International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 03 | March - 2024 SJIF Rating: 8.176 ISSN: 2582-3930

IoT based Smart Watering System with Remote Monitoring and Control

Jana Divyashree, Vinayaka A V, Veeru N Arkasali, Rakshitha K B
Students, Department of Electronics & Communication Engineering
Usha B R, Archana N M, Lecturers
Department of Electronics & Communication Engineering
D.R.R GOVERNMENT POLYTECHNIC, DAVANGERE

Abstract *- **This paper presents the design and implementation of an IoT-based smart watering system equipped with monitoring and control capabilities using Blynk IoT software. The system integrates various components including soil moisture sensor, water flow sensor, 12V water pump motor, relay module, and NodeMCU ESP8266 microcontroller. Through this setup, users can remotely monitor soil moisture levels, control water flow to plants, and automate watering schedules via the Blynk mobile application. This paper discusses the system architecture, hardware setup, software implementation, and presents experimental results demonstrating the effectiveness and reliability of the proposed solution.***

Key Words: IoT, Smart watering system, remote monitoring.

INTRODUCTION

The integration of Internet of Things (IoT) technology into agriculture has revolutionized traditional farming practices, leading to the development of smarter and more efficient solutions. Among these innovations, the IoT-based smart watering system stands out as a promising approach to optimize water usage while ensuring optimal plant growth. At its core, this system leverages advanced sensors, such as soil moisture and water flow sensors, coupled with control mechanisms facilitated by Blynk IoT software, to provide real-time monitoring and precise control over irrigation processes.

Central to the functionality of the smart watering system is the utilization of various sensors, including soil moisture sensors capable of gauging the moisture content of the soil. These sensors serve as the eyes of the system, continuously monitoring the moisture levels in the soil and relaying this data to the central control unit. Complementing this, water flow sensors enable accurate measurement of the volume of water being delivered to the plants, ensuring efficient water management and preventing wastage.

The control aspect of the system is facilitated by Blynk IoT software, a powerful platform that enables users to remotely monitor and control IoT devices through intuitive mobile applications. Integrated with a NodeMCU ESP8266 microcontroller, the system can receive data from sensors, process it, and trigger actions such as activating a 12V water pump motor through a relay module. This allows for precise control over irrigation schedules based on real-time environmental conditions, ensuring that plants receive just the right amount of water they need for optimal growth. In summary, the IoT-based smart watering system with monitoring and control using Blynk IoT software represents a significant advancement in agricultural technology, offering a sustainable and efficient solution for precision irrigation management.

SYTEM COMPONENTS AND ARCHITECTURE

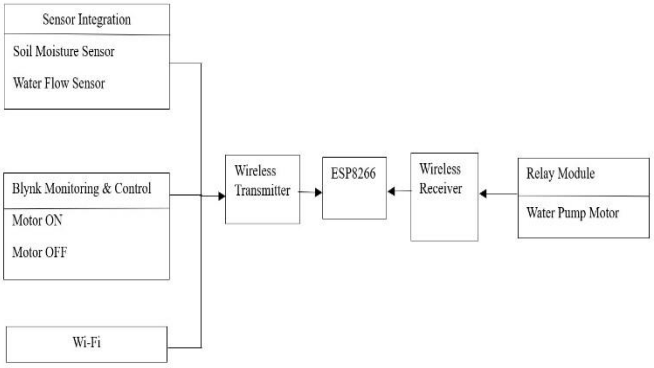


Fig 1 System Architecture

A comprehensive IoT-based smart watering system with monitoring and control can be achieved by integrating various components such as a soil moisture sensor, water flow sensor, 12V water pump motor, relay module, and NodeMCU ESP8266 microcontroller. By leveraging the Blynk IoT software platform, users can remotely monitor and control the watering system from their smartphones or computers.

The NodeMCU ESP8266 serves as the central processing unit, responsible for gathering data from sensors, controlling the water pump motor through the relay module, and communicating with the Blynk server via Wi-Fi. The soil moisture sensor detects the moisture level in the soil, enabling the system to initiate watering when the soil becomes too dry.

Additionally, the water flow sensor measures the flow rate of water through the system, providing valuable feedback on water consumption and ensuring efficient usage. The 12V water pump motor, controlled by the relay module, delivers water to the plants or garden as needed based on the soil moisture readings.

Through the Blynk app interface, users can remotely monitor real-time data such as soil moisture levels and water flow rates. They can also set desired thresholds for moisture levels and control the watering schedule accordingly. Overall, this integrated system offers convenience, efficiency, and effective management of watering tasks for optimized plant growth and resource utilization.

COMPNENTS REQUIRED

1. Arduino IDE program software: Arduino IDE is an open-source software platform used for programming Arduino microcontroller boards.

Arduino IDE is a user-friendly integrated development environment. It simplifies programming for Arduino boards using C/C++. It offers a code editor with syntax highlighting and auto completion. Libraries and examples are included to facilitate code development. A simple interface uploads code to the connected Arduino hardware. It supports various Arduino board models and compatible hardware. Serial monitoring tools assist in debugging and data exchange. Arduino IDE is free and available for Windows, macOS, and Linux.

Fig 1.1 Arduino IDE

2. Development board ESP8266:

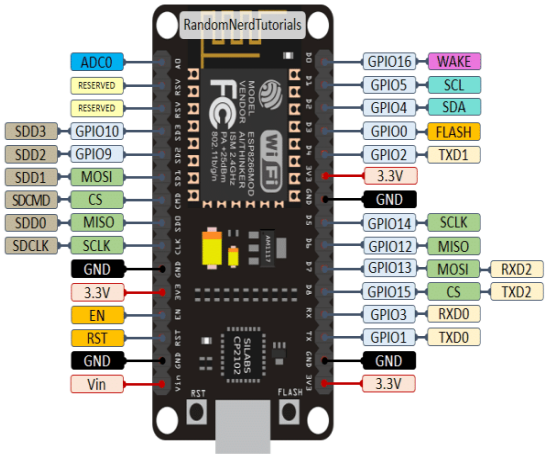


Fig 1.2 NodeMCU ESP8266

The ESP8266 provides built-in Wi-Fi connectivity, allowing devices to connect to Wi-Fi networks and communicate with other devices or the internet. It supports both station (client) and access point (AP) modes, enabling it to function as a standalone device or as part of a network.

3. Soil Moisture Sensor:

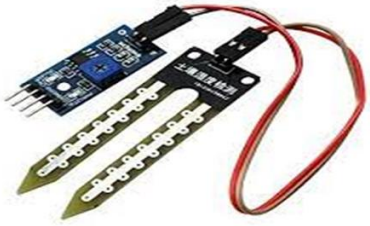


Fig 1.3 Soil Moisture Sensor

Soil moisture monitoring is another common use for the ESP8266. It can be used to measure the moisture level in soil using a soil moisture sensor and transmit this data wirelessly to a server or display it locally. This is particularly useful for agriculture, gardening, and environmental monitoring applications.

4. Water Flow Sensor:

Fig 1.4 Water Flow Sensor

It works use ultrasonic waves to measure the flow rate of water. They are non-invasive and can be installed externally to the pipe, making them suitable for a wide range of applications. It work based on Faraday's law of electromagnetic induction. They measure the flow rate by detecting the voltage generated as the conductive fluid (water) passes through a magnetic field.

5. Dual Channel Relay Module:

Fig 1.5 Dual Channel Relay Module

The dual-channel relay module contains switching relays and the associated drive circuitry to make it easy to integrate relays into a project powered by a microcontroller. On the left are two terminal blocks, which are used to connect mains wires to the module without soldering.

As marked on the body of the relay, the relay coil is rated for 5VDC, and the contacts are rated for 10A at 250VAC or 30VDC, or 125VAC or 28VDC.

6. Water Pump Motor (YF – S201):

Fig 1.6 Water Pump Motor

A 12V water pump motor refers to a type of electric motor designed to operate on a 12-volt direct current (DC) power supply. The design of a 12V water pump motor often includes features such as efficient brushless or brushed DC motor technology, durable construction materials, and waterproof or corrosion-resistant components to ensure reliable operation in various environments.

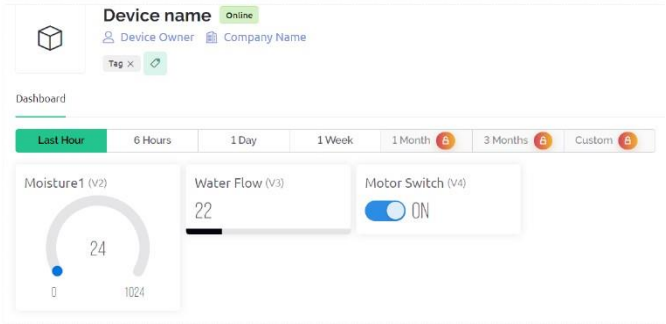
Blynk IoT:

Fig 1.7 Blynk IoT

Blynk IoT Cloud is a comprehensive platform that facilitates remote monitoring and control of connected devices. It offers a user-friendly interface for creating customizable dashboards, enabling users to visualize data and manage devices from anywhere. With its robust infrastructure, Blynk supports various hardware platforms and communication protocols, making it versatile for IoT applications. Users can easily integrate sensors, actuators, and other IoT devices into their projects and access real-time data, alerts, and analytics. Additionally, Blynk provides features for automation,

scheduling, and data logging, empowering users to automate processes and optimize efficiency. Overall, Blynk IoT Cloud offers a seamless solution for building, managing, and scaling IoT projects with monitoring and controlling capabilities.

RESULTS



An IoT-based smart watering system with monitoring and control using Blynk IoT offers an innovative solution for efficient plant care. By integrating components like a soil moisture sensor, water flow sensor, 12V water pump motor, relay module, and NodeMCU ESP8266, users can remotely manage their watering schedules and monitor their garden's conditions in real-time.

The soil moisture sensor detects the moisture level in the soil, triggering the system to activate the water pump when moisture levels fall below a certain threshold, ensuring plants receive adequate hydration. Additionally, the water flow sensor enables precise measurement of water consumption, helping users optimize water usage and detect leaks or abnormalities.

Using Blynk IoT platform, users can receive alerts about watering events, such as low soil moisture levels, directly to their smartphones or other devices. They can also remotely monitor the motor's status, ensuring seamless operation and troubleshooting potential issues from anywhere with internet connectivity. With Blynk's user-friendly interface, customization of alerts and monitoring parameters is simple, allowing users to tailor the system to their specific needs and preferences. Overall, this smart watering system offers convenience, efficiency, and peace of mind for plant care enthusiasts.

CONCLUSION

The proposed IoT-based smart watering system offers a cost-effective and efficient solution for automating irrigation processes while ensuring optimal plant health and water conservation. By leveraging Blynk IoT software and integrating advanced sensors and control mechanisms, users can remotely monitor soil moisture levels, control water flow to plants, and schedule watering tasks with ease. The system's modular architecture allows for flexibility and scalability, making it suitable for various indoor and outdoor gardening applications. Experimental results demonstrate the effectiveness and reliability of the system in improving water efficiency and plant growth, highlighting its potential for widespread adoption in agricultural and horticultural settings.

ACKNOWLEDGEMENT

We extend our sincerest gratitude to all those who have contributed to the development and success of this research project. We are deeply indebted to our project supervisor, Nithya A S ma'am, for their invaluable guidance, expertise, and unwavering support throughout the duration of this project. Their insightful feedback and constructive criticism have been instrumental in shaping the direction of our research.

REFERENCES

[1] Dr. Vibha Dhawan, “Water and Agriculture in India Background paper for the South Asia expert panel during the Global Forum for Food and Agriculture” Global Forum for Food and Agriculture (GFFA), 2017.

[2] L. S. Pereira, Theib Oweis, Abdelaziz Zairi, “A study on smart irrigation system using IOT”, Agricultural Water Management, Volume 57, pp 175-206, April 2002.

[3] Bharat R. Sharma, Ashok Gulati, Gayathri Mohan, Stuti Manchanda, Indro Ray, and Upali Amarasinghe, “Water

Productivity Mapping Of Major Indian Crops", NABARD report, 2018.

[4] Bobby Singla, Satish Mishra, Abhishek Singh, Shashank Yadav, "A study on smart irrigation system using IOT", International Journal of Advance Research, Ideas and Innovations in Technology, Volume 5, issue 2, pp 14161418, 2019.

[5] Miss. Mayuri Mali and Miss. Simran Mulla, "Study Paper On Smart Irrigation System", Mr. Dhanaji Baravade, International Journal Of Engineering Sciences & Research Technology, Volume 8, issue 4, pp 99-102, April 2019.

[6] Bishnu Deo Kumar, Prachi Srivastava, Reetika Agrawaln and Vanya Tiwari, "Microcontroller Based Automatic Plant Irrigation System", International Research Journal of Engineering and Technology, Volume 4, issue 5, pp 1436-1439, May 2017.

[7] Muhammad Ayaz, Mohammad Ammad-Uddin, Zubair Sharif, Ali Mansour,And El-Hadi M. Aggoune,, "Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk", Special Section On New Technologies For Smart Farming 4.0: Research Challenges And Opportunities, IEEE Access.Volume 7, pp 129551-129583, September 2019.

[8] Shradha Verma, Anshul Bhatia, Anuradha Chug and Amit Prakash Singh, "Recent Advancements in Multimedia Big Data Computing for IoT Applications in Precision Agriculture: Opportunities", Multimedia Big Data Computing for IoT Applications: Concepts, Paradigms and Solutions, Volume 163, pp 391-416, Springer Nature Singapore Pte Ltd. 2020.

[9] Maanak Gupta, Mahmoud Abdelsalam, Sajad Khorsandroo, And Sudip Mittal, "Security and Privacy in Smart Farming:Challenges and Opportunities", IEEE Access.Volume 8, pp 34564-34584, February 2020.