IOT Based Wireless Data Technology Using LORA and GSM

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Abstract. Traditional agriculture is converting into smart agriculture due to the bulge of the IoT (Internet of things). An agriculture services platform is developed to support environmental monitoring and to improve the efficiency of agriculture management. Contemporary the Internet of things (IoT) is one of the highest promising application areas in information technology for forthcoming products and services. And, the agriculture field is changing expeditiously pointing to the future of automated and embedded systems with a bunch of sensors to monitor and curb the flourishing plants in a way to profit associated with it. However, one of the major issues of IoT is still a conversion between devices, notably on long-range. LoRa is lately accepted as auspicious communication technology, due to its properties such as long-range, two-way communication, and low cost. In this work, the LoRa technology is applied in the agriculture sector for making long-distance, low-cost communication. This work includes sensing and monitoring the parameters such as level, temperature, and humidity and also controlling the said parameters with the help of a remote unit. The proposed system is based on a high-performance microcontroller, integrated temperature and humidity sensor on real-time data analysis. The use of Data collection, pattern classification and apply strategic analysis then control execution for the final result.

Keywords: IoT, LoRa , Wi-fi, GSM

1. Introduction

Because of the rapid expansion of the Internet and the Internet of Things (IoTs), a variety of useful service applications are now being employed in a variety of industries. Smart agriculture is a new agricultural information and communication technology that was developed in recent years to suit the needs of farmers for data gathering, signal processing, data analysis, and equipment control. This paper presents a wireless sensor network and LoRa communication technology-based agricultural service platform [1,2]. To overcome the problem of communication failure and save energy, the work employs LoRa as a network transmission interface. To support environmental monitoring and increase farm management efficiency, a smart agriculture service platform is being created [3].

The purpose of this paper is to incorporate Internet of Things (IoT) awareness and communication technology into a smart agriculture platform [4]. Sensors of diverse types have their accuracies measured, and these sensors are then merged into a multi-function sensor component. Then, multi-functional sensor components and LoRa wireless network components are combined [5]. The goal of this work is to design and build a smart sensor network platform for agricultural applications.
Many people in our modern world make extensive use of technology, and as a result, they complete their tasks quickly and effectively. However, many rural farmers are still unable to use technology. In addition, due to an increase in the world population, the need for food is increasing. At the time, IoT (Internet of Things) was tending to create particular agricultural approaches in order to boost food output. Farmers can also acquire helpful information about moisture and soil requirements, among other things. As a result, we're putting in place this smart agricultural system for them. Farmers can use this system to check the temperature, humidity, and soil moisture of their farm, which is done using various IOT sensors such as DHT and soil moisture, as well as regulate various components such as motors, and so on. This system is incredibly straightforward to use and operates entirely on wireless technology. To use this system, the farmer must install transmitter modules at various locations throughout his field, as well as a receiver in his home that is connected to the server. The farmer can now use the internet or a mobile application to monitor and control the system. As previously stated, this system is built utilising wireless technology, and we currently have a

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number of wireless protocols such as BLE (Bluetooth Low Energy), Wi-Fi, and cellular, among others. However, these technologies are not appropriate for IoT sensor nodes, which must broadcast data over a long distance while utilising little power and at a cheap cost [6,7]. Apart from that, LoRa technology is quite important in agriculture. That's why we're relying on LoRa technology, which allows us to send data or information across vast distances at a low cost and without the need for an internet connection. Long Range is the abbreviation for LoRa [8]. LoRa is a wireless technology that transmits data in both ways over great distances. LoRa typically has a range of 15 to 20 kilometres and may operate for a year on a single charge. In India, the LoRa Technology licencing frequency band is 865 MHz to 867 MHz[9].

2. METHODOLOGY

Agricultural data is currently collected using a variety of sensors, including soil moisture, light intensity, and air temperature and humidity. However, because such sensors lack an integrated computing platform, they can only perform environmental monitoring and data collecting; as a result, the data collected cannot be efficiently exploited or processed. An agricultural intelligence platform is being investigated and developed to overcome this challenge. The objective of this work is to create a smart agricultural platform that combines communication and multi-functional sensing. The intelligent agriculture platform may be used to collect environmental data in agricultural areas and communicate it to remote computers using LoRa or another IoT strategy, such as sending data over the internet.
The goal of a smart agricultural system that uses LoRa wireless technology is to monitor and regulate the field's temperature, humidity, moisture, and motor via a website and an Android mobile application that uses GSM technology. Without an internet connection, field data will be transmitted using LoRa technology.

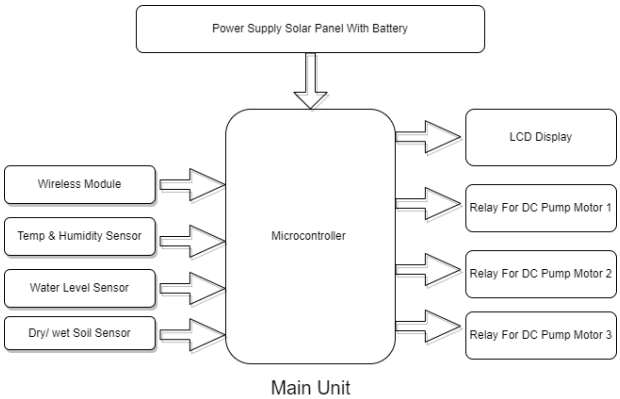

Fig. 1. Block diagram of the main unit

The main device, which includes a microprocessor, power supply solar panel with battery, wireless module ie lora RA-02, temperature and humidity sensor, water level sensor, dry and wet soil sensor, and temperature and humidity sensor. On the main unit, we've also attached a lcd display, three relays, and a dc motor pump. We attached a wireless module, the LORA RA-02, switches, and a microcontroller to the remote control unit. GSM MODULE 800I, battery, lcd display, buzzer, and led The LORA RA-02 is a wireless data monitoring and control device.

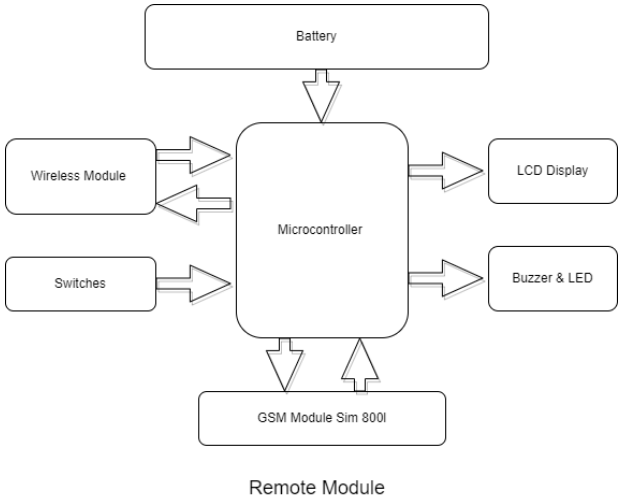

Fig. 2. Block diagram of remote module

The design is split into two parts: the main unit and the remote unit.
The major goal of the initiative is to make agricultural production easier.
Farmers can handle their agricultural fields in remote places where there is a lack of power and energy with the help of this concept. The major goal of this paper is to make farming easier at a low cost and to make the process work without the use of electricity.
Manpower is being conserved.
Quality and efficiency have both improved.
Working in a hostile atmosphere is a must. As the temperature of the field rises, the relay will activate and display the value on the LCD screen; motor 1 will activate and sprinkle water, lowering the temperature value.
The motor, relay, and buzzer light will switch on when the water level in the sensor falls below a specified level. In order to fill the tank to the desired level, the motor will deliver water to the field. When the dry wet soil sensor determines that there is insufficient water in the soil, motor 3 is activated and water is supplied to the soil.

The LORA RA-02 will be installed on the main unit as well as the remote unit.

3. EXPERIMENTAL SETUP

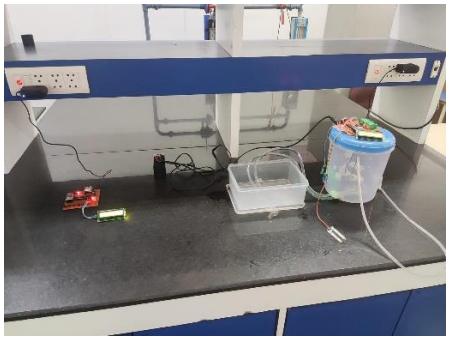

Fig. 3(a) Setup of IoT based wireless data technology using LoRa and GSM

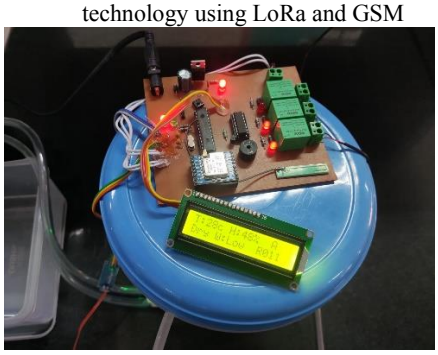

Fig.3(b) Controller Unit

The controller unit includes a microprocessor, power supply, battery, wireless module ie lora RA-02, temperature and humidity sensor, water level sensor, dry and wet soil sensor, and temperature and humidity sensor as shown in figure 3(b). On the main unit, we've also attached a lcd display, three relays, and a dc motor pump. We attached a wireless module, the LORA RA-02, switches, and a microcontroller to the remote control unit. GSM MODULE 800I, battery, lcd display, buzzer, and led The LORA RA-02 is a wireless data monitoring and control device.

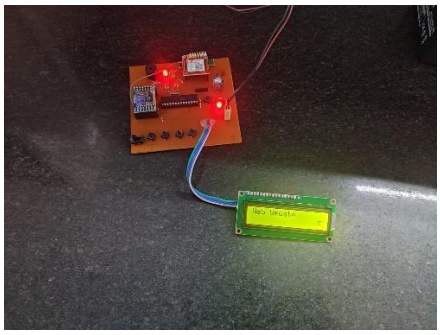

Fig.3(c) Remote unit

The remote unit consist of LORA RA-02, microcontroller, GSM module 800I, LCD Display, 4 Switches to control the system in manual mode as shown in figure 3(c). Also, there is a switch connected for the real data to be uploaded on the web page.

The design is split into two parts: the main unit and the remote unit. The major goal of the initiative is to make agricultural production easier. Farmers can handle their agricultural fields in remote places where there is a lack of power and energy with the help of this concept. The major goal of this paper is to make farming easier at a low cost and to make the process work without the use of electricity. Manpower is being conserved. Quality and efficiency have both improved. Working in a hostile atmosphere is a must. As the temperature of the field rises, the relay will activate and display the value on the LCD screen; motor 1 will activate and sprinkle water, lowering the temperature value. The motor, relay, and buzzer light will switch on when the water level in the sensor falls below a specified level. In order to fill the tank to the desired level, the motor will deliver water to the field. When the dry wet soil sensor determines that there is insufficient water in the soil, motor 3 is activated and water is supplied to the soil. The LORA RA-02 will be installed on the main unit as well as the remote unit.

The farmer will be able to control the field using a remote module and a GSM SIM 800I. In the main unit there is a switch for auto mode and manual mode if the farmer turn on the manual mode he can control and analys the real time data within 1km of range. As we can see, there are buttons on the website for mannual and auto mode; in auto mode, we can see the live status of our project; in manual mode, if the operator is away from the field, he can change the setting to manual mode and control the field; in manual mode, we can see the live status of our project; in manual mode, we can see the live status of our project; in manual mode, we can see the live status of our project; in manual mode, we can see the live status with the help of buttons on the remote control and the web page By upgrading antenna design, the LoRa module has extended its range even farther. For the unique wireless sensor network architecture, the modify web-page design for real-time data analysis. In a different approach, the number of parameters increases as the number of sensors increases, resulting in real-time data with great accuracy.

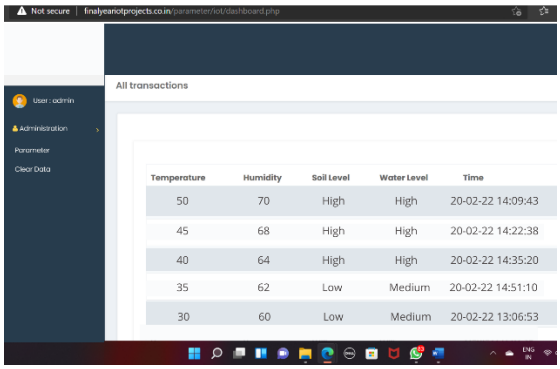

Fig.4(a) Real time data reading

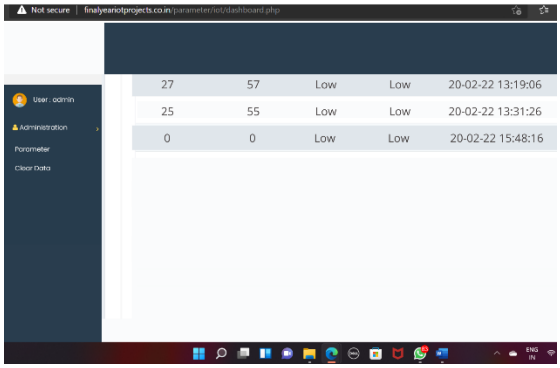

Fig.4(b) Real time data reading

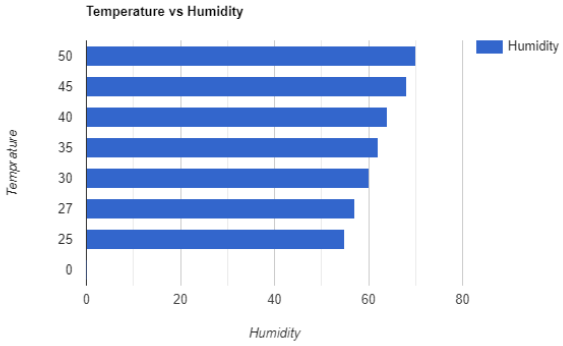

Fig.4(c)Graph of temprature vs humidity

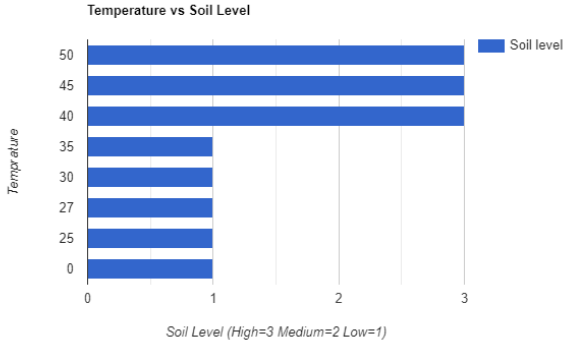

Fig4.(d)Graph of temprature vs Soil level

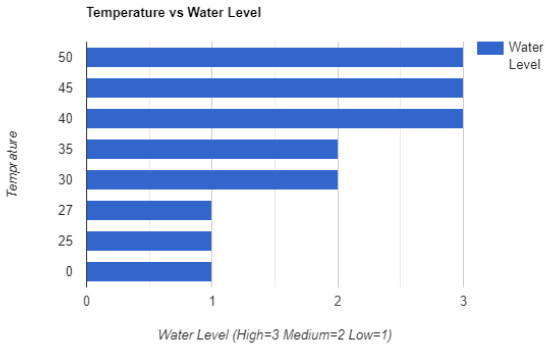

Fig4.(e)Graph of temprature vs water level

Fig5.(a)IoT website

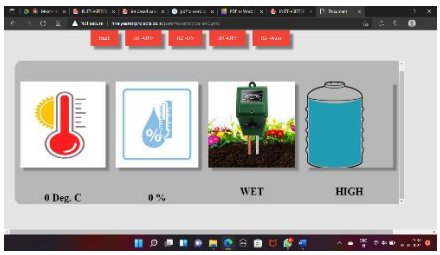

Fig5.(b)Real time data analysis dashboard

4. CONCLUSION

In the proposed work, the LoRa technology is effectively utilised for agriculture application for making long-distance, low-cost communication. The results shows the efficacy of proposed work that includes sensing and monitoring of the parameters such as level, temperature and humidity and also controlling of the said parameters with the help of remote unit. The proposed system is based on a high-performance microcontroller, integrated temperature and humidity sensor on real-time data analysis. The key benefit of the proposed work is that we can control and analyse it with the help of real-time data that will be shown on website. This study can be expanded in the future as more data is collected, resulting in more accurate and exact results through the use of algorithms. For smart monitoring systems, wireless sensor networks offer a lot of potential. WSNs are extremely appealing for smart agricultural systems because of their ability to quickly construct low-cost,

simple end devices that can be deployed in the field.

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