RESEARCH ARTICLE

Onion growth monitoring system using internet of things and cloud

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Many real-time apps acknowledge the different advancements made in many sectors through the usage of new technologies. Using Wireless Sensor Networks and Think speak Cloud; this research paper proposes a remote internet of things (IoT) based onion growth monitoring approach.

With the use of the internet of things and wireless sensor networks, the suggested study work improves the traditional approach to onion growing in rural areas. This study proposes the creation and deployment of a thermal-based Internet of Things system within onion farms, with the goal of managing devices such as fans and heaters according to the ideal range of onion production and good onion growth.

Key Words: *Agriculture; Soil testing; IoT; Sensor*

INTRODUCTION

T simulator is used to implement and validate the suggested model. The results show that the proposed method is faster, and that the proposed model has a lower simulation time while also being more efficient. This proposed research has continued to boost onion farm yields; however the outcomes may not be as predicted if the fields and onions are not adequately monitored. Modern tools, such as the internet of things, can aid onion development and farmers in not just monitoring their onions on the farm but also taking actions to produce them on time. They can boost onion production quality without using a lot of energy.

In this paper, we present an Arduino UNO-based onion growth monitoring system that uses Thing Speak to reduce the amount of energy used in the onion farming industry. The Arduino UNO is a primary microcontroller control tool that can communicate all collected data to the Thing Speak cloud and receive control commands from the service. Thing Speak is an open-source cloud computing tool that allows farmers to instantly and remotely visualise onion growth data. It also allows the farmer to read sensory data from a distance. On the onion farm, the camera module is also employed to maintain continuous views. The major goal of this study is to reduce the administrative burden and energy necessary for onion growth monitoring and farming.

Downy mildew is a devastating kind of onion disease caused by a soil infection caused by the Peronospora bug. It severely damages the leaves, causing a major loss in plant value. Due to a shortage of carbohydrates and potassium in the plant leaf, downy mildew develops, causing persistent dryness and constipation at the edges of the leaves and roots, resulting in a weakened immune system and numerous ailments. When the soil temperature is below 15 degrees Celsius, the fungus does not eat, but when the temperature is between 25 and 28 degrees Celsius, it thrives. Infection can also be caused by rainy weather before to harvest or moist packing. In addition, during mid-April and early May, onions are rapidly infected with repeated production. The disease strikes in the fall and spring, particularly in mid-April when it rains heavily. Infected onion leaves first show chlorosis, then turn yellow before dying. As a result of the recent growth in crop production, more advanced crop management technology is required to boost productivity and product stability. Many agricultural studies are now incorporating flying items such as drones to address this need.

The drone, however, is not as simple as real-time and long-term observations, such as rapid climatic change, without the use of particular scales. It is vital to share information such as the location and size of the crop in order to further monitor the yield in order to predict disease production and crop production.

Similarly, it requires real time to consider how IT technology might be used to measure growth and plant illnesses.

Monitoring system using internet of things

Farmers assist in determining the temperature and soil moisture content of local information supplied by authors [1], hence IoT is based on Agriculture stick. Muthunoori, et al. [2] suggested an Internet of Things (IoT) that connects the agribusiness diagram with a variety of activities, such as accuracy and development, to meet industry challenges [3] Gondchawar, et al. hope to help the agricultural industry thrive through robotization and IoT development in this article. Nobrega, et al., [4] proposed a tight IoT system to combine data from the creation and phase level, as well as optimization and energy efficiency, in order to feed ovine within areas appropriately. Grapes are being planted Stadiums and waterfowl fields are not always walled, according to Bavane, et al. [5].

The use of GSM technology to provide agricultural heat is reported by Zhao, et al. [6-8]. GSM technology with GPRS support allows for remote temperature monitoring in the Thing Speak platform the study of diverse soil kinds. Takekar, et al. developed a method for utilising IoT in agriculture. Khattab, et al. proposed a cloud-based IoT solution for a variety of precision agricultural applications, including a portal layer that connects an online storage layer to a data storage layer in the background, address the importance of current agricultural technology in the intelligent use of MQTT [9,10].

METHODOLOGY PROPOSED

Farmers collect data in a variety of ways, including employing mobile sensors and mobile devices such as Smartphone and tablets to collect data about crops, soil, and climate, allowing them to readily access and monitor their yield. For analysis, the acquired data is transferred to a central cloud platform. The findings are given to the farmers in order to improve the

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agricultural process and allow for a longer irrigation process. Different approaches to agricultural access are better described by Suciu, et al. Their main objective is to conduct research into integrated technologies and to teach future generations of students how to use and use emerging technology. He talks about what may be learned to make agriculture more precise.

Uno

The ATmega328P controller on the Arduino Uno is a tiny 8-bit microcontroller. It features several components, such as a gem oscillator, serial volumes, and a volume controller, in addition to the ATmega328P microcontroller. Arduino UNO Board Communication (B), a sequential screen is included in the Arduino system, which allows data to be transferred to and from the Arduino board. When data is transferred *via* USB-to-sequential chip and USB connection with PC, the Arduino board has two RX and TX LEDs that can be stretched out, changes (C) the power converter (0-230V) will be reduced by the converter (0-6V).Correct arrangement is linked to a powerful converter.

Voltage stabilisers

Electrical controls are a type of IC that is commonly utilised. Index source hardware, a comparison enhancer, a control gadget, and a computer purchase guarantee for IConly play are all included in the controller's IC units D. A transferred transmission is an electrical switch that operates automatically. The current transfer curl movement produces the lovely field depicted in RS232, for example. The RS-232 can be used as a common two-way communication between DTE (Data terminal hardware) and DCE (Data communication equipment) in broadcast communications (Data Circuit-ending Equipment). Motion Sensor Plants must be harmed by organic animals. By employing a PIR scanner and sending signals to a fence around the Earth to change critters, we utilise the Motion Sensor to track the formation of animals around the home planet.

It encourages biodiversity growth in a new IoT-based sector. PIR sensors are electronic devices that detect infrared light emitted by objects in the viewing field. The "piezo buzzer" is essentially a little speaker that can be connected to Arduino directly. When you add electricity to some crystals, it causes them to alter shape, which is known as "piezoelectricity". The crystal can generate a sound by employing an electrical signal with the right frequency.

Humidity and soil level analysis

Using the URL, the farmer can see the most recent update. We can assess soil moisture levels in an area using that data to help plants grow plants that are ideal for this soil, such as paddy, or sugarcane, which is equivalent to water-saving soil a low-cost Wi-Fi microchip with both full TCP IP stacks as demonstrated in Figure 1.

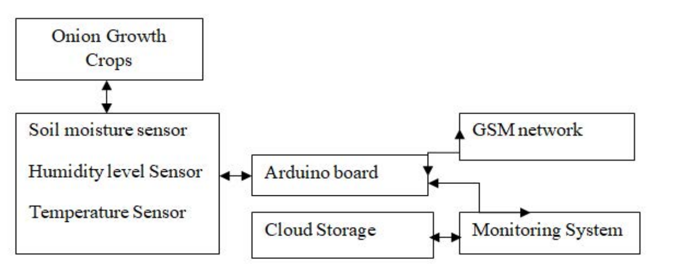

Figure 1) *Block diagram onion growth monitoring system*

The soil moisture sensor is used to measure moisture content in the soil. The Arduino board receives a signal because the humidity level is low. When the humidity level is low enough for the pipe to open, the Arduino board gets a signal from the sensor and shows it on the LCD screen. It provides a signal to the pump so that it can pump itself. When the ground moisture level reaches a certain level, the pump will automatically switch on; the PIR sensor measures the animal's temperature to some extent when animals surround a field. The terms "node" and "MCU" are combined in the word "NodeMCU" (microcontroller unit).

In broad terms, "NodeMCU" refers to firmware rather than development kits. The 16 × 2 LCD display is a basic display that can be found in a variety of devices and circuits. A 16 × 2 LCD can display up to 16 characters per line, and there are two lines in total. Each letter is presented in a 5 × 7 pixel matrix on this LCD. The Arduino board receives a signal from the PIR sensor. The Arduino board detects the PIR sensor and displays Animals Receive Alarm on the LCD screen before sending a signal to the transmission indicated in Figure 2.

Figure 2) *Cultivation of onion growth monitoring system*

The transfer is made automatically from the field's buzzer. The temperature of the pyroelectric substance is always changing due to infrared radiation, resulting in a constant signal, showing that the Buzzer is visible on the figs dwellings. The data sheets contain the time of entry, date of entry, soil moisture level, and whether the weather pump was turned on or off. We determine the soil moisture level in a specific area based on these data, as well as how long the pump runs every day, and analyse the energy usage displayed in Figure 3.

Figure 3) *Cultivation of onion growth monitoring system*

RESULTS AND DISCUSSION

The model's performance, as well as its benefits and major characteristics, are presented below. It is critical for farmers who grow onions to be able to implement this technique in their farms. The sensors detect your location and transmit data to the Arduino board. Data is processed by the Arduino Board and shown in the Arduino IDE. The results are also delivered to the GSM module, which uses the GSM network to provide data, data, or values to the farmer.

CONCLUSION

Onion growth monitoring systems based on the Internet of Things are frequently utilised as agricultural endpoints. Farmers will benefit from this because it relieves them of the strain of cultivating and monitoring growth. The sensor can open and close the pump to keep soil moisture levels consistent, making the pump one of the most useful farming tools. The pump is continually irrigated whenever the humidity level falls below the boundary level. The IoT-based system also has a feature that prevents the entry of things or animals that can be found using the sensory land on agricultural land to monitor onion growth using IoT technology. Water shortages are rare, and electricity is used sparingly. The results suggest that the proposed model is faster and more efficient, with shorter simulation duration.

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