ISSN No:-2456-2165

Automation in Agriculture using Lora Modules

Nalawade Chaitrali vinay, Abhang Nikhil Madhukar, Takale Avinash Tanaji, Kharat Akshay Rohidas
Dept. of E&TC S. B. Patil College of Engineering
Indapur, India

Abstract:- The world over the decades has made considerable advancements in automation, automation is employed in every sector whether it is home or industry. Here a new and inexpensive design is being presented. The deployment of Automation in agriculture systems has been prevailing over the last few decades and it poses many difficulties to manual control them once they are installed on a large scale. A common approach to overcoming this issue is setting up a Long-Range network (LoRa). However, using wireless technologies in the field of agriculture presents several technical challenges, such as achieving long battery life, long-range capabilities as well as low cost at the same time. In recent years, many technologies and protocols have been deployed trying to overcome those challenges It implies that LoRa is lately accepted as auspicious communication technology, due to its properties such as long-range, two-way communication, and with low cost. It is stated that the communication distance of LoRa is up to 10 km [1], but it is not clear what measure does. The communication distance is affected by the environmental conditions, parameters of devices, etc. Here we merge the LoRa WSN technology in the agriculture sector for making long-distance, low-cost communication. The project that is described in this paper includes the implementation results of both hardware and software for the wireless nodes, and the development of a GUI app for controlling drip irrigation systems.

Keywords:- *component; LORA module; Smart Farming; Efficiency; Productivity; Automation;*

I. INTRODUCTION

In our modern world, many people are making full use of technology, and because of that, they are doing their job soon and well. But still, many rural farmers cannot have more knowledge technology more. Also, the demand for food supply is increasing. So we are performing this smart agricultural system for them. With the help of this system, farmers can examine the temperature, humidity soil moisture of their farm, which is done by various IOT sensors like DHT, Soil moisture, as well as control various components, like motor, etc. This system is very easy and simple to use, it works fully on IOT. To use this system the farmer has to place the transmitter module in different places in his field and the receiver is put in his home and connected to the server. Now, the farmer can monitor and control the system by the website or mobile application. Term LoRa means Long Range. It's a wireless radio frequency technology introduced by Sentech.The license frequency band for LoRa Technology in India is 865 MHz to 867 MHz 1 In wireless technology solution, BLE works with low power, but cannot send information to long distances.

II. LITERATURE SURVEY

In the last few years, researchers have shown a great interest in smart agriculture, WSN (wireless sensor network), and also in the area of LoRa technology. Many researchers used ZigBee and other WSN technology for field data monitoring. This chapter briefly discusses the related research work carried out by different researchers in the area of smart agriculture, and WSN. In paper iot based smart crop field monitoring and automation irrigation the main advantage of this work is crop development at low quantity water consumption. Disadvantage of this is risk of file corruption high cost of Raspberry pi and software problems. In paper iot based smart agriculture system advantage is send suggestion via sms to the farmer directly using gsm system and disadvantage is continuous internet connection is required. In paper development of wsn system for precision agriculture advantage is zigbee technology used and disadvantage is transmission rate is too much low. In paper iot for precision agriculture application advantage is communication through wifi gives more efficiency than Bluetooth and disadvantage is wifi has short range communication over LoRa Module.

III. BLOCK DIAGRAM

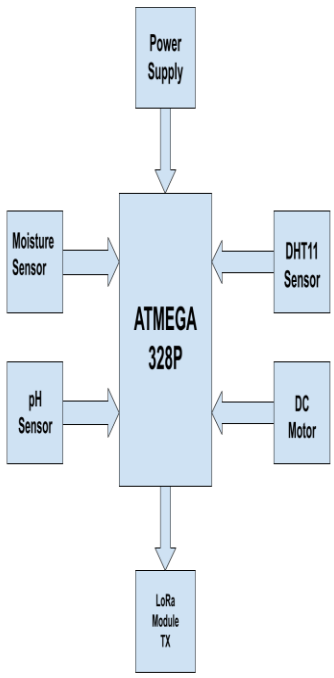

Fig. 1: block diagram of the transmitter

ISSN No:-2456-2165

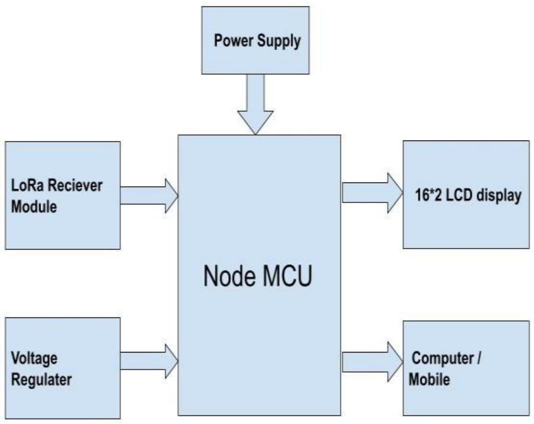

Fig. 2: Block diagram of Receiver

A. *DESCRIPTION OF BLOCK DIAGRAM*

In Fig 2.1 A) block diagram of a transmitter, there we use the ATMEGA328P i.e., Arduino UNO development board which is the main component of the transmitter side. Arduino UNO is interfacing with different sensors like soil moisture sensor, DHT 11 sensor, and pH sensor. It is also interfacing with the LoRa transmission Module to send the data for long-distance communication up to 10 KM. we are giving an external power supply to the development board.

In Fig 2.2 B) block diagram of the receiver side, at the receiver end we are using Node MCU (ESP8266 Wi-Fi module). Node MCU is interfacing with the LoRa receiver module to receive the data coming from the transmitting side and it will provide to a user for the displaying of data we are using Liquid Crystal Display (LCD). It also provides the data to the user's mobile through Wi-Fi. A voltage regulator is used for regulating the voltage.

IV. SYSTEM DEVELOPMENT

A. *LORA Module*

Fig. 3: LORA Module

The LoRa SX1278 RA02 works with SPI communication protocol so it can be used with any micro microcontroller that supports SPI communication protocol. It is mandatory to use an antenna along with the module else it might damage the module permanently. The module should be powered only with 3.3V, and the operating voltage is 3.3V, and the frequency is 433 MHz and transmits and receives packets up to 256 bytes [1]. Here we are not legally allowed to use the 433MHz frequency module for a long time other than for educational purposes [1].

B. *ARDUINO UNO*

Fig. 4: ARDUINO UNO

Arduino uno has several input and output pins. From this pins it is Interfaced with various boards as well as ic. Arduino Uno is used for to interface with the other sensor collect the data from sensor and store it.the board has also one reset button that helps to restart the program using the board.

C. *NODE MCU (ESP8266 WIFI MODULE)*

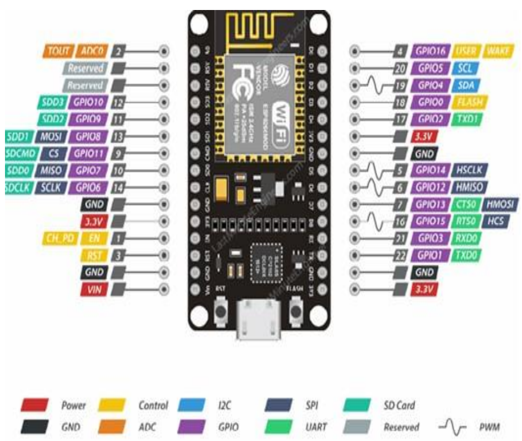

Fig. 5: NODE MCU (ESP8266 Wi-Fi Module)

ESP8266 is a low-cost, WiFi Module chip that can be configured to connect to the Internet for the Internet of Things(IoT) and similar technology projects Basically, Your normal Electrical and Mechanical equipment cannot to the internet on their own, because they don’t have the in-built set up to do so [5].

ISSN No:-2456-2165

D. MOISTURE SENSOR

Fig. 6: Moisture Sensor

The soil moisture sensor is basically used to measure the content of water present in the soil. This consists of two conducting probes that act as a probe. The sensor can measure the moisture content in the soil, based on the change in resistance between the two conducting plates[21].

E. DHT 11

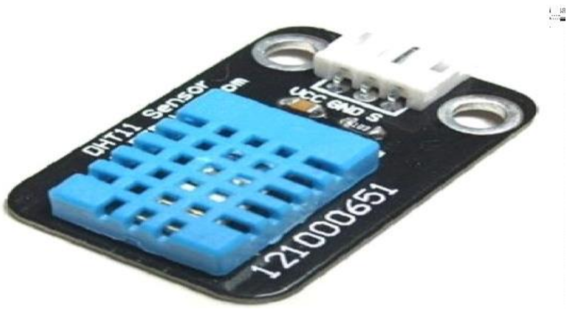

Fig. 7: DHT11 Sensor

The DHT provides an easy and inexpensive way to get temperature and humidity measurements with the Arduino. The wiring is very simple – you just need to connect the DHT data pin to Arduino digital pin [2].

F. LCD (LIQUID CRYSTAL DISPLAY)

Fig. 8: LCD(Liquid Crystal Osillator)

LCD is liquified crystal display. Here in this project LCD is used to display the outputs of the various sensors. Which is collected from various sensors.It is used to display the day, real-time, as well as alarm timings. The time is show in the HH: MM format.

Fig. 9: pH Sensor

The nutrients are essential for plant as well as human growth so the quality of water plays an important role. If the quality of water is not good then it will affect the body of human and plant. So, the quality water should be measured for that pH sensor is used. The main principle of pH sensor is to detect the H+ content in water, with good selectivity and stability. pH sensor works on 12v dc supply and 0-50ºC temperature range.

V. OFTWARE DEVELOPMENT

A. Flow Chart

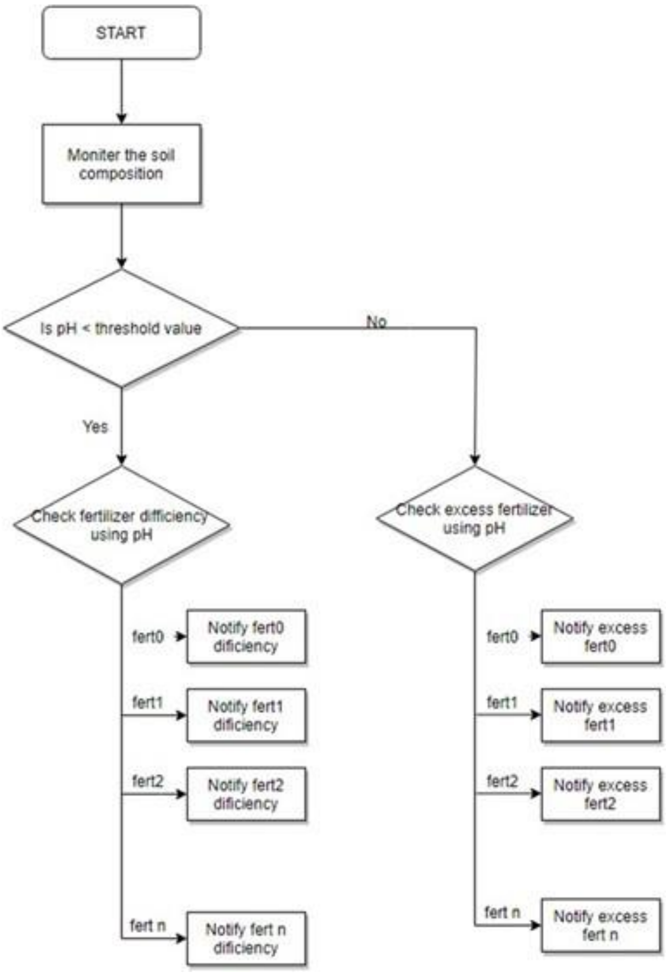

Fig. 10: Flow chart For soil Testing

B. Flow Chart For Irrigation

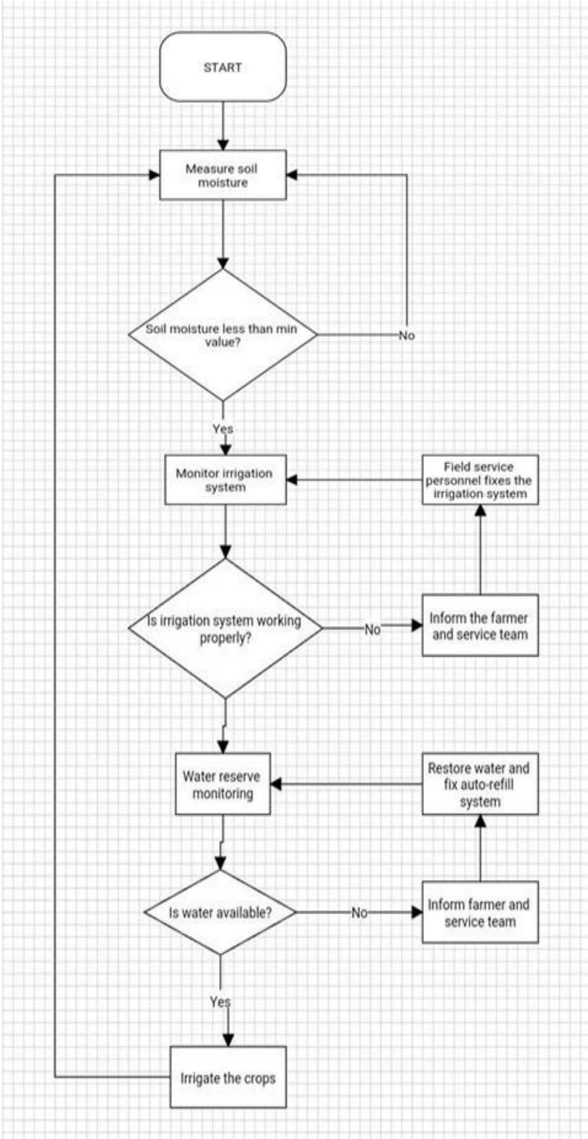

Fig. 11: Flow chart For Irrigation

After performing flow of A & B flow will be stop.

VI. ADVANTAGES AND APPLICATIONS

A. Advantages

- High Accuracy
- Reduce Human Efforts
- Save The Cost
- Easy To handle
- Time-Consuming

B. Applications

- Automation in Agriculture.
- Automation in Green House.
- Automation in Garden

VII. RESULT

For any farmer, the monitoring of information about soil moisture, temperature, as well as humidity is very essential for producing superior yield and controlling various components like motor (LED), etc. For that purpose, wireless technology is a must. There is much wireless technology available in the market right now, but apart from them, LoRa technology is very suitable in the agriculture sector because it does not require an internet connection moreover it operated at a greater distance.

VIII. CONCLUSIONS

By using Arduino UNO user interface developing the automation in agriculture using LORA module. This type of design is well suited in the field of Agriculture. This is well suited to some other general applications. from that system finally, we conclude that it reduces time and reduces for any farmer, the monitoring of information about soil moisture, temperature, and humidity is very essential for producing superior yield and controlling various components like motor (LED), etc. For that purpose, wireless technology is a must. There is much wireless technology at hand in the market right now, but apart from them, LoRa technology is very suitable in the agriculture sector because it does not require an internet connection moreover it operated at a greater distance manually work away.

REFERENCES

[1.] "Arduino LoRa Tutorial: Interfacing SX1278 (Ra-02) LoRa Module with Arduino." https://circuitdigest.com/microcontroller-projects/arduino-lora-sx1278-interfacing-tutorial (accessed Nov. 27, 2019).

[2.] "dht sensor - Google Search." https://www.google.com/search?q=dht+sensor&oq=dht &aqs=chrome.1.69i57j69i59l2j69i60l 3.2048j0j7&sourceid=chrome&ie=UTF-8 (accessed Nov. 27, 2019).

[3.] "moisture sensor image - Google Search." "Lora comparison - Google Search (accessed Nov. 27, 2019).

[4.] "nodemcu board - Google Search." https://www.google.com/search?q=nodemcu+board&sxsrf=ALeKk03_w5ZTkFaXIzlpgZQB3CDI7z5wIA:1593215478375&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiNk46V1qDqAhXFlOYKHV9OBC4Q_AUoAXoECBkQAw&biw=1536&bih=754#imgrc=Jm9WX4lV4 msaDM (accessed Jun. 27, 2020).

[5.] D. Davis, K. Mitreski, S. Trajkovic, V. Nikolovski, and N. Koteli, "IoT agriculture system bassed on LoRaWAN," in 2018 14th IEEE International Workshop on Factory Communication Systems (WFCS), Jun. 2018, pp. 1–4, DOI: 10.1109/WFCS.2018.8402368.

[6.] P. Gangurde and M. Bhende, "A Novel Approach for Precision Agriculture Using Wireless Sensor Network," p. 8, 2015.

[7.] D. I. Saˇcˇaleanu, R. Popescu, I. P. Manciu, and L. A. Peri¸soarˇa, "Data Compression in Wireless Sensor Nodes with LoRa," in 2018 10th International

Conference on Electronics, Computers and Artificial Intelligence (ECAI), Jun. 2018, pp. 1–4, DOI: 10.1109/ECAI.2018.8679003.

[8.] G. Sushanth and S. Sujatha, "IOT Based Smart Agriculture System," in2018 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), Mar. 2018, pp. 1–4, DOI: 10.1109/WiSPNET.2018.8538702.