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Smart Agricultural Irrigation System Using IoT

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Abstract: *Smart Agricultural Systems have advanced rapidly in recent decades. Demonstrate the importance of agriculture over the world. Indeed, in India, over 70% of the population is reliant on the critical agricultural industry. Irrigation systems in the past relied on mills to water the land using traditional ways without knowing the proper quantities of these crops. Automation over here is the process of turning on and off an irrigation system automatically. All data may be accessed at any time and monitored remotely using a mobile device. This benefit may be utilized to keep track of and regulate many plant and agricultural factors. The suggested solution is intended to address this issue by automating the system while also ensuring portability. The system can detect moisture, temperature, and humidity levels and take appropriate action. In this paper, the UI i.e., User Interface has also been explained which is the BLYNK app.*

Keywords: IOT, Agriculture, App, DHT11, Moisture Sensor, MQTT Protocol

I. Introduction

Agriculture's revenue must continue to grow since the world's population is expected to rise from 6.8 billion in 2013 to over 10 billion by 2050. With the dwindling potential of farmers, efficiency has become a critical necessity. The project's expected outcomes are to make the irrigation system easier to use and understand by constructing and developing the entire autonomous irrigation system, and to improve crop performance by decreasing overwatering from saturated soil. It can prevent irrigation on the incorrect day, to switch ON or OFF by using the irrigation system, the controller will operate to switch, so no need for employers, to eliminate operational errors caused by workers as much as possible, and to conserve water from waste.The primary issues in the agricultural area include a shortage of manpower, a lack of understanding about soil testing, an increase in labour wages, seed waste, and increasing water waste. The concept of using robots technology in agriculture is very new. In agriculture, the potential for robot-enhanced productivity is greater, and robots are increasingly emerging on farms in varied forms and quantities. Many agricultural robots have been developed in recent years that can only execute one or two jobs. But practically in areas where there is no proper infrastructure of movement for robots, it will not be possible to implement such a system for real use, hence we use systems which are portable or low cost and can be implemented to cover the whole farms using multiple units of these systems. The primary problems in agriculture in the current day include a shortage of agricultural labour, a lack of information about soil testing, a rise in labour wages, seed waste, and increasing water waste. To alleviate all of these drawbacks, an agricultural system has been proposed. Agriculture 4.0, Digital Farming, or Smart Farming are all terms used to describe a new philosophy based on agricultural data that was formed when telematics and data management were merged with the already well-known idea of Precision Agriculture to improve the precision of operations. As a consequence, Agriculture 4.0 is founded on Precision Agriculture principles, with farmers adopting technology that collect data about their fields, which is then analysed to make correct strategic and operational choices. Farmers have always gone to the fields to check on their crops and make judgments based on their previous experience. has been suggested. . Getting a larger variety of non-invasive sensors that can measure on-the-go will be one of the most pressing difficulties to overcome in the next years. Because these sensors could be attached to autonomous platforms and robots, this approach would be closer to Agriculture 5.0. Not all parameters of interest can be monitored non-invasively and at a safe distance from the target nowadays.

II. LITERATURE REVIEW

Rani et al., in this paper the controller turns on the water pump as soon as the sensor delivers a reading below the threshold. Pump on/off commands are delivered over the internet platform[1].Ranjitha B et al. they developed robot is powered by a solar panel and controlled by a Bluetooth/Android app that provides signals to the robot to control the necessary mechanics and movements. This improves seed sowing and pesticide spraying efficiency while also reducing the problems associated with hand planting.[2] The technique aids farmers in the fundamental operation of seed planting, according to S. Kareemulla. The operation of this equipment is straightforward. It is feasible to successfully raise the overall yield %. The labour shortage can be alleviated. In comparison to manual and tractor-based sowing, this robot equipment requires less time and energy. There is also reduced seed waste. The model's shortcoming is that it only has one mechanism.[3][4][5].

III. PROPOSED WORK

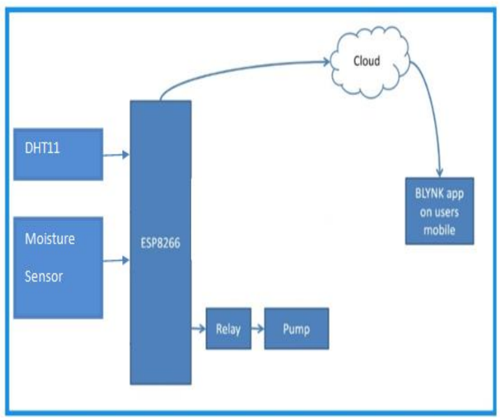

Figure 1: Block diagram of Proposed system

To operate and monitor the entire system, a central computer or mobile application is used. Each of these blocks/nodes has a variety of sensors and gadgets, which are linked to a central server by wireless Wi-Fi modules. Using internet connectivity, the central device sends and receives data from the user. The system is primarily divided into two modes: automated and manual. In automated mode, the system makes decisions on its own while managing multiple devices, and in manual mode, the user may control the system via a mobile app or PC instructions. The user receives data from the node MCU via Wi-Fi and the blynk app. Programming may regulate the automation of the watering mechanism, and the threshold value must be adjusted according to the user and the amount of water required by various crops and soils. Its sensors and controller module, which includes the following:

- Controller: The Node MCU is a microcontroller-based platform with a Wi-Fi module that enables control and status transmission to any mobile device.
- Moisture Sensor: This device detects the amount of water in the soil. It will employ a capacitive type moisture sensor.
- DHT11: It sends temperature and humidity data to the controller.
- Driver: This component is used to drive or supply the necessary voltage to turn on the motor.
- Remote: It features a variety of controllers for moving the chassis, including the Blynk app.
- Cloud: A virtual area and on-demand availability of computer system resources, particularly data storage and computational power, without the user's direct active administration. The word refers to data centers that are accessible over the Internet to a large number of people.
- Mobile: The data is obtained via a cloud service.

The DHT11 is a basic digital temperature and humidity sensor that is extremely inexpensive. It measures the ambient air with a capacitive humidity sensor and a thermistor and outputs a digital signal on the data pin (no analogue input pins needed). It's simple to use, but data collection takes precise scheduling. The only major disadvantage of this sensor is that you can only collect new data from it once every 2 seconds, therefore sensor values can be up to 2 seconds outdated when using our library.

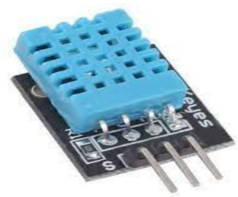

Figure 2: DHT11 sensor

The Capacitive Soil Moisture Sensor Module measures variations in capacitance to assess soil moisture content. This can be used in an automatic plant watering system or to trigger a notification when a plant needs to be watered.

Figure 3: Capacitive Moisture sensor

Blynk is essentially an app editor. Each project can include graphical elements such as virtual LEDs, buttons, value displays, and even a text terminal, as well as interface with one or more devices.Blynk was created with the Internet of Things in mind. It can control hardware remotely, show sensor data, save data, visualize it, and perform a variety of other tasks. In our project we have designed the app interface for our needs like using label, buttons and titles in app to complete our purpose of the app.

IV. Results

Farmers now handle irrigation methods manually and water their land on a regular basis. These processes drain a significant quantity of water, resulting in water loss. In arid locations, rainfall is scarce and irrigation is difficult. As a result, the ESP8266 Wi-Fi based communication system was chosen because to its ease of use, maintenance, and low cost. The device is automated and will correctly monitor and manage the water use. The app's communication allows the user to engage with sensors from all over the world in nanoseconds, which is beneficial to the user. Furthermore, this concept employs an ESP8266 Wi-Fi module and an Arduino microcontroller to reduce power consumption while increasing system life and executing on vast regions for a little cost.

V. Conclusion

In this proposed work, we have successfully implemented the blynkapp based automation system which can help the farmers to reduce the manual efforts and the need of physically visiting the farms multiple times. We would like to thank our guide for him unconditional support and guidance throughout the project term.

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