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Cloud-based innovative agricultural service platform that makes use of LoRa

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ABSTRACT

The expeditious growth of the Internet and Internet of Things (IoTs), a variety of useful service applications are being deployed in a variety of industries. Innovative agriculture service system is a new agricultural information and communication Technology (ICT) that was developed in recent years to meet the needs of farmers for data gathering, signal processing, data analysis, and equipment control. This paper presents an innovative agriculture service platform based on LoRa Technology and a wireless sensor network. This study uses LoRa as a network transmission interface to solve the communication challenge while also conserving energy. To assist with environmental monitoring and to improve things, an innovative agriculture service platform tool was designed.

KEYWORDS: LoRa, Innovative Agriculture, Cloud, Wireless Sensors.

1. INTRODUCTION

Many people in our modern world make extensive use of technology, and as a result, they are doing their job soon and well. But still, many rural farmers cannot use technology more people are doing so. In addition, due to an increase in the world population, the need for food is increasing. IOT (Internet of Things) tends to create specific techniques in the meantime to increase food production in agriculture field. The farmers can also get useful information regarding the Ph, moisture, water level and soil requirements. So, we are designing this innovative agriculture service system for them.

Farmers can use this method to check the temperature, humidity, and soil moisture, PH value of their farm, which is done by various IOT sensors like Humidity, Temperature, Soil moisture, as well as control various components, like motor, etc. This system is very easy and simple to use, it works wholly on wireless technology. To use this system the farmer has to place the transmitter module in different places in his field with the assistance of this system, and the receiver is placed in his home. Now, the farmer can monitor and operate the system by the website or mobile application.

As previously said, this system is built using wireless technology, which we are already familiar with wireless protocols like Bluetooth low energy, Wi Fi, and cellular, Many people in our modern world make extensive use of technology, and as a result, they are doing their job soon and well. But still, many rural farmers cannot use technology more people are doing so. In addition, due to

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2. LITERATURE SURVEY

According to D. Davcev, et al. LoRa WAN can achieve data transmission from range of 2-5km in urban areas and in rural areas it transmits up to 15km. LoRa WAN follows the star topology while the ZigBee follows mesh network topology doesn't require any additional routers, which decrease the network cost and complexity.

Yi-Wei Ma1 and Jiann-Liang Chen2 [2]. The work intelligent agriculture platform was used to collect, send environmental data in remote areas was implemented in 2018 and transmits data to remote computers through the LoRa for analysis and decision-making, various sensors and equipment controls are used. In this work, experimental measurements are made to be determine sensor accuracy, select sensors for intelligent agriculture. A multi sensor component is installed as well as integrated communications network. To support intelligent agriculture system wireless sensor networks and network communication technology are deployed.

3. EXISTING METHOD

Santosh Kumar have discussed the development of the WSN system for Precision farming using the Zigbee wireless sensor network. Zigbee is a wireless technology based on standards that allows for low-cost, low-power wireless M2M and internet of things (IoT) networks. Zigbee is a wireless communication protocol with modestdata and low power consumption. This allows for the combining of implementations from different manufacturers in theory, but in practice, sellers have enlarged and personalized ZigBee devices, resulting in interoperability concerns. Unlike Wi-Fi networks, which used to avoid hub devices and establish a networking protocol, create a self-healing architecture, Zigbee networks have far lower data rates and use a mesh networking protocol in order to neglect hub devices and make a self-healing architecture.

Santosh Kumar and R.Y Uday Kumar have proposed a WSN node based on the ZIGBEE wireless sensor network for precision agriculture. In this model, at the transmitting side, the Microcontroller and ZIGBEE transceiver is power by the external power supply and for microcontroller different type of sensors are connected. The microprocessor controls and collects all sensor data, which is then wirelessly sent using the ZIGBEE transceiver. At the receiving side, another microcontroller and the ZIGBEE transceiver are present, it will receive the sensed data and use for the personal computer. They've employed WSN as a ZIGBEE, using frequencies of 868MHz, 902-928 MHz, and 2.4 GHz to communicate at speeds of up to 250kbps over distances of up to 50 meters.

4. PROPOSED METHOD

Cycleo of Grenoble patented and developed LoRa, an enhanced data communication system in wireless technology, which was eventually taken up by Semtech (Zourmand). Spread spectrum modulation technology is used, Chrip spread spectrum technology is responsible for this. This technology, which combines the advantages of a low-power area network and a wide- area network, is intended to connect wirelessly to the Internet of Things while also delivering end-to-end localization services. In any wirelessly transferred data, security is a big concern module. A unique 128-bit network session and application session provides the security between end device to application and networkserver.

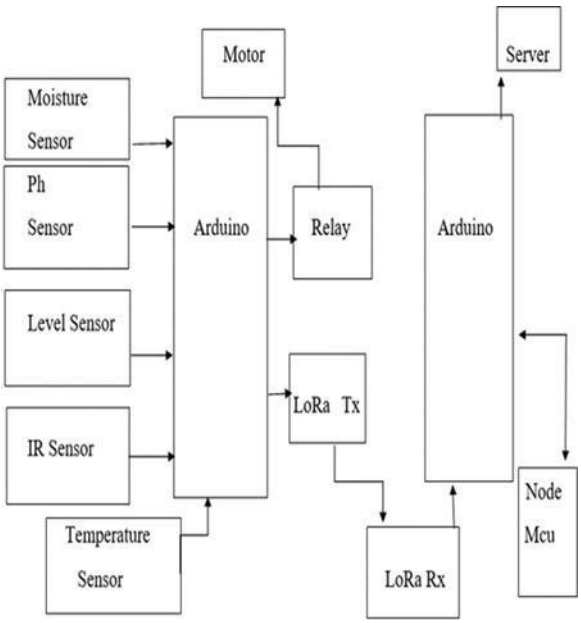


Figure 1: Block Diagram of The Proposed Method

DHT SENSOR:

The DHT sensor comes up with an easy and economical way to obtain temperature and humidity values with the Arduino. The wiring is straight forward: simply connect the DHT data pin to the Arduino digital pin [19].

PH SENSOR:

A Ph sensor is one of the most important tools for water testing. This sort of sensor can detect alkalinity and acidity levels in water and other liquids**.** If Ph value is more than 7 then it represents the water as acidic

Pure water has a Ph level of 7. Any number of 7 are more likely equals to the alkaline.

ARDUINO UNO:

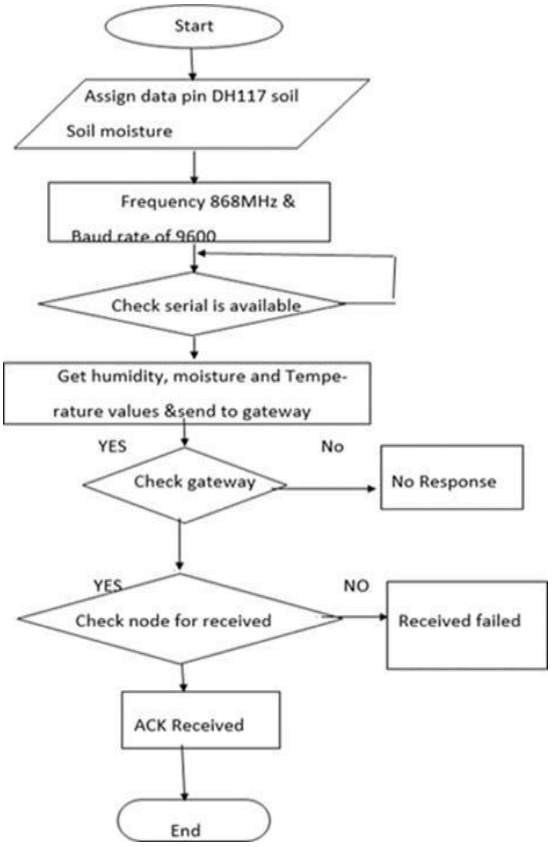
Innovative Agriculture Service System is combination of both hardware and software tools. Embedded systems are included in the hardware, and the software program is created using the Arduino IDE. The sensors used in this are temperature sensor and humidity sensor, Ph sensor and soil moisture sensor.

LORA:

Long range, low power wireless characteristics of LoRa Technology enable the deployment of low-cost sensors to transport data from the farm to the cloud, where it can be analyzed to optimize operations.

NODEMCU:

The ESP8266 Wi-Fi Module chip is a low-cost Wi-Fi Module that may be programmed to connect to the internet. Normal Electrical and mechanical devices cannot connect to the internet on their own because they lack the necessary infrastructure.



FLOW CHART:

5. RESULTS

In this method multiple readings were taken over a period of 'n' number of days in order to construct graphs. The sensor data were collected and with the refresh, the data is constantly updated in the cloud at the rate of 30s. Below figure shows the graph of humidity, soil moisture readings at different environmental conditions over the surroundings. It determines whether or not the sensors are operational. And it includes all non-zero readings, i.e. The temperature and humidity sensor work continuously. The graph below depicts the temperature variation gathered from field sensors.

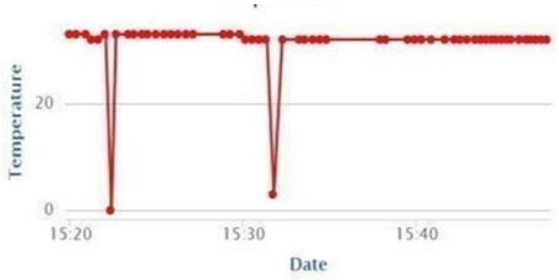


FIG 5.1 Temperature Graph illustration

FIG 5.2 Humidity Graph illustration

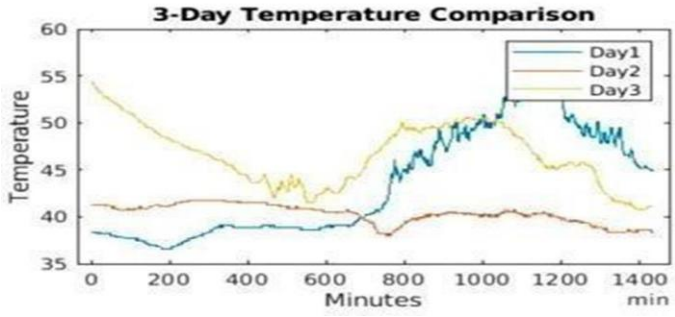


FIG 5.3 Temperature Comparison Graph illustration

6. CONCLUSION

Monitoring the information regarding soil moisture, temperature, Ph and humidity is very critical for farmers to produce greater yield and controlling various components like motor (LED), etc. For that motive, wireless technology is required. There is much wireless technology available in the market right now, but apart from them, LoRa technology is very useful in the agriculture sector because it does not require more power and internet to connect. Further, it was also possible to connect to the internet from a longer distance. By using this design technology, every farmer can place the transmitter at the different places in the field whereas the information generated by them are collected with the help of the receiver. Now farmers can observe this collected information via the website and an Android application.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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