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AGRICULTURE IRRIGATION WATER DEMAND FORECASTING USING LORA TECHNOLOGY

N. Ashika Barveen Nisa[1], K. Priyadharshini[2], K. Priyadharshini[3], R. Nandhini Devi[4]

[1,2,3,4]UG Scholar, Dept. of Electronics and Communication Engineering, Panimalar Engineering College, Chennai-600123, Tamil Nadu, India

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Abstract - *Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. It has to support almost 17 per cent of world population from 2.3 per cent of world geographical area and 4.2 per cent of world's water resources. The economic reforms, initiated in the country during the early 1990s, have put the economy on a higher growth trajectory. Annual growth rate in GDP has accelerated from below 6 percent during the initial years of reforms to more than 8 percent in recent years. This happened mainly due to rapid growth in non-agriculture sector. India is an agricultural country, wherein about 70% of the population depends on agriculture. Farmers have wide range of diversity to select suitable fruits and vegetables crops. However, the cultivation of these crops for optimum yield and quality produce is highly technical. Watering the plant is the most important cultural practice and one of the labour intensive tasks in daily greenhouse operation. Watering systems ease the burden of getting water to plants when they need it. Knowing when and how much to water is two important aspects of watering process. To make the gardener works easily, the irrigation watering system is created. Normally, the plants need to be watered twice daily, morning and evening. For example, the microcontroller has to be coded to water the plants in the garden or farms about two times per day. People enjoy plants, their benefits and the feeling related to nurturing them. It can be improved by the aid of technological support like LoRa. The management of irrigation can be improved using automatic watering system. A system that will help a farmer to know his field status in his home.*

Key Words*: *LoRa, irrigation,* GDP *(Gross Domestic Product), intensive, technology.

1. INTRODUCTION

Micro Irrigation is an artificial supplying of water to the root of plant. Irrigation has been used to assist in the growing of agricultural crops, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. In crop production, irrigation helps in protecting plants against frost, suppressing weed growth in grain fields and preventing soil consolidation.

Irrigation systems are also used for dust suppression, disposal of sewage, and in mining. The old method used for irrigation was the use of watering cans, water channels that have to be opened and closed manually or backpack sprinklers. In this case, a lot of water is wasted in the process. There is need for improvement on the existing or old forms of irrigation. An automated irrigation system needs to be developed to optimize water use for agricultural crops. An intelligent automatic irrigation system has to have all the components that autonomously monitor and control the level of water available to the plants without any failure or human intervention.

In current generation most of the countries do not have sufficient human factor in agricultural sector and it affects the growth of developing countries.

So it's time to automate the sector to overcome this problem. In India, there are 70% people dependent on agriculture.

This system is mainly based on minimizing man power and cost of the equipment, which can be affordable to all farmers.

2. EXISTING SYSTEM

In earlier system, the soil level moisture and various factors are measured manually by the human. The human should check the condition of the farm and they want to on/off the motor manually to irrigate the field. The water level in the tank will be monitored by human and every time he need to switch on the motor to fill the water tank.

The automation for the irrigation system also have the problem of data transmission over a long distance. The data transmission through WiFi and other Radio communication device transmit for a particular range.

3. PROPOSED SYSTEM

In this paper, we are designing the agricultural autonomous system which will sense the conditions in real time and analyse the field parameters such as, Temperature, soil Moisture.

The soil moisture sensor will monitor moisture level and temperature sensor will monitor temperature level. These data will be given to the controller unit.

The controller unit will receive the data and transmits the data to the receiver through LoRa. Once the controller receives the signal, it generates an output that drives a relay for operating the water pump by using DC motor.

Fig1: LoRa in Agriculture

An LCD display is also interfaced to the controller to display status of the soil and temperature. A buzzer is used to indicate the farmer about water requirement and a water pump is used to pump the water. Once the water pump is switched ON, it will be monitored using a water level indicator. To irrigate the crop at the correct time this system has been implemented.

Fig2: Block diagram of transmitter side

At the transmitter side, the soil moisture and temperature of the soil is measured using sensors and it is processed using aurduino. The processed data are transmitted to the user side via LoRa technology. LoRa also receives the information from the user and provide it to the controller. The controller makes the water pump to pump the water to the land. The water level is measured using a water level indicator. Once the water level is increased beyond the limit, the motor automatically turns OFF.

Fig3: Block diagram of receiver side

On the receiver side an LCD is used to display the temperature and water level. The buzzer is used to indicate that the agricultural land is dry. The Irrigation system can also be controlled manually by using switches. There are totally four switches to select the temperature, increment, decrement and exit.

3.1 LoRa Technology

The SX1278 transceivers feature the LoRa long range modem that provides ultra-long range spread spectrum communication and high interference immunity whilst minimizing current consumption. LoRa uses Spread spectrum technology for modulation. Using this data can be transmitted up to 20 km.

Lore is a proprietary chirp spread spectrum radio modulation technique for use in a low-power wide-area network (LPWAN). It is a WAN specification designed to enable long-range, low-bit-rate communication among “things” (i.e., connected objects) such as a battery - powered sensors, and it uses license-free, sub-GHz radio-frequency bands such as 196, 433, and 868 MHz in Europe and 915 MHz in North America. An LPWAN may be used to create a private wireless sensor network or a third-party service or infrastructure.

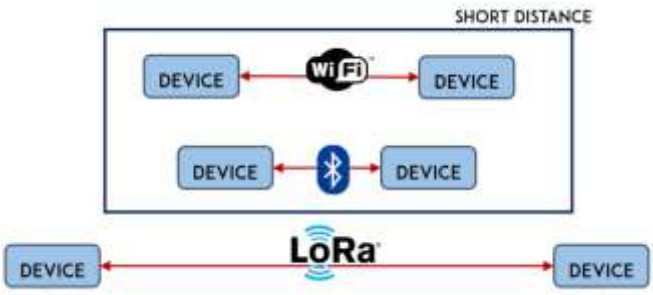

Fig4: Example of LoRa range

Table 1. LoRa coverage

s.no	Type of living area	Coverage of LoRa SX-1278
1	Urban area	5 km
2	Sub urban area	15 km

SX-11278 operates in the free ISM band of 433 MHZ with 125 KHZ of Bandwidth. It follows IEEE 802.15.4 protocol standard. The data rate is up to 50 kbps.

3. CONCLUSION

The system uses a moisture sensor to observe the moisture level, which increases further accuracy of the system as it identifies the moisture level very accurately than human. The system also observes different environmental conditions such as humidity, soil moisture and temperature, which human cannot measure accurately by open eyes to decide the plant health so the accuracy of the system is high. It also involves watering mechanism which reduces human labor and reduces labor further by modifying the system further for other agricultural work such as picking, harvesting, weeding. Using this method, the irrigation system is automated and can be controlled from a long distance. Future enhancement can be done to increase the range of coverage to control the irrigation system across the world. This proposal focuses on future agriculture method, i.e. people from the city can also look after the agriculture in their busy life.

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