International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 05 | May 2021 www.irjet.net p-ISSN: 2395-0072

LORAWAN Based Smart Farming Modular IOT Architecture

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Abstract - *This system mainly helps to improve Greenhouse management with data-driven smart farming & resource management using Low Power Long Range Wide Area Networks (LoRaWAN). By using this LoRaWAN based IoT system farmers can check & control various day-to-day activities of farming. Like environment monitoring, farm asset monitoring, irrigation control, soil health, etc. Due to that farmers can control various farm activities like maintaining the correct amount of water on the farm, Greenhouse temperature conditions, Soil moisture conditions, Water level conditions to get the best quality product.*

Key Words: **LoRa1, Network2, WAN3, cost4, Greenhouse5**

1.INTRODUCTION

To achieve the best quality product & to get easy control on farming we have arranged the Lora nodes with IoT platform & various types of sensors like soil moisture Sensor, temperature sensor, humidity sensor, & on basis of the output of these sensors controlling output devices works that is greenhouse roof opening or closing, Water pump ON or OFF. Lora module controls the activities with help of various node inputs which are arranged in the farm for the working of LoRaWAN very little power is needed also it has a long range of communication. In this system, we used a LoRa module, an atmega328 controller processor, various types of sensors like temperature humidity sensor, soil moisture sensor, cooling fan, water pump motor. In this project, an IoT platform is used, LoRaWAN provides connectivity over the large agricultural field with low energy requirement.

There is main two parts of the system. Transmitter side & Receiver side. On the transmitter side, there is the controller with a sensor node & on the receiver side, there is a LoRa module with IoT graphic user interface. To controller connected soil moisture sensor SHT10 which will sense moisture level of soil & according to that required amount of water, we can provide to plants using water pump motor. Then the second type of sensor i.e., temperature humidity sensor DHT11 it will sense the temperature level of the greenhouse & according to that we can control turn on or off the cooling fan or if needed we can open or close the greenhouse roof as per requirement Means these three operations will be performed i.e., Water motor on or off, cooling fan on or off & greenhouse roof open or close.

These all operations are performed with help of the LoRa module. LoRaWAN stands for Long Range Wide Area Network. It can transmit the data with a distance of 100km also. Lora node is implemented in the farm. This node will collect all the sensor data like soil moisture level, temperature humidity level, water requirement all these data are collected by the Lora transmitter & it sends or transmits data at the receiver side. This transmitted data received by LoRa receiver at PC server & we can see this data on laptop or mobile with the use of IoT graphic user interface. GUI is nothing but the form of interface that allows users to interact with electronic devices through the graphical icon. Due to GUI, we can see the run time condition of the farm & with just one click we can operate motors fans that are connected to the farm. These all happen due to LoRaWAN from long distances also we can control the farm activities from our home.

2. OBJECTIVE

- Main aim of the project is to improve the management of the generic farm in a highly customized way.
- To collect & handle relevant data from farms activities like the growing condition of crops, greenhouse products, livestock, further processing them for effective farm management
- To get better quality, reduction in human power, reduce wastage of water.
- With minimum efforts output is maximum & effective also.

3. BLOCK DIAGRAM

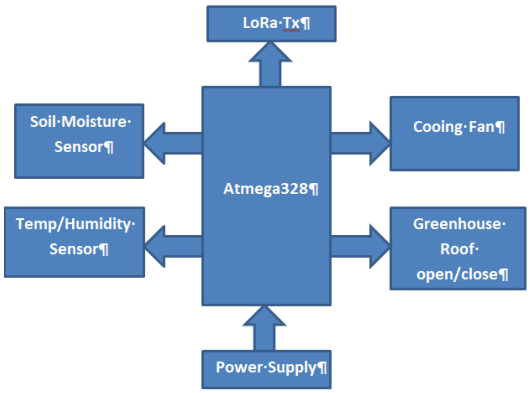


Fig: Transmitter Block Diagram

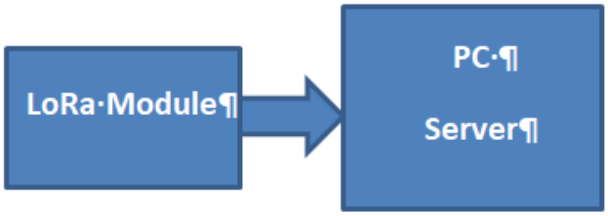


Fig: Receiver Block Diagram

4. COMPONENTS USE.

- At mega 328
- Lora Module(433MHZ) SX1278
- Soil Humidity Sensor SHT10
- Temp/Humidity Sensor DHT11
- Power Supply: Lipo Battery (3.7V 1800mA)
- Cooling Fan
- Relay

Atmega328:
The AVR controller is used for overall system operation. It is 8bit controller having 28 pins. AVR stands for Advanced Virtual RISC i.e., Reduced Instruction Set Computer.

LoRaWAN:
Lora WAN stands for Low power Long Range Wide Area Network It is implemented in farm to collect all the sensor level data & transmitted to LoRa receiver

Soil Humidity Sensor:
The soil moisture sensor SHT10 is implemented in the farm to sense the moisture level of soil

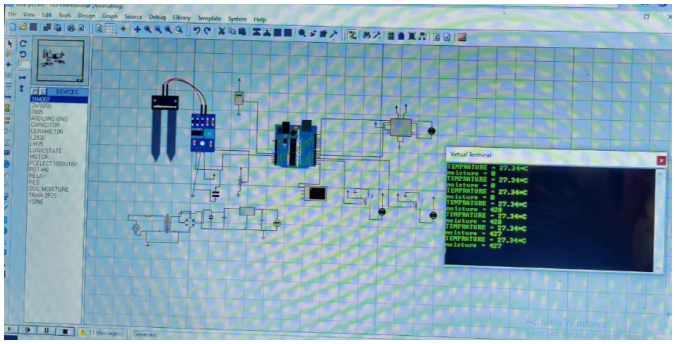
Temp/Humidity Sensor:
The DHT11 sensor is used to sense the temperature humidity level of the overall greenhouse

Cooling Fan: The cooling fan maintains the temperature level as per requirement

Relay: 5VDC relays used to operate fan motor & Roof open-close motor

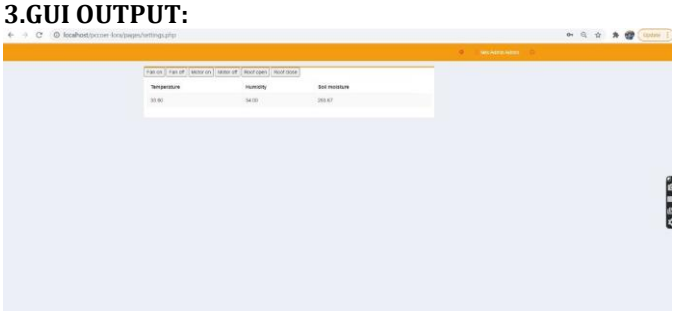
6. EXPERIMENTAL RESULTS:

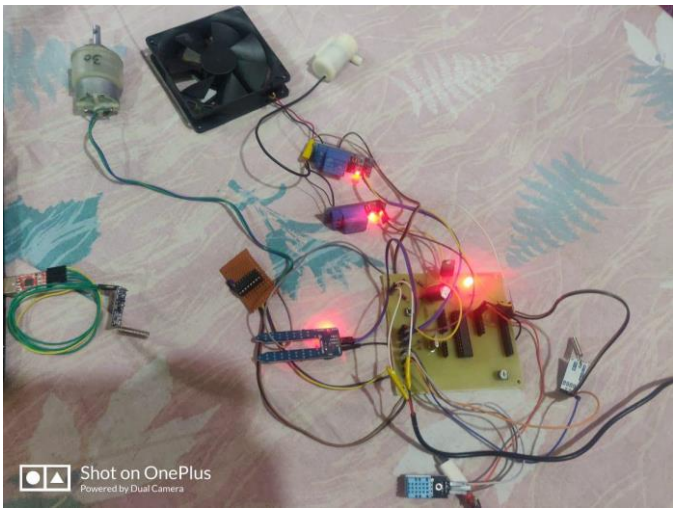
1.Simulation:



2.IOT GUI:

3.GUI OUTPUT:





7. BENEFITS:

- Quality Production Enhancement
- Low-cost requirement
- Profit Increase
- Human requirement Reduction
- Labour Effectiveness Rising
- Reduction of Resources Waste

8. APPLICATIONS:

- In Greenhouse
- Agriculture Sector
- For Monitoring Environmental Conditions

9. CONCLUSION:

The system has been configured to use the LoRa module to create a smart agriculture control and monitoring system. Intelligent agricultural data collection and equipment control is supported by wireless sensor networks and network communication technologies. We've also added the ability to control and monitor the device remotely using computer software.

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