

Automated Plant Watering System using IoT and Robotics

1. Introduction

Watering plants regularly is essential for their healthy growth, but many times plants either get over-watered or under-watered due to irregular human intervention. To solve this, an automated plant watering system is developed using IoT (Internet of Things) and Robotics.

2. Components Required

- * ESP32 (or NodeMCU ESP8266)
- * Soil Moisture Sensor (capacitive recommended)
- * Relay Module (5V/3.3V)
- * DC Water Pump (12V mini pump)
- * Servo Motor (SG90/MG995)
- * Power Supply (12V & 5V)
- * Jumper wires, tubing

3. System Design & Working

1. Soil moisture sensor detects soil water content.
2. ESP32 processes data and uploads it to Blynk IoT Cloud.
3. If soil moisture is below threshold, relay switches ON pump.
4. Servo motor rotates pipe towards selected pot.
5. User can monitor via Blynk app.

4. Circuit Diagram

Soil Sensor: VCC→3.3V, GND→GND, A0→GPIO34

Relay: VCC→5V, GND→GND, IN→GPIO26

Pump: +→Relay COM, -→12V(-), Relay NO→12V(+)

Servo: VCC→5V, GND→GND, Signal→GPIO27

5. Program Code (ESP32 + Blynk IoT)

```
#define BLYNK_TEMPLATE_ID "YourTemplateID"

#define BLYNK_DEVICE_NAME "Plant Watering System"

#define BLYNK_AUTH_TOKEN "YourAuthToken"

#include <WiFi.h>

#include <WiFiClient.h>

#include <BlynkSimpleEsp32.h>

#include <Servo.h>

char auth[] = BLYNK_AUTH_TOKEN;

char ssid[] = "YourWiFiSSID";

char pass[] = "YourWiFiPassword";

#define SOIL_PIN 34

#define RELAY_PIN 26

#define SERVO_PIN 27

Servo waterServo;

BlynkTimer timer;

void sendSensor()

{

int sensorValue = analogRead(SOIL_PIN);
```

```
int moisturePercent = map(sensorValue, 4095, 0, 0, 100);

Blynk.virtualWrite(V0, moisturePercent);

if (moisturePercent < 40)
{
  digitalWrite(RELAY_PIN, LOW);

  Blynk.virtualWrite(V1, 1);

  waterServo.write(60);

  delay(3000);

  digitalWrite(RELAY_PIN, HIGH);

  Blynk.virtualWrite(V1, 0);

  waterServo.write(0);
} else
{
  digitalWrite(RELAY_PIN, HIGH);

  Blynk.virtualWrite(V1, 0);
}
}

void setup()
{
  Serial.begin(115200);

  pinMode(RELAY_PIN, OUTPUT);

  digitalWrite(RELAY_PIN, HIGH);

  waterServo.attach(SERVO_PIN);

  waterServo.write(0);

  Blynk.begin(auth, ssid, pass);
```

```
timer.setInterval(2000L, sendSensor);  
}  
  
void loop()  
{  
  Blynk.run();  
  timer.run();  
}
```

6. IoT Dashboard

In Blynk app:

- * Gauge (V0) → Soil Moisture (%)
- * LED (V1) → Pump Status
- * Button → Manual Pump Control

7. Advantages

- > Fully automatic watering
- > IoT remote monitoring
- > Robotics allows watering multiple pots
- > Prevents overwatering/underwatering
- > Expandable with DHT22 for climate monitoring

8. Applications

- * Smart home gardening
- * Greenhouses & nurseries
- * Agricultural automation

* Rooftop gardens

9. Conclusion

This Automated Plant Watering System using IoT and Robotics ensures efficient plant growth through precision irrigation while reducing human effort and water wastage.