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SENSOR DATA MANGEMENT OF LORAWAN TECHNOLOGY

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ABSTRACT

Water Resource : One of the most important natural resource problems to be paid more attention in the world in 21st Century. This paper is based on LoRaWAN technology for Irrigation System. Water system strategy in conventional agribusiness has low use of water asset. With the advancement of Internet of Things (IoT), Irrigation framework has turned into a recent fad in the field of rural water system. This paper proposes a LoRaWAN based irrigation system. In this framework, the water system hub is for the most part made out of LoRaWAN correspondence module, solenoid valve and hydroelectric generator. The water system hub sends information to cloud through LoRa passages by means of remote transmission. The framework can be controlled distantly by versatile applications. Test results show that both transmission distance and energy utilization in the proposed framework are dependable.

Keywords: LoRaWAN, Irrigation, Logic Gates, Wireless Sensor Network, wireless communication, Low Power, Radio Frequency.

I. INTRODUCTION

IoT technology provides the interconnection of objects which have built-in computing, communication and sensing capabilities. The advancement of the Internet of Things has highly facilitated its implementation in various industries such as smart agriculture, smart city, smart factory, smart healthcare, etc. As one of the important communication technologies of IoT applications, LoRa is a designed specifically for long-range, low-power communications. It is a proprietary radio modulation technology licensed by Semtech Corporation. It provides long-range connectivity by using the chirp spread spectrum technique and can be operated at the ISM frequency band of 433 MHZ, 868 MHZ, and 915 MHZ.

With the rise of IoT, horticulture has progressed toward robotization and intellectualization. Water system framework can use water proficiently, in the accuracy place, at the proper time and in the perfect sum. It can also optimize the electricity consumption and labor costs. However, the irrigation system equipped with GPRS has the problems of high power consumption and high cost of maintenance and deployment. It can also optimize the electricity consumption and labor costs. However, the irrigation system equipped with GPRS has the problems of high power consumption and high cost of maintenance and deployment. On the other hand, the systems use ZigBee or Wi-Fi have the problem of low coverage.

In general, a LoRa Wide Area Network (LoRaWAN) can cover 20 km in rural area and around 8 km in urban area, which can ensure the high coverage of the irrigation system. Because of low power consumption, the LoRa device can operate up to ten years on battery. In the long term, it brings great benefits, such as water-saving, lower costs of maintenance and deployment. Therefore, a water system framework dependent on LoRa innovation is proposed in this paper. It is an incredible answer for these issues referenced previously. The proposed framework is fit for correspondence between water system gadgets and applications through LoRaWAN. The primary expectation of the work is to empower applications to control the water system framework through cloud. Water system hub will send its status data to the door, and these data will be sent to cloud to measure and store. By utilizing cloud Application Programming Interfaces (APIs), applications can send order to control the water system framework. Besides, solenoid valve in water system hub can be charged by a hydroelectric generator. In this way, full utilization of energy can be realized.

II. LITERATURE REVIEW

Recently, wireless sensor networks have been deployed in many applications, which includes agriculture data collection, industrial controlling, logistics management, metrological monitoring and so on. LoRa gives new correspondence answer for remote underground sensor organization. A LoRa engendering testing hub is introduced in this paper. Tests about in-soil LoRa propogation attributes identified with volumetric water content, entombment profundity and payload are tentatively assessed with the testing hub. A few ideas are proposed for LoRa- based Wireless Underground Sensor Network (WUSN) which is applied in soil. Deployment of wireless sensors and sensor networks in agriculture can be a great help in monitoring environment and growing crops and having a network to support those devices is necessary to successfully utilize those resources. Recently, LPWAN have been recognized as an appropriate technology for agriculture use. LoRa is a representative network of LPWAN. It can be applied to IoT for agriculture due to its long range and low power capabilities. Currently most studies have shown LoRa communication capabilities in urban, mountains and maritime areas with little focus on agriculture use cases. Tree cultivating is a drawn out venture, requiring cautious checking to relieve misfortune; hence, this paper gives an investigation about the effect of variation actual layer boundaries on execution of LoRa networks in a nursery. Other than the execution in the brilliant city applications IoT has likewise discovered critical spot in the agrarian and food creation measure. In this paper, an imaginative force effective and profoundly adaptable IoT agrarian framework is introduced. 10This framework depends on LoRaWAN network for long reach and low force utilization information transmission from the sensor hubs to the cloud administrations.

The reference paper is used for this system is :

1) "Design Implementation of LoRa Based Wireless Control for Drip Irrigation Systems" [https://doi.org/10.1109/ICRAE.2017.8291389] In this paper, the solution using LoRa technology for cost effective wireless control of drip irrigation systems has been presented. The system which utilizes LoRa modules to establish reliable radio link has been designed and customized data transfer protocol that stratifies the requirements has been deployed. It is shown that this solution has the advantages over existing LORAWAN protocol in terms of cost complexity for this specific application.

2) The second paper refer for this system is "Design and Implementation of Smart Irrigation System Based on LoRa". [https://doi.org/10.1109/GLOCOMW.2017.8269115] This paper proposes a smart irrigation system based on LoRa technology. In order to validate the excellent execution of the proposed irrigation system, experiments have been carried out. Exploratory outcomes approve the materialness of the proposed framework. Simultaneously, the benefits of LoRa innovation received in keen water system framework have been appeared by tests. The system proposed by us facilitates more efficient, also minimizes the cost of deployment and maintenances. According to the experimental results, the irrigation node equipped with hydroelectric generator can operate up to for decades. The communication distance between the irrigation node and gateway is up to 8 *km*, thus the irrigation system can cover up to 200 hectares. By mobile App, users can control the irrigation system remotely and check the status of system in time. It is believed that adopting LoRa technology to smart irrigation system will significantly simulate development of smart agriculture Of course, we have a lot of follow-up work to do to make the system more intelligent and precise controlling.

3) The Third paper refer for this system is "Design and Implementation of LPWA- Based Air Quality Monitoring System" [https://doi.org/10.1109/ACCESS.2016.2582153] In this paper, implemented an air quality monitoring system by using the advanced IoT techniques in this paper. With the guide of the LPWA organization, the air detecting information over a huge inclusion region is gathered and sent to the IoT cloud on schedule. The gateway checking hubs are produced for simple organization and can work the entire day with a battery or a sun based board. Every one of the elements of the AP are carried out on a GPP-based SDR stage. The detected information are put away in the data set and dissected in the IoT cloud. A lot of investigations have been completed in the metropolitan conditions to approve the dependability of the proposed framework. Some intriguing realities have been uncovered when contrasting the air quality pattern and other comparable information. It is accepted that long haul and huge scope air observing can significantly assist us with

understanding air contamination and figure out how to tackle the issue of air contamination at any rate part of the way.

4) The Fourth Paper refer for this system is "An SMDP-Based Resource Allocation in Vehicular Cloud Computing Systems"[https://doi.org/10.1109/TIE.2015.2482119] In this paper we have proposed a computation resource allocation scheme for a Vehicular Distributed computing framework, which is detailed as an infinite skyline Semi-Markov Decision Process (SMDP). An ideal dynamic plan is acquired through the emphasis calculation to augment the drawn out anticipated all out remuneration of the VCC framework. Mathematical outcomes show significant expect reward execution acquire over others, e.g., contrast and Greedy Allocation (GA) conspire, almost 7% execution acquire when either λ p is high or K is low. Besides, the intricacy of the SMDP-based plan is lower than that of the SA conspire.

5) The Fifth Paper refer for this system is "The Internet of Things: a survey"[https://doi.org/10.1016/j.comnet.2010.05.010] The Internet has changed drastically the way we live, moving interactions between people at a virtual level in several contexts spanning from the professional life to social relationships. The IoT can possibly add another measurement to this interaction by empowering correspondences with and among brilliant articles, consequently prompting the vision of "whenever, anyplace any media, anything" communications In this paper, we have overviewed the main parts of the IoT with accentuation on the thing is being done and what are the issues that require further exploration. In fact, current advances make the IoT idea practical yet don't fit well with the adaptability and effectiveness prerequisites they will confront. We accept that, given the interest appeared by enterprises in the IoT applications, before long resolving such issues will be an incredible driving element for systems administration and correspondence research in both mechanical and scholarly labs.

6) The Six Paper refer for this system is "A Smart Irrigation System in Agriculture with Cloud Support using Internet of Things" [https://dx.doi.org/10.17485/ijst/2018/v11i45/137416] This work was defined with the objectives of helping the farmers through the recent technologies by reducing their burdens, loss and enlarging the yields. In connection with that, the survey of their real problems had been undertaken and listed in the previous sections. The most important problem of the list is considered and it is addressed by the proposed smart water irrigation system for the high yield process. Though many sensors used the installation cost of the developed technology should be less. It is also been addressed. As the outcome of this work, it can support the farmer needs 100%, secure them from the loss, with cost less and gain more.

III. METHODOLOGY

Description :

Title of our paper is Sensor Data Management of LoRaWAN Technology. This paper is based on LoRaWAN Technology is used for Irrigation System. In our paper we are using the LoRaWAN module as transmitter side and as receiver side. LoRaWAN module will help to transfer data from field to farmer. Farmers are unable to monitor their farms from distance. They need to visit farm every time to monitor water level if it is proper or not for that particular crop. This paper will help them monitor the quality of their land require for their crop is present or not. There won't be any need to physically monitor water level of farm this paper will help farmers to do it.

For transferring data We are using LoRaWAN module to transfer data, Soil moisture sensors to check water level of farm, temperature and humidity sensor to monitor temperature and humidity whereas we will use relay to switch On / Off solenoid valve.

we are using soil moisture sensors to sense the moisture of soil continuously. According to data from soil moisture sensors, water motors will work automatically. Water motor will operate with the help of a relay. We are using a relay as an automatic switch. DHT11 sensor will monitor the temperature and humidity of our surrounding continuously. Data of soil moisture sensor and DHT11 will be sent to receiver module of LoRaWAN module to farmer. LoRaWAN transmitter module will collect all this data and will send it to receiver module which will be with farmer so that he can get instant update of farm.

Proposed work and Objectives:

We are using LoRaWan module to transfer data, Soil moisture sensors to check water level of farm, temperature and humidity sensor to monitor temperature and humidity whereas we will use relay to switch On

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/ Off solenoid valve.

Soil moisture sensor will continuously monitor the moisture of soil and switch on and off solenoid valve accordingly. LoRaWan transmitter module will collect all this data and will send it to receiver module which will be with farmer so that he can get instant update of farm.

Objective :

To design system that will allow farmers to monitor their farm from distance of 5km to 7 km (rural area) and 2km to 3 km (city area).

IV. MODELING AND ANALYSIS

Proposed System Architecture :

LoRaWAN Transmitter Module :

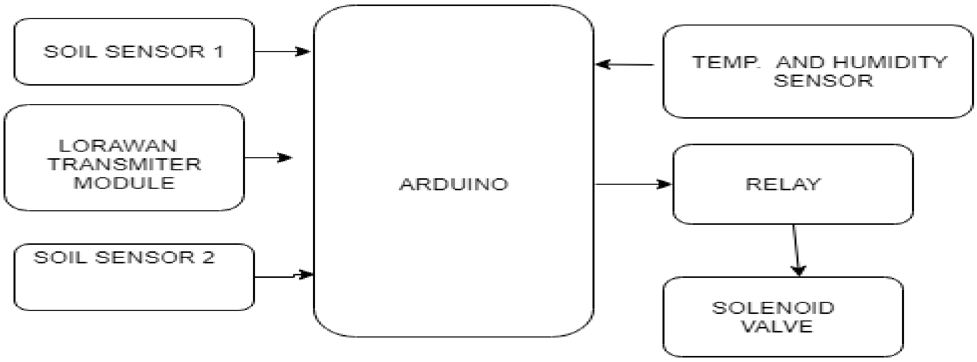


Figure 1: LoRaWAN transmitter Module

Above Figure 1. Shows the block diagram of LoRaWAN Transmitter Module. This sections consisting blocks are Soil sensor 1, LoRaWAN Transmitter module, Soil sensor 2, Arduino, Temperature and Humidity Sensor, Relay, Solenoid Valve. In Input side 2 soil sensor and LoRawan Transmitter module are connected of Ardunino they check water level, Temperature and Humidity of the farm. According to data relay will ON/OFF Solenoid Valve.

LoRaWAN Receiver Module :

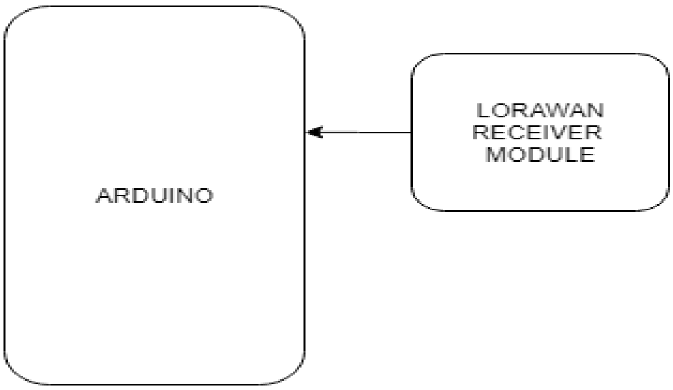


Figure 2: LoRaWAN Receiver Module

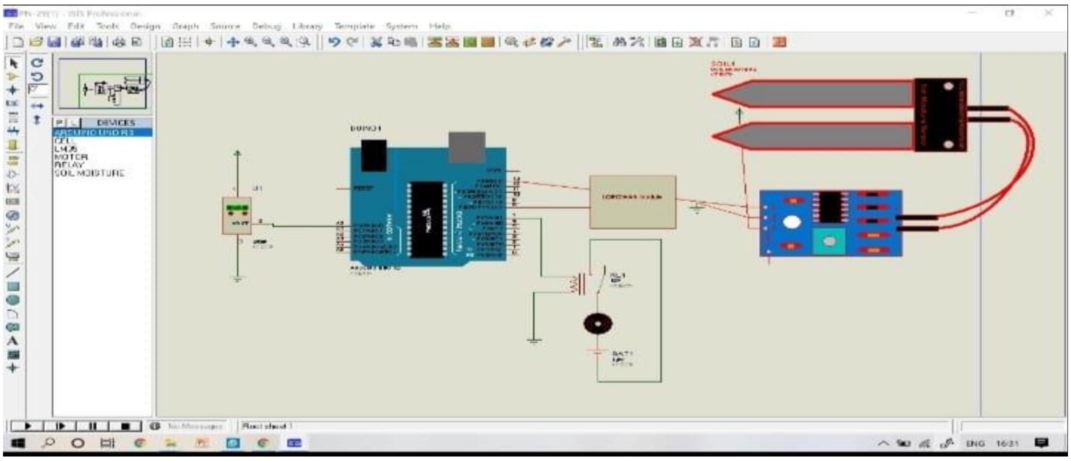
Above Figure 2. Shows LoRaWAN Receiver Module. This Receiving section consists of blocks like Arduino, and LoRaWAN Receiver Module. In the Receiver side Arduino Module are connected to LoRaWAN Receiver Module. LoRaWAN Transmitting module collect all data of the farm and send to the receiver module which will be with farmer so that he can get instant update of farm.

V. RESULTS AND DISCUSSION

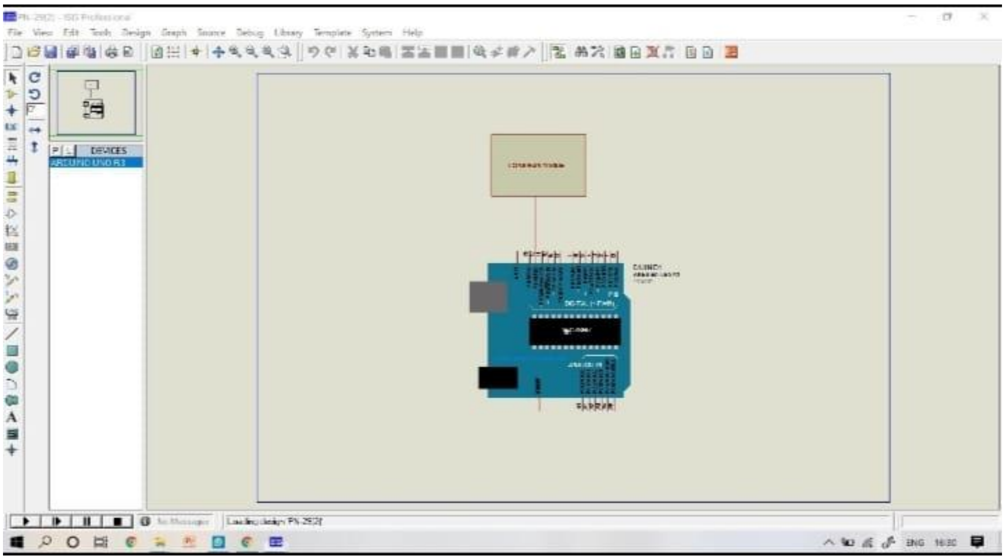
The water system hub sends information to cloud through LoRa doors by means of remote transmission. The framework can be controlled distantly by versatile applications. Exploratory outcomes show that both transmission distance and energy utilization in the proposed framework are dependable.

Simulation Diagram of this system :

1) Simulation Diagram of LoRaWan Transmitter Module :



2) Simulation Diagram of LoraWan Receiveer Module :



APPLICATION

By using the APIs provided by Cloud server, diverse applications can be offered in application part, i.e., web applications, mobile applications developed in Android or iOS platforms. Users can obtain the status of irrigation nodes in the field via application, and can also control the irrigation system by sending control commands through applications.

VI. CONCLUSION

The practice of smart agriculture using LoRa to LoRaWAN network. There are two LSN50 nodes, one at transmitter and the other at receiver. Node at transmitter is equipped with variety of sensors that collect and transmit data to our cloud services, while node at receiver is equipped with actuators for controlling the technology enhances the former methods of collecting and analyzing data in the agro environmental system. By leveraging LoRa technology and LoRaWAN protocol, agribusiness can digitally monitor, analyze and monitor every aspect of their business. LoRa automatic sprinklers, turn on/off the valve, etc... technology provides a solid platform for the When a command is send through TTN network, the LSN50 node gets the data from the sensors which can be seen through TTN and the future of smart agriculture as it is easy to deploy and helps farmers to grow their business.

VII. REFERENCES

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