CLOUD AND IOT LAB PROJECT

(PCCCS693)

PROJECT TITLE:

Smart Irrigation System with Blynk and ESP8266

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ABSTRACT

The Smart Irrigation System using Blynk and ESP8266 with soil sensor, rain sensor, DHT11, relay, and motion sensor is an automated irrigation system that aims to conserve water resources while promoting plant growth. The system consists of multiple sensors that measure soil moisture, rainfall, humidity, and temperature, along with a motion sensor to detect the presence of people. An ESP8266 microcontroller processes sensor data and sends it to the Blynk cloud-based platform, where users can monitor and control the system remotely using a smartphone application. The relay module controls the water pump, which irrigates the plants when the soil moisture level is low and it is not raining. The system also provides real-time updates on soil moisture, rainfall, and temperature, allowing users to adjust the irrigation settings as needed. This system aims to promote sustainable agriculture and save water resources while ensuring optimal plant growth.

INTRODUCTION

A smart irrigation system is a technological solution designed to optimize water usage for crop growth. It operates by collecting data from sensors, such as soil moisture, rainfall, temperature, and humidity, and then utilizing that information to automate the watering process. Smart irrigation systems can be controlled remotely via smartphones, tablets, or computers, allowing farmers to monitor and adjust irrigation schedules from anywhere.

One of the key advantages of smart irrigation systems is their ability to save water. By providing the right amount of water to the crops, these systems minimize waste, resulting in significant water conservation. Additionally, they reduce labor costs associated with manual irrigation and eliminate the risk of under- or over-watering. Smart irrigation systems can also increase crop yields by ensuring that plants receive the optimal amount of water and nutrients, resulting in healthier and more productive crops.

However, there are also some disadvantages to smart irrigation systems. The initial installation cost of these systems can be high, especially for small farmers with limited budgets. The cost of sensors, controllers, and other components can add up quickly, making it difficult for some farmers to justify the investment. Additionally, the sensors used in these systems require regular maintenance and calibration to ensure accurate readings, which can add further costs and time commitments. Furthermore, smart irrigation systems may require a reliable source of electricity, which can be problematic in remote areas without access to electricity.

In conclusion, smart irrigation systems are an effective technological solution for optimizing water usage and improving crop yields. While they offer significant advantages, including water conservation and increased productivity, they also have some drawbacks, such as high initial costs and ongoing maintenance requirements. Despite these challenges, smart irrigation systems have the potential to revolutionize farming practices and help farmers overcome the challenges of water scarcity and climate change.

ABOUT THE PROJECT

To make a smart irrigation system using Blynk and ESP8266, along with the required sensors and a relay, we followed a step-by-step procedure.

First, we set up the ESP8266 with Wi-Fi by connecting it to our local network. We then registered with the Blynk app and obtained the authorization token required for the project. We connected the ESP8266 to the Blynk cloud server, which allowed us to control and monitor the sensors using our smartphones.

Next, we connected the sensors to the ESP8266 board. We connected the soil sensor to an analogue input of the board, the rain sensor to a digital input, and the DHT11 sensor to the board's data pins. We also connected the relay to a digital output of the board, which would be used to turn on or off the water pump based on the sensor readings.

After connecting the sensors and the relay, we programmed the ESP8266 using the Arduino IDE. We used the DHT11 library to read the temperature and humidity values and used the Blynk library to send these values to the Blynk app. We also programmed the board to read the soil moisture level and rain sensor status and used these values to control the relay and turn on or off the water pump.

We also used the Blynk app to set up a user interface for the project. We added various widgets to the app, such as value displays, gauges, and buttons, which allowed us to monitor and control the sensors and the water pump. We also set up notifications in the app, which would alert us if the soil moisture level was too low or if it was raining.

To test the smart irrigation system, we placed the sensors in a pot and connected the water pump to a water source. We monitored the sensor values and observed how the system turned on or off the water pump based on the readings. We also observed the notifications and how they helped us to maintain the soil moisture level and save water.

Overall, the smart irrigation system we created using Blynk and ESP8266, along with the soil sensor, rain sensor, DHT11, relay, and motion sensor, was a success. We were able to monitor and control the sensors using our smartphones, which allowed us to maintain the soil moisture level and save water.

METHODOLOGY

A smart irrigation system using Blynk and ESP8266, soil sensor, rain sensor, DHT11, relay, and motion sensor has various practical applications.

One of the most significant practical applications of this system is the conservation of water resources. By accurately measuring the moisture content of the soil, the system ensures that the plants receive just the right amount of water they need. This way, the system prevents overwatering, which leads to the wastage of water resources and underwatering, which results in the death of the plants.

The smart irrigation system is also practical for homeowners and landscapers who want to maintain healthy gardens, lawns, and landscaping. With this system, users can monitor their plants' water needs and adjust the watering schedule accordingly. The system helps to ensure that plants receive the right amount of water at the right time, which can result in healthier, greener plants.

Another practical application of the smart irrigation system is in the agricultural sector. With the increasing demand for food production, farmers need to find ways to maximize their crop yields while minimizing water usage. The system helps farmers achieve this goal by accurately measuring soil moisture levels and rainfall, which enables them to conserve water and optimize crop growth.

However, there are some potential disadvantages to the smart irrigation system. One of the **main concerns is the cost of installation and maintenance,** which can be quite high. Additionally, the system may be vulnerable to cyber threats if not adequately secured. Another potential disadvantage is the system's reliance on electricity, which can be a problem in areas with frequent power outages.

Despite these potential disadvantages, the benefits of a smart irrigation system using Blynk and ESP8266, soil sensor, rain sensor, DHT11, relay, and motion sensor far outweigh the drawbacks. The system's practical applications in water conservation, landscaping, and agriculture make it a valuable investment for homeowners, landscapers, and farmers alike. With the proper installation and maintenance, this system can provide reliable and efficient watering to plants, conserve water resources, and contribute to a sustainable future.

SOFTWARE USED

1. **Blynk:**

   Blynk is a popular Internet of Things (IoT) platform that allows users to develop and manage their own customized mobile applications for controlling and monitoring IoT devices. With Blynk, developers can easily create mobile apps to control a wide range of devices, including home automation systems, smart appliances, security systems, and more. One of the key benefits of Blynk is its user-friendly interface, which makes it easy for even non-technical users to create and customize their own mobile apps. Additionally, Blynk offers a wide range of pre-built widgets and features that can be easily added to any project, such as push notifications, data logging, and email alerts.

   Blynk also offers seamless integration with various IoT platforms, such as Arduino and Raspberry Pi, allowing developers to connect their IoT devices to the Blynk app and easily manage them remotely. Blynk supports various hardware and software platforms, including popular development boards

2. **Arduino IDE:**

   Arduino IDE (Integrated Development Environment) is an open-source platform used for writing and uploading codes to Arduino boards. It provides a user-friendly interface that makes it easy to write, compile, and upload code to the board. The IDE is designed to work with different types of Arduino boards and has a vast library of pre-written codes and examples that make it easy for beginners to get started with Arduino programming. One of the most significant advantages of Arduino IDE is that it simplifies the process of programming microcontrollers, which are the heart of most electronics projects. Arduino IDE is compatible with Windows, Mac OS X, and Linux operating systems. The software supports various programming languages like C, C++, and Python, and is compatible with different hardware boards, making it flexible for use in different applications.

COMPONENTS USED

1. **Soil moisture sensor:**
   It is a device that measures the amount of water content in the soil. It is commonly used in agricultural applications to optimize irrigation and improve crop yields.

2. **Rain sensor:**
   It is a device that detects the presence of rainfall. It is used in various automated systems such as smart irrigation systems to prevent over-watering and reduce water waste.

3. **DHT11:**
   It is a digital temperature and humidity sensor that measures the ambient temperature and relative humidity. It is widely used in indoor climate control systems and IoT applications.

4. **Relay:**
   It is an electromechanical switch that is used to control high voltage and current loads using low voltage signals. It is commonly used in home automation and IoT projects to control lights, motors, and other appliances.

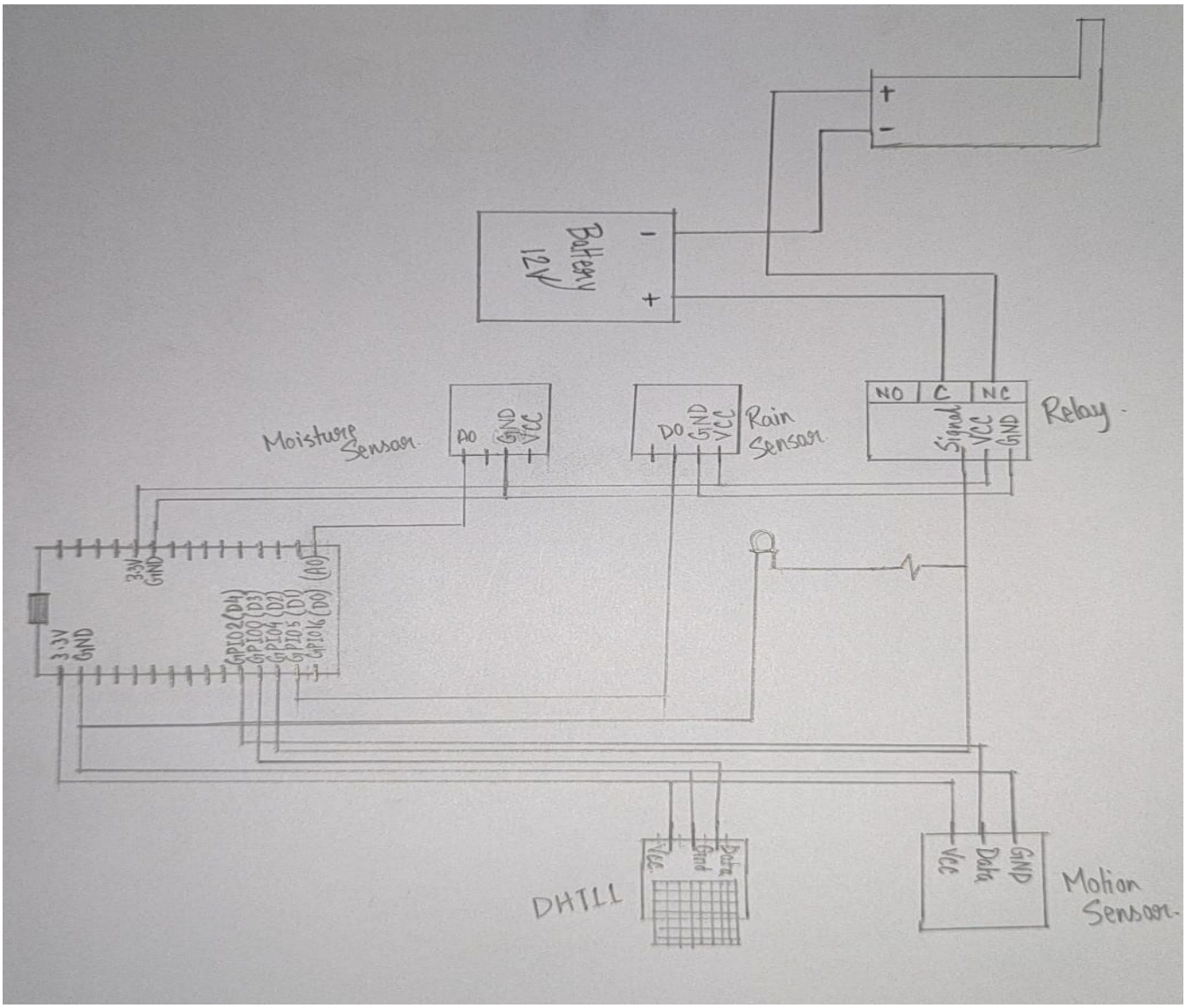
5. **Motion sensor:**
   It is a device that detects movement or the presence of objects in its field of view. It is widely used in security systems, automatic doors, and lighting control systems.

6. **Breadboard**

7. **Wires**

8. **LED**

CIRCUIT DIAGRAM



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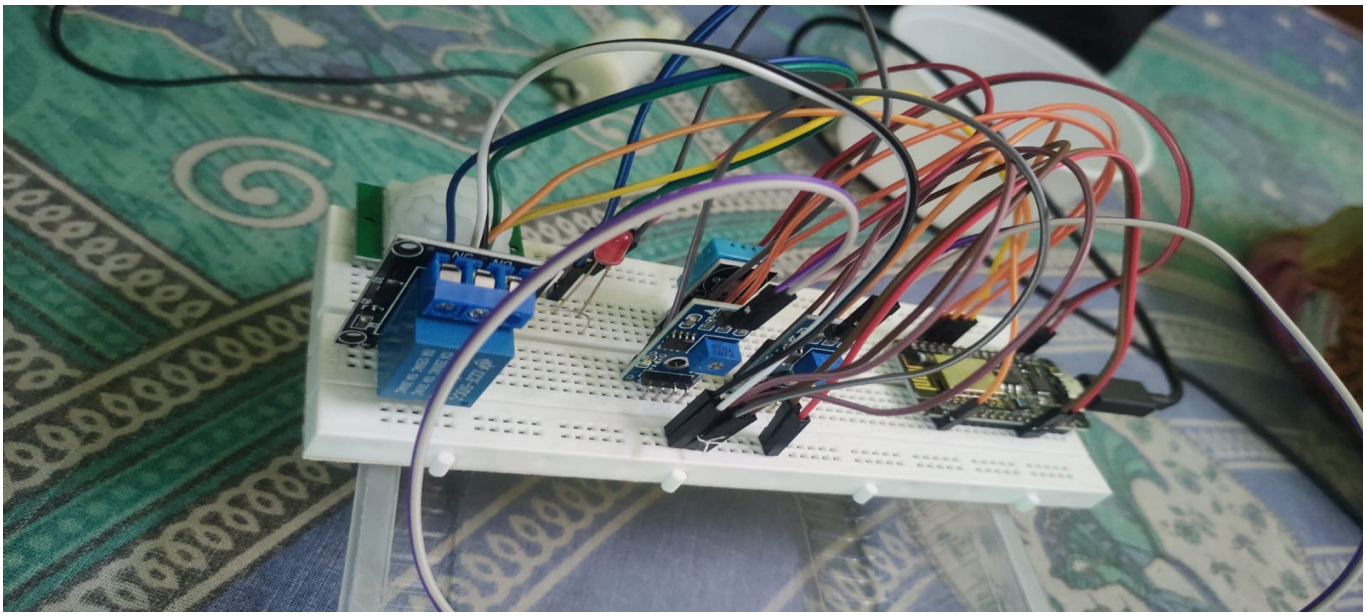
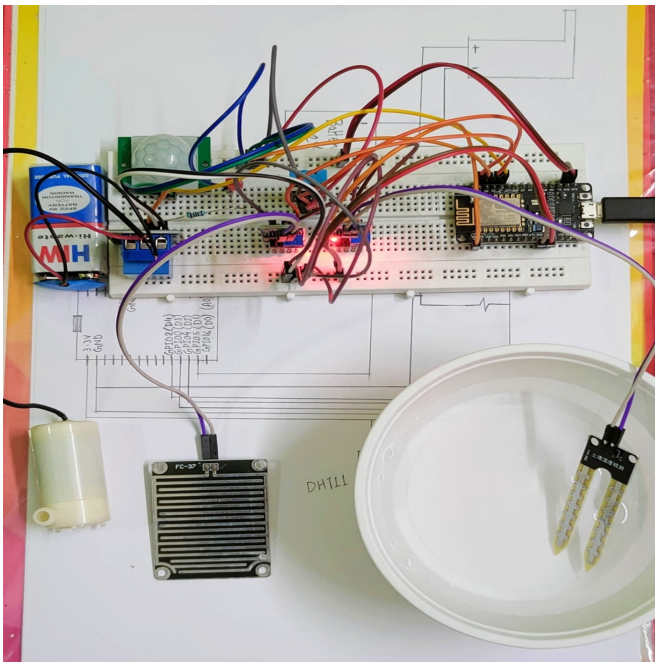
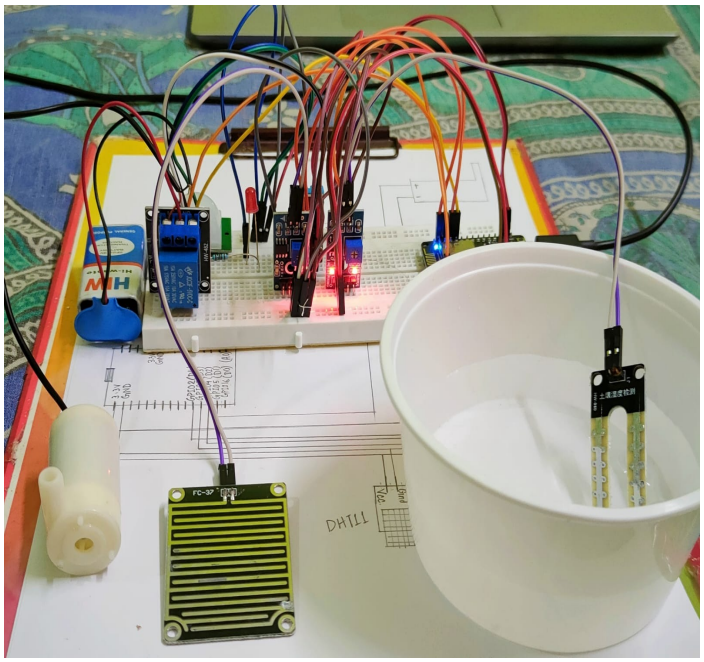
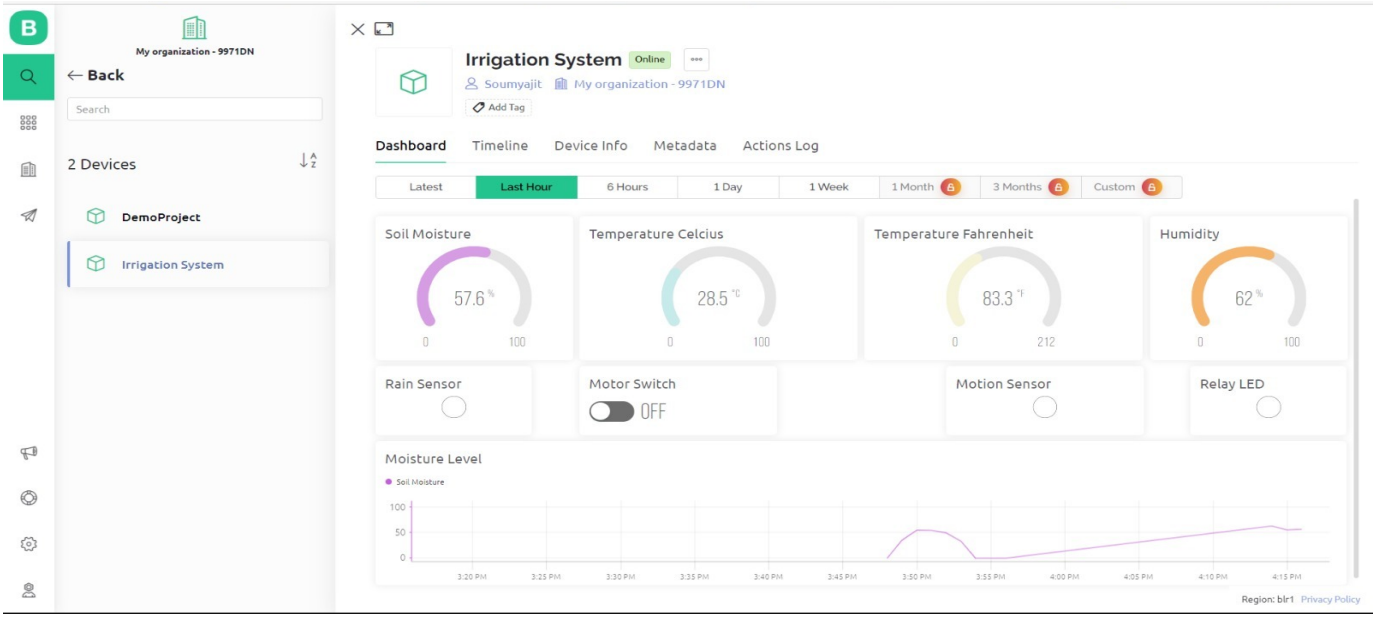




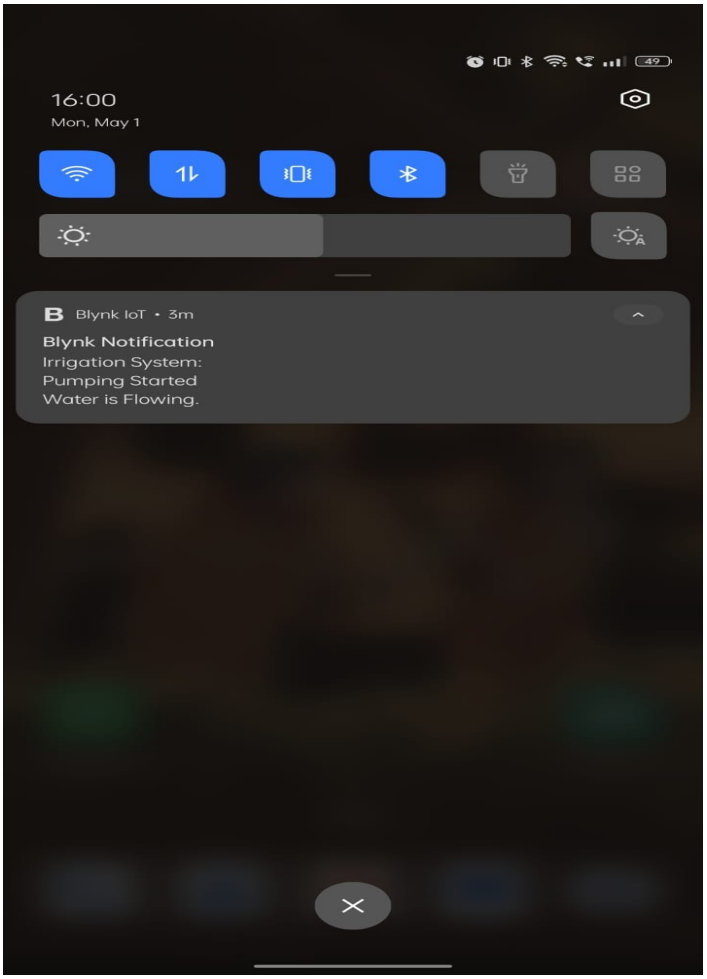


Blynk dashboard:



App Interface:

App Notification:



CONCLUSION

In conclusion, a smart irrigation system using Blynk and ESP8266 with soil sensor, rain sensor, DHT11, relay, and motion sensor offers several advantages over traditional irrigation methods. It enables farmers and gardeners to monitor and control the water supply, reducing water wastage, and ultimately saving water and money. The use of various sensors, including soil moisture and rain sensors, allows for more accurate and precise watering, providing plants with the optimal amount of moisture they need. Additionally, the integration of a motion sensor and relay ensures the security of the irrigation system, preventing unauthorized access and misuse. Overall, a smart irrigation system is a sustainable, efficient, and cost-effective solution for modern farming and gardening practices.

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