Autonomous Home Gardening System Using IOT

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Abstract

Plants have a significant role in reducing air pollution by absorbing the pollutant gases, absorbing carbon dioxide, and releasing the oxygen that human beings can breathe. During day-to-day activities, planting is reduced because of improper monitoring, and most people still use the physical method for passing water to the plants. A proper irrigation system helps the plants grow well and prevents them from the improper water supply that can cause adverse effects, leading to poor crop development. The autonomous home gardening system uses IoT water conservation by providing water based on the needs of the plants without any human resources. Node MCU and various sensors are used to monitor the plants automatically. The sensors give information about the soil moisture and temperature content connected to node MCU. It analyzes the parameter and passes the water to the plant without the physical presence of humans. The information can be sent to mobile devices by using the Android application.

Keywords: *Internet of Things(IOT), NODEMCU, Soil Moisture Sensor and Mobile Application.*

1. INTRODUCTION

One of the fundamental problems restricting agriculture is water scarcity. The factors are more prevalent in locations where water supplies are scarce. Successfully managing irrigation in such settings is a critical aspect of long-term output. Water has been managed sustainably in agricultural production using information and communication technology. The Internet of Things (IoT) techniques of placing wireless sensor networks in yields and the remote administration of data via CC have enabled massive tracking of agriculture metrics which create vast amounts of records. Most people love gardening, and it is a hobby for many of us. Plants and trees provide clean air and fruits, and all of their parts are beneficial to humans, and they serve as a home for many birds and cure a wide range of diseases. As a result, we have to monitor the plant's growth

closely. However, using a manual method to examine the plant's growth and feed water in this day and age is quite complex, limited by the lack of period and a busy schedule. [11]When the caretaker of a home garden must leave for some time, they cannot maintain it properly. The best solution for the issue, as mentioned earlier, is automation. It helps in garden monitoring, and it has the potential to change the garden watering system from manual to smart active one.[4] An autonomous watering system aims to reduce water usage in gardens.

This results in efficient water usage and less manual work. This application is based on a cloud network using node MCU. Sensor nodes should be used to provide different variables. It measures the moisturizing content of the plant in the soil and gives accurate details about whether it is too watered or less watered[10]. The most widely used soil parameter sensor nodes use dielectric properties because they are flexible and inexpensive. However, their effective operation necessitates complicated standardization, considering soil state spatial variability, temperature, soil structure, and texture. IoT solves various problems by allowing objects to be detected and monitored directly over a system architecture. A mobile app for an autonomous home gardening system is built that employs IoT technology to track plant growth. People can use their Android application to monitor or retrieve data utilizing this technique[1].

2. RELATED WORK

Thamaraimanalan T et al.[1] proposed an innovative technique using IoT to automatically pass water to the plants without the physical presence of humans. Implemented using equipment like temperature detecting sensor, moisturizing sensor, and humidity detecting sensor, all the data are linked to node MCU with inbuilt WiFi technology. Information is collected using equipment and stored in cloud software.

According to [2] the journal discussed a technique based on IoT in Automatic Plant Watering System using functional components, like a moisturizing sensor and a water pump are integrated with an Arduino board is coded with the Arduino ide software. Finally, the required amount of water is passed to the plant.

In the journal [3], this paper aims to discuss the development of an Automatic water passing System using Arduino UNO. In this one, they are using functional components, like a moisturizing sensor and a water pump integrated with a Raspberry pi coded with the Arduino ide software information displayed on the LCD and sent to the mobile app.

From [4] IOT a Dynamic Approach for Monitoring the plants on Soil with the help of Arduino Uno and various sensors such as Soil Moisturizing, MQ-2 Gas detecting Sensor, Ultra Sonic Sound measuring Sensor, MQ-7 Gas Testor, and so on to supply a variety of parameters to Arduino Uno. The system also includes an LCD with a GSM Modem Module for sending notifications to farmers to take appropriate action. They also use a motor to ensure proper irrigation. For programming the entire system, the Keil IDE will be used.

3. OBJECTIVE OF THE PROPOSED WORK

The proposed model analyses the garden wet well and provides water at the right time with the required amount for plant growth. As a result, the plant will get the required water without human resources. It plays an essential role in reducing water scarcity, where water will be supplied precisely and effectively, reducing the unwanted wastage of water.

4. EXISTING SYSTEM

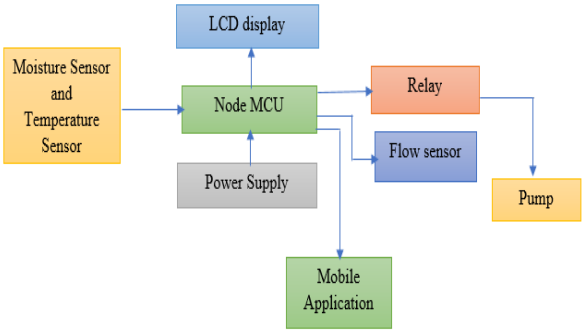
People may forget to irrigate their plants during their daily duties, making it challenging to keep their plants healthy and flourishing. Nowadays, we see the scarcity of water where we are supposed to utilize the water efficiently.[9] As

a result, we propose this technology, which will mechanically irrigate and open the garden based on moisture and temperature content and measure the amount of water supplied to the field and send a message to mobile phones via the Blynk app. The existing system is designed to irrigate plants based on their water requirements, and the data was transferred through SMS by GSM Module[6]. The moisture range gets low, and the plant requires water; hence an appropriate amount of water is delivered at the correct time by using water efficiently, allowing them to grow well. Whenever the moisture level goes down, the person need not worry about watering the plant. The system automatically works efficiently, and the information is forwarded to the user through SMS[5]. It moreover makes the process smoother and more productive.

5. PROPOSED SYSTEM

Autonomous home gardening is a collection of components that consist of sensors like a moisturizing sensor that helps identify the wet level of the garden and is very useful in detecting the moisture content effectively and efficiently at a minimum price. In contrast, temperature sensors can help determine the heat impact on the home garden connected to the microcontroller and sense the values from the sensor. The humidity sensor provides the value of humidity in the environment. The proposed system plays a significant role in saving water by efficiently utilizing the water without wasting excess water for irrigation. If the wetness level is below the detected range, the motor will turn on and finally, we can measure the accurate amount of water passed to the field in milliliters with the help of a flow sensor. The water is fetched from the water source and supplies the required amount whenever needed.

Fig 1: Architecture of proposed work



The moisturizing and temperature sensor captures data in the field and send it to the Node MCU. The power supply to the nodeMCU is connected to a relay that acts as a switch on and off. The automatic water system helps pass the required amount of water from the source to the soil. Finally, Node MCU sends the values of moisture, temperature range, and the level of water supplied will be displayed on the LCD when the system is turned on. This information is sent to the mobile Application through the WIFI connected to the mobile. The Application is named the Blynk app, a cloud-based application that is quite effective and even faster than the other methods. Start the process, and the sensor will detect the plant's moisture content, which is connected to the nodeMCU. The value will be displayed on the LCD, and if the moisture content is less than the acceptable moisture level, which is 35 percent, a signal is sent to the Relay, the pump will turn on, and the water is passed to the plant for a few seconds. Suppose if the value is more than 35 percent the motor will turn off it does not pass the water to the field finally, it reaches the end state. The system requirements are Node MCU, Moisturizing sensor, Temperature sensor, Flow sensor, Power supply, Water pump, Relay, and LCD.

5.1 NODE MCU

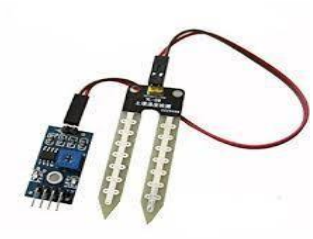
Fig 2: NODE MCU

The node MCU is a device to design the system development platform based on the ESP8266, a low-cost System-on-a-chip. The ESP8266 features are essential components of a modern computer, including a CPU, RAM, wireless connectivity, a current working platform, and Software. As a result, it is an excellent fit for many IoT projects.

5.2 MOISTURIZING SENSOR

Moisturizing sensors assist in determining the soil's water level. Moisturizing sensors do not directly detect water content in the soil. Instead, they track changes in another soil parameter that is predictable regarding the water content.

Fig 3: Moisture sensor



5.3 TEMPERATURE DETECTING SENSOR

The temperature detecting sensor helps to identify the heat of the surface. When the temperature increases or decreases, this sensor measures its values and then sends them to the Node MCU

Fig 4: Temperature sensor

5.4 FLOW SENSOR

Water flow sensors are used to calculate the volume of water that has passed through a pipe by measuring the flow rate. The volume of water flow is measured in litres per hour or cubic meters per hour.

Fig 5: Flow sensor

5.5 LCD DISPLAY

LCD Display displays the values measured by the different sensors integrated with the Node MCU. When the system is provided with the power supply, the LCD Display displays the information.

5.6 RELAY

Relay is a switch connected to the water pump and Node MCU. The relay is used to supply the water from the water pump with the actions given to Node MCU. The water pump will be inside the water pump, connected with a pipe. When the pump is turned on, it will supply water through the connection pipe from the pot.

6. IMPLEMENTATION AND RESULTS

Application for mobile devices and the sensors are programmed with node MCU will be coupled to a mobile app that transfers the data

acquired by the device. This prototype's development includes both hardware and software. The implementation consists primarily of two parts: a device and software and a data transmission part. The first concern is on the hardware side, such as sensing components critical to the project's success. The node MCU is connected to the Power supply, and the relay switch turns on/off the motor and the moisturizing and humidity sensor. The node MCU is integrated with the WIFI Protocol, which is connected to the mobile to receive the information from the node MCU. The WiFi username and password fed in the WiFi protocol should be set the same as the mobile hotspot's user name and password to receive the information. The node MCU transfers the data from one device to the other, communicating with other devices to send and receive the data. Based on the data sent from the node MCU, the motor will turn on/off.

Fig 6: Execution

Fig 7: Temperature Graph

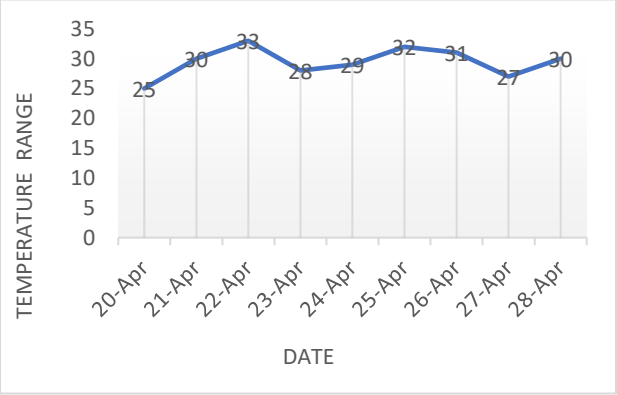


Fig 8: Moisture Graph

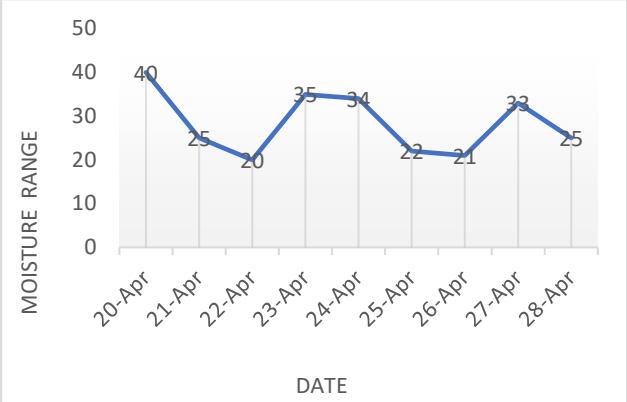
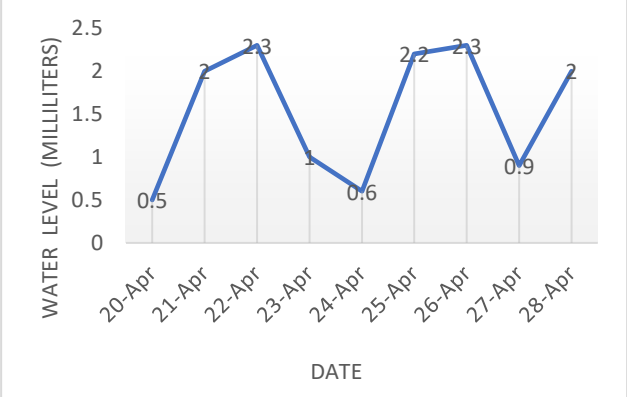
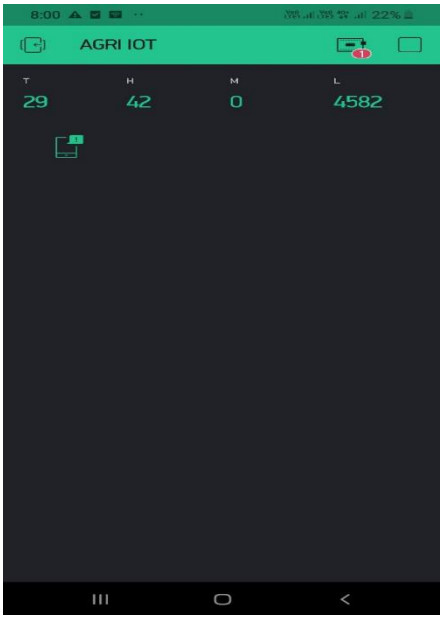


Fig 9: Water flow Graph





From the above picture, we can see the mobile application's temperature, moisture, and water flow values.

ADVANTAGES

The system's initial cost and installation are low, and it can be installed any place.

This technique saves water and effectively utilizes the existing water resources, increasing profits.

Tracking the level of water poured into the soil.

CONCLUSION & FUTURE SCOPE

This strategy has the potential to tackle the gardening issues that exist in metropolitan areas due to the lack of gardeners. It provides an excellent way for gardeners to take care of their plants. Gardeners can use their Android devices to retrieve real-time data utilizing this system. It also focuses on water conservation by improving the accuracy of water distribution to the crops. It also tracks the amount of water supplied. In comparison to the other traditional irrigation systems, the approach utilized in this work can be considered a suitable strategy in the irrigation field as it can save time and money. This technology could be integrated into automation to create an effective home system that can operate for several days with high efficiency and less workforce. It can be further customized and applied to intelligent agricultural applications.

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