gardening tasks.

- **Irrigation Systems**: Used in small-scale irrigation systems to automate the watering of crops or gardens.

- **Home Automation Projects**: Integrated into home automation systems to take care of indoor or outdoor plants.

- **DIY Projects and Educational Purposes**: Used in DIY electronics projects and educational setups to teach about microcontrollers, sensors, and automation.

ADVANTAGES

- Provides an efficient and automated solution for maintaining appropriate soil moisture levels. This system eliminates the need for manual intervention and ensures the plants receive the necessary amount of water, preventing overwatering or underwatering.
- The remote monitoring and control capabilities offered by the WiFi module add convenience and flexibility for users to manage their plants from anywhere.
- Future enhancements could involve integrating additional environmental sensors for monitoring factors such as temperature and humidity, further improving the system's ability to deliver personalized care to plants.

DISADVANTAGES

- **Initial Cost**: The initial setup cost for a smart watering system can be relatively high due to the need for sensors, microcontrollers, pumps, and possibly a central control unit.

- **Complexity**: Setting up and configuring the system can be complex, especially for those without a background in electronics or programming.Troubleshooting issues can also be challenging.

- **Maintenance**: Regular maintenance is required to ensure sensors and pumps are functioning correctly .Sensors may need to be cleaned or replaced periodically to maintain accuracy.

- **Power Dependency**: These systems typically require a continuous power supply, making them dependent on electricity .In case of power outages, the system may fail to operate, potentially harming the plants.

- **Connectivity Issues**: If the system relies on Wi-Fi or other wireless connections, it can be prone to connectivity issues, affecting its reliability .Network issues could lead to delays in the system's response or complete failure.

CONCLUSION

Implementing a smart plant watering system offers a blend of modern technology with traditional gardening practices, providing numerous advantages in terms of efficiency, convenience, and plant health. This system can significantly ease the task of maintaining optimal soil moisture levels, ensuring that plants receive the right amount of water at the right time.. This automation ensures consistent plant care, which is particularly beneficial for busy individuals or those who travel frequently.

However, it's essential to consider the potential disadvantages, such as the initial cost, complexity, maintenance requirements, power dependency, and the risk of over or underwatering due to sensor inaccuracies. Addressing these challenges involves proper planning, careful installation, regular maintenance, and possibly integrating backup power solutions to mitigate power dependency issues.

In summary, while a smart plant watering system involves some upfront investment and technical knowledge, the benefits of automated, precise watering make it a valuable addition to both personal and commercial gardening endeavors . As technology continues to advance, these systems are likely to become more accessible, reliable, and user-friendly, further enhancing their practicality and effectiveness in various gardening applications.

REFERENCES

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