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SMART IRRIGATION SYSTEM

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ABSTRACT
The smart irrigation system that is suggested in this research is intended to maximize water use in agricultural applications. For real-time monitoring and control, the system makes use of the Blynk console and the Internet of Things (IoT). IOT protocols are used to wirelessly transfer sensor data—such as temperature, humidity, and soil moisture content—to a central hub. The ideal watering schedule is then determined by processing and analyzing this data. Using the Blynk console as a user interface, farmers may view sensor data, keep an eye on field conditions, and remotely turn on and off the irrigation system. comparison to conventional techniques, the smart irrigation system has a number of benefits. The method minimizes water waste by using sensor data to make sure crops receive the exact amount of water they need. It is developed to use the Blynk console and the Internet of Things (IoT) to transform agricultural water management. With the use of precision watering methods and real-time data processing, this system goes above and beyond simple monitoring. Important environmental parameters including temperature, humidity, and soil moisture content are continuously monitored by sensors that are carefully positioned across the field. IoT protocols are used to wirelessly transfer this data to a central hub for processing and analysis. The system uses sophisticated algorithms to calculate the best irrigation plan, making sure crops get the precise amount of water they require based on current conditions. By doing this, overwatering and underwatering are eliminated, encouraging sustainable practices and water conservation. The Blynk console functions as an intuitive user interface, providing farmers with a thorough overview of sensor data and visually represented
Keywords: Water conservation, Crop monitoring

1. INTRODUCTION
Traditional irrigation methods can waste water due to overwatering or underwatering. The innovative smart irrigation system powered by the Internet of Things (IoT) and the Blynk console offers a solution. This system utilizes sensors to gather real-time data on soil moisture levels. A popular choice is the soil moisture sensor, which transmits this information to a microcontroller board like the ESP8266. The Blynk console, a user-friendly IoT platform, acts as the brain of the operation. Data is sent to the Blynk app on your smartphone, allowing you to monitor soil moisture remotely. The magic lies in automation. Based on pre-defined moisture thresholds and programmed logic, the system can trigger a relay module to activate the water pump. This ensures your plants receive the optimal amount of water, reducing waste and promoting healthy growth. Additionally, the Blynk app interface provides manual control options, offering flexibility for adjustments.
This smart irrigation system is a powerful tool for both home gardeners and large-scale agriculture. By embracing the power of IoT and Blynk, you can create a water-efficient and intelligent irrigation solution for a greener tomorrow. A rising global concern is water scarcity. Due to overwatering or underwatering, traditional irrigation methods frequently waste water. Using real-time soil moisture data, an Internet of Things (IoT)-enabled smart irrigation system may automate the watering process, thereby addressing this difficulty. Utilizing the Blynk application and the Internet of Things, this article suggests a smart irrigation system. Soil moisture monitoring is achieved by the use of sensors on a microcontroller unit (MCU) in the system. In order to visualize sensor data and remotely operate the irrigation system, the Blynk platform functions as a user interface. This system combines

sensors, a microcontroller, and the Blynk cloud platform to create an automated watering solution. Sensors like a soil moisture sensor monitor real-time conditions, and the microcontroller uses this data to activate the water pump only when necessary. Blynk provides a user-friendly console to monitor sensor readings and remotely control the irrigation system from your smartphone or tablet.

2. LITERATURE

J.V. Wijayakulasooriya, H.A.C. Dharma gunawardhana, and H.G.C.R. Laksiri [3] Creating an efficient smart irrigation system based on the Internet of Things is another essential requirement for farmers in the agricultural sector. This study creates a weather-based, low-cost intelligent irrigation system. The first step is to design an efficient drip irrigation system that can automatically adjust the amount of water applied to plants according to the moisture content of the soil. Then, an Internet of Things (IoT)-based communication component is added to this water-saving irrigation system to further increase its efficiency. This feature enables a remote user to monitor soil moisture conditions and manually control water flow. The system also has sensors for temperature, humidity, and raindrops; these have been modified to enable online remote monitoring of these parameters. These field meteorological variables are recorded in real time and kept in a remote database. Finally, based on the present weather conditions, a weather prediction algorithm is employed to manage water distribution. Farmers would be able to irrigate their crops more efficiently with the proposed smart irrigation system.

Shabinar Abd Hamid, Zakiah Mohd Yusoff, Nor Adni MatLeh, Muhammad Azri Asyraf Mohd Hafez, and Zuraida Muhammad [1] The phrase "Internet of Things" describes how items, machinery, cars, and other electronic devices are connected to a network in order to exchange data (IoT). Connecting things and gathering data is becoming more and more common uses for the Internet of Things (IoT). Therefore, it is imperative that the Internet of Things be used in agriculture. Developing an internet of things-connected smart agriculture system is the project's goal. An irrigation system is integrated with the technology to address Malaysia's unpredictable weather. The Raspberry Pi 4 Model B is the microcontroller used in this system. The surrounding area's temperature and humidity, as well as the moisture level of the soil, are monitored using the DHT22 and soil moisture sensor. The data will be available on both a smartphone and a computer. As a result, Internet of Things (IoT) and Raspberry Pi-based Smart Agriculture Systems have a significant impact on how farmers work. It will have a good impact on agricultural productivity as well. In Malaysia, employing IoT-based irrigation systems saves roughly 24.44 percent per year when compared to traditional irrigation systems. This would save money on labour expenditures while also preventing water waste in daily needs.

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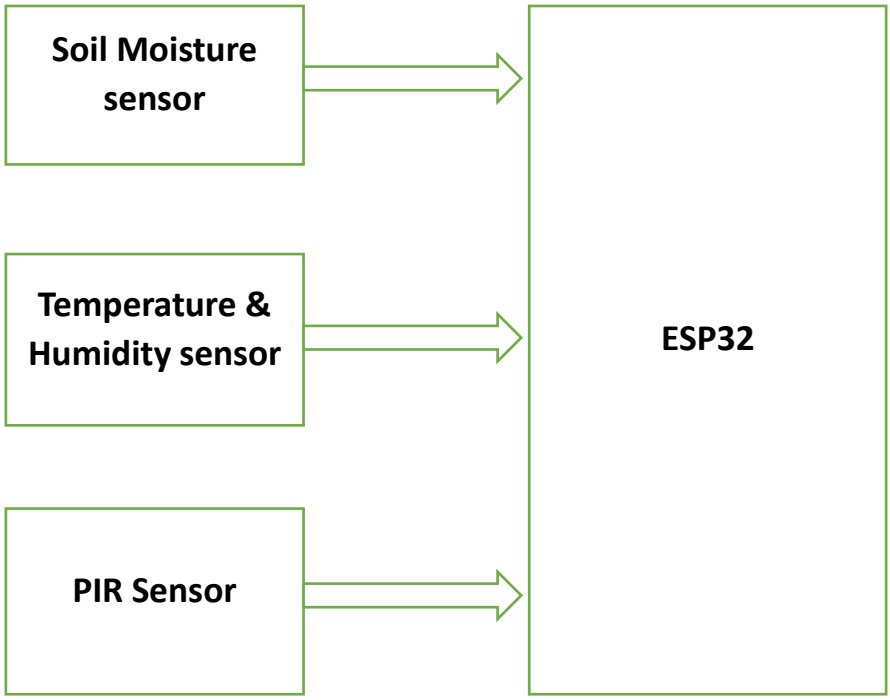
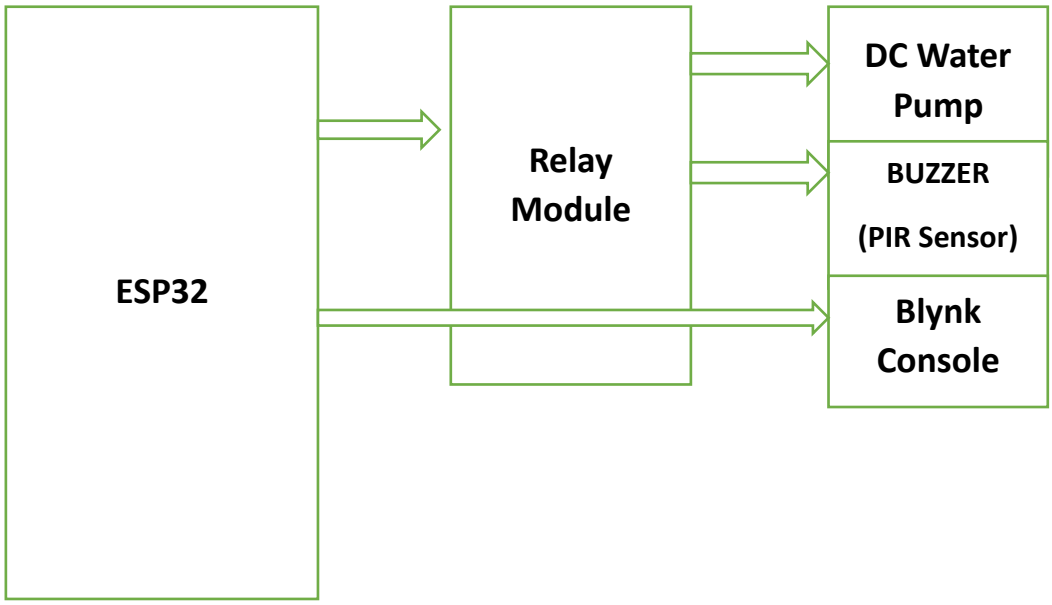
3. PROPOSED SYSTEM

3.1 Transmitter:



3.2 Reception:



3.3 SENSORS

Utilising sensors, smart irrigation systems gather information about the surroundings and the requirements of the plants.

The watering procedure is then automated using this data, guaranteeing that plants get the proper amount of water at the right time. The operation of three typical sensors in a smart irrigation system is broken down as follows:

3.3.1 Soil Moisture Sensor:

In a smart irrigation system, the pin connections between a soil moisture sensor and an esp8266 are simple. The majority of soil moisture sensors contain four pins, however there may be minor differences. The standard connecting scheme is as follows:

GND and VCC:

The sensor receives electricity from these pins. Attach GND to the GND pin and VCC to the 3.3v pin of the ESP8266.
D0 or DOUT:
This pin serves as the sensor's output, providing an analogue voltage signal that indicates the moisture content of the soil. Wetter soil is indicated by greater voltage , and drier soil is indicated by lower voltage. This pin is connected to ESP8266's analogue input pin, usually pin A0.

3.3.2 Temperature and Humidity sensor:

DHT 11 Pins:
VCC: Power supply for the sensor.
GND: Ground Connection.
DATA: Signal pin that transmits digital data.
ESP8266 Connections:
VCC:
Connect to the 3.3v pin on the ESP8266.
GND:
Connect to the GND pin on the ESP8266.
DATA:
Connect to the digital GPIO pin on the ESP8266. Choices are D0, D1, D2, D3, etc.,

3.3.3 PIR Motion sensor:

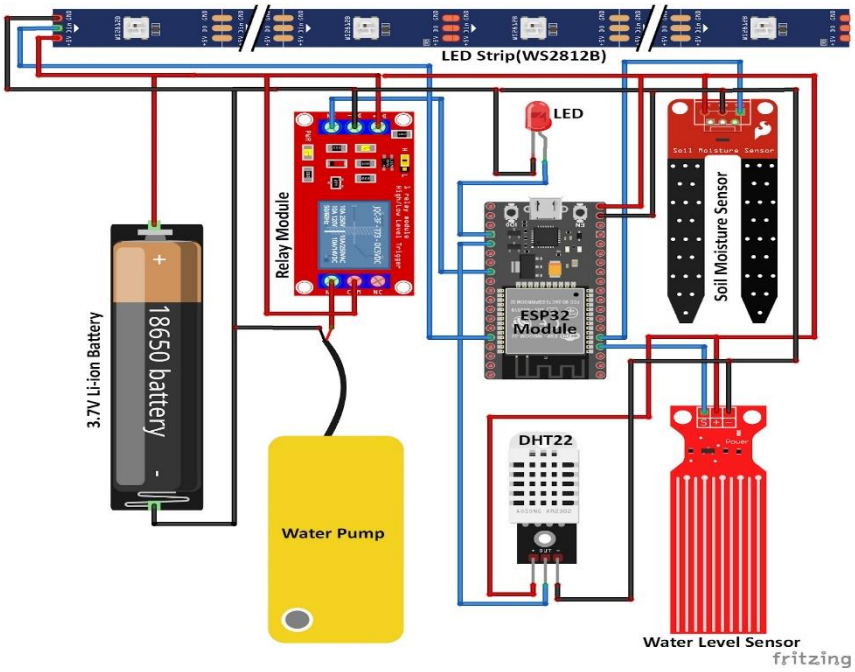
Though PIR sensor does not helps directly for efficient irrigation, it is used for safety and precautious situation of plants. It contributes to this project in below following ways,
Animal Deterrent:
To frighten away animals that can damage plants, the PIR can detect motion and then activate a light or sound deterrent.
Alerts:
Using PIR data an alert can be send to your phone via blynk console about possible irrigation needs can be issued if the PIR detects motion near plants and the soil moisture sensor shows dryness. This offers a roundabout method of determining the amount of watering needed.
PIR Sensor Pin connection:
VCC:
Connect to 3.3v pin on the ESP8266.
GND:
Connect to ground pin on the ESP8266.
D0:
Connect to any GPIO Pin on the ESP8266.

3.5 ESP8266:

In smart irrigation system, ESP8266 acts as the brain of the operation. Key roles of ESP8266 is mentioned below,
Obtaining Data:
All of the sensors (soil moisture, temperature, humidity, and optionally PIR) are connected to the ESP8266.
It periodically reads the digital and analogue signals from these sensors.
It translates the analogue voltage reading from soil moisture sensors into a percentage of the soil's water content.
It obtains data from the DHT sensor regarding temperature and humidity.
If a PIR sensor is present, it recognises motion based on the digital output of the sensor.
Processing Data and Making Decisions:
The ESP8266 is configured to check sensor data against pre-established limits.
It detects if irrigation is required based on temperature, humidity, and soil moisture levels.

For instance, the ESP8266 might activate if the temperature and humidity are high, signalling higher evaporation, and the soil moisture falls below a particular threshold.
In essence, ESP8266 acts as a smart controller that collects sensors data, makes informed decisions based on parameters provided in the code, controls irrigation and can even provide remote communication possibilities for your smart irrigation system.

4.CIRCUIT DIAGRAM



5. SOFTWARE ALGORITHM

STEP1 Include Libraries:

- Include libraries for esp8266 wifi functions (eg., Wifi.h)
- Include libraries for specific sensors (eg. DHT library for DHT sensor)
- Include the blynk library for communication with the blynk app.

STEP2 Define sensor pins and variables:

- Define pin connections to each sensor and the relay module control pin.
- Define variables to store sensor readings.
- Set variables for blynk app widgets IDs.

STEP3 Blynk app setup:

- In the blynk app, create a new project and connect your ESP8266 device.
- Add widgets to your blynk dashboard:

Gauges to display soil moisture, temperature and humidity.
A button to allow manual irrigation control(optional).
STEP4 Setup Function:

- In the ESP8266 code, define a setup function that runs once at startup.
- Initialize Wifi connection using your SSID and password.
- Initialize Blynk connection using your Blynk app credentials.
- Configure sensor pins as input/output based on sensor type.
- Configure the relay module pin as output.

STEP5 Loop function:

- Define a loop function that runs continously.

Inside the loop:

- Read sensor value from their respective sensors.
- Convert the soil moisture sensor reading to percentage value.
- Send sensor reading to their corresponding outputs.

STEP6 Irrigation Decision Logic:

- Implement a logic block to determine if irrigation is needed:
- Compare the soil moisture level with predefined threshold value.
- Consider temperature and humidity readings.
- Consider PIR sensor readings (eg to avoid irrigation after the rain detected by motion sensor).

STEP7 Irrigation control:

- Based on irrigation control logic, Control the relay module:
- If irrigation is needed, turn the relay ON, activating the water pump for the set duration.
- After the set duration, turn the relay OFF, deactivating the water pump.

6. RESULTS:

Water conservation:

- By precisely controlling irrigation based on real time soil moisture data, we can significantly reduce water waste compared to traditional irrigation.

Improved Plant health:

- Delivering the right amount of water at the right time promotes plant's healthy growth and potentially higher yields.

Remote monitoring and control(with Blynk):

- The Blynk app allows you to monitor sensor readings remotely and potentially control irrigation manually through the app.

Customisation:

- The software algorithm can be customized with different thresholds and watering duration to suit specific plant needs and environmental conditions.

To assess the project's success rate, we can track:

- Water usage: Monitor water consumption before and after implementing the smart irrigation system.
- Plants growth: Observe the health and growth of your plants compared to previous methods.

7. CONCLUSION

Smart irrigation with Blynk and the Internet of Things focuses as much on sustainability as on convenience. It increases environmental sustainability, reduces water waste, and encourages wise use of water. This technology will be very beneficial to home gardening, agriculture, and precision farming. It will also have a significant impact on water conservation efforts. Smart irrigation systems driven by IoT and Blynk make a compelling case for efficient water management. By combining sensors, like soil moisture probes, with a microcontroller, like the ESP8266, real-time soil condition data can be obtained. Subsequently, the Blynk app receives this data and makes remote monitoring possible. What makes things beautiful is the automation. The water pump can be started automatically by the system in line with predetermined moisture requirements, ensuring that plants get the right amount of water. By doing this, you can save water and promote healthy plant growth by avoiding both overwatering and underwatering. The user-friendly interface of Blynk makes it possible to view temperature, soil moisture level, and even manual irrigation system control. Imagine receiving alerts on your phone when your plants want watering.

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