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Development of Smart Network Using WSN and IoT for Precision Agriculture Monitoring System on Cloud

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Abstract - *The economy of developing countries like India which are basically dependent on agricultural sector on other hand increase of population agriculture sector facing problem to feed everyone in the country. And other environment factors also responsible for the growth of efficient quantity and quality of food products from agricultural lands. Due to lack of precise information and communication leads to loss of production. In this proposed system using Internet of Things (IoT) and Wireless Sensor Network (WSN) technology some of the problems can be minimized and can grow the quantity and quality food products. In this paper, the proposed system uses hardware like n-Mote, n-Gateway and various sensors which are sense the atmospheric parameter which are related to agriculture and gives an alert to the formers or green house supervisor regarding environment so the quantity and quality of the food can increased. The cloud plays important role in this proposed system.*

Key Words: **Internet of Things (IoT), Wireless Sensor Network (WSN), n-Mote, n-Gateway, cloud.**

1. INTRODUCTION

Food is the basic necessity for everyone on this world. As population growth of the world increases the food requirements also increases proportionally. And agriculture sector must yield large amount of the efficient quantity and quality of the food items from the field. To get the huge food products agriculture sector must be improved with the new techniques and should implement new technologies to the field. According to the world statistics India stands in the
27th position in production of food whereas still India facing problem to feed everyone in the country. Increase of the quantity and quality in the agriculture with help of IoT and WSN is called as smart agriculture or precision technology. The application of modern Information and Communication Technologies (ICT) into the agriculture leads to third green revolution in the agriculture sector.

The proposed system is to create completely automated monitoring system for the greenhouse applications which reduces the human efforts effectively. Depending upon the sensor informing decision can take in order to get suitable environment for the crops.

2. RELATED WORK

Kwang-il Hwang et al. presented a paper on the designing and implementation of wireless sensing element gateway for economical querying and managing through worldwideweb [1]. Here paper has bestowed the architecture of the sensing element gateway for web-based management and its implementation details.
Sirisha et al. presented a paper on wireless sensing element
based remote controlled agriculture monitoring system using zigbee [2]. The system consisted of the soi1 monitoring wireless sensing element network and remote information center. The sensing element node was developed using JN5121 module and IEEE 802.15.4/ZigBee wireless microcontroller.
Sonali et al. presented a paper on monitoring wireless sensor network using android primarily based smart phone Application [3]. The planned work of this project is to use the technologies of centralized computing and android programming for the development of the application.
Prof C. H. Chavan et al. proposed a system on wireless monitoring of soil wetness, temperature & humidity using zigbee in agriculture [4]. The proposed hardware system includes eight bit AVR, Bluetooth module, Temperature, humidity and soil wetness sensors, LCD. The system is low price & low power consuming so anybody will afford it. Prabha et al. presented a paper on real-time atomization of agricultural environment for social modernization of Indian agricultural device using Arm 7 [5]. This device makes use of the integration of the both wired and Wi-Fi techniques and ARM controller to have normal monitoring at the environmental conditions of farm and also affords the vital precautions to be taken for yield to growth for contemporary agriculture.
Angel C et al. Published a research paper on developing clever surroundings in agricultural irrigation method
[6]. The paper specializes in a way for developing clever surroundings to screen the irrigational parameter in theentire field. The gadget also ambitions on lowering theenergy intake and the value of communication.

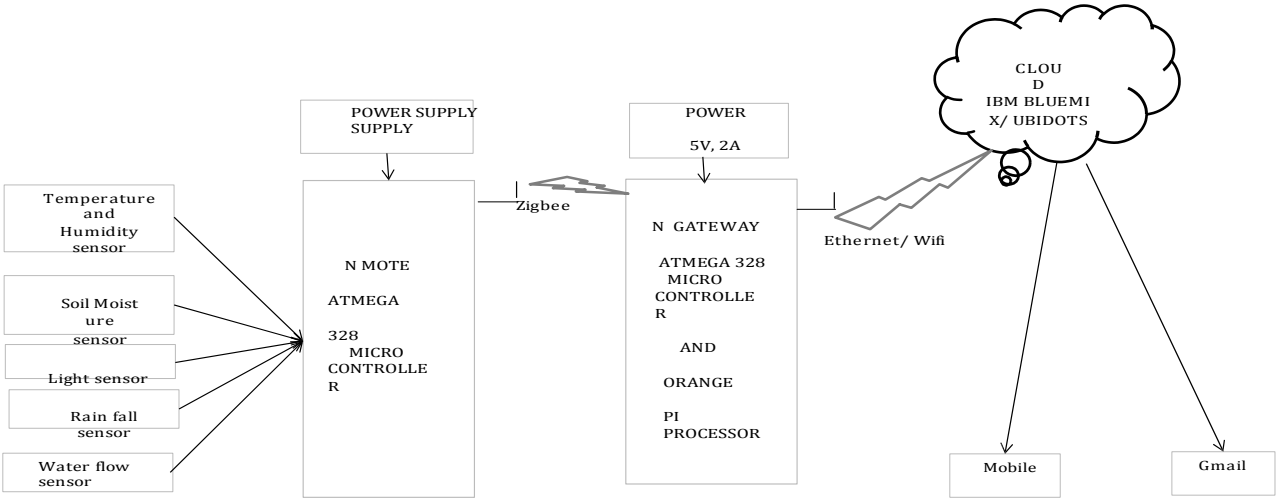

Fig-1: Block Diagram of Smart Agriculture

3. OBJECTIVES

The main objectives of the proposed system are given below:-

- Increased productivity.
- Enhanced safety.
- Easier agriculture procedures.
- Instant interventions around the clock.
- Advanced life style.

4. PROPOSED SYSTEM

The main motive of the precision agriculture is to increase the quality and quantity of the crops. For that IoT and WSN are used to create the smart network for efficient network. The sensors used to measure different parameters of agriculture system which are employed at sites. These sensors are intern connected to microcontroller (N Mote) which controls the sensors. A gateway is used to interconnect two different networks which are connected to internet through Wi-Fi or Ethernet. The data from sensors are sent to gateway, and then it is sent to cloud. When certain thresholds are reached, the data is sent to respective destination.

The proposed system works in three divisions. Namely n- Mote section, N-Gateway section and cloud part.

5. IMPLEMENTATION

Sensor data will be collected from the sensors which measure the physical parameters from the atmosphere in different voltage levels, which again converted into suitable formats for sending the data to the processor. The Sensor data will send to the N-Mote (AtMega 328 Microcontroller). Here five senors are using namely Digital Humidity and Temperature (DHT11), Soil moisture, water flow, Rainfall And Light sensor (LDR).The sensors will measure the physical parameters related to the environment and sends the data to the n-mote. The received data will be processed and feed to the Xbee (IEEE 802.15.4 protocol) to send the data from N-Mote to N-Gateway because AtMega 328
Microcontroller does not support Wi-Fi or Ethernet features. The data will be sent to the Xbee receiver at the N – Gateway end.

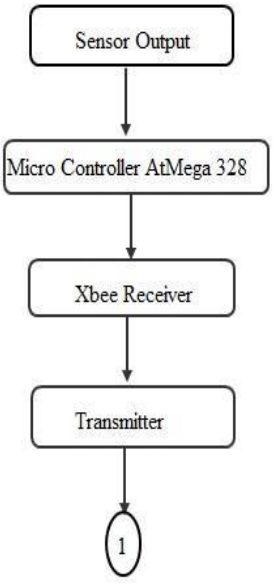

Fig -2: n-Mote section

The sensor data received from the Xbee transmitter from N- Mote will processed and displayed on the laptop or desktop connected to the N-Gateway. In another part the received data will be transmitted to Pi processor to send the data to the cloud using python script through Ethernet or Wi-Fi.

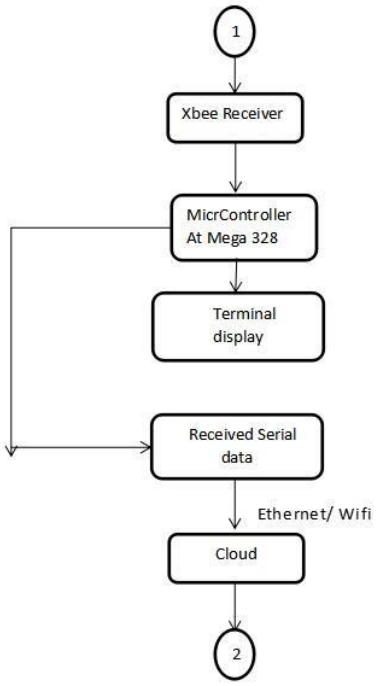

Fig -3: n-Gateway section

The sensor data which received on cloud will stored and database will be created and once the sensor data reaches threshold level remainder will be sent to the mobile or E- mail.

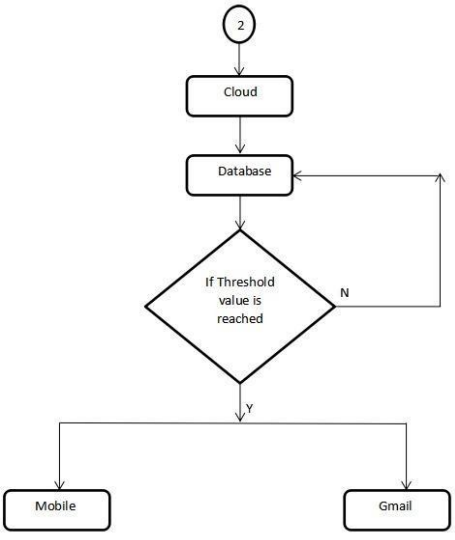

Fig -4: Cloud section

6. RESULTS

In this section we discussing the results obtained from the sensor mote which physical parameter measured by the sensors and sent to the cloud to make the decisions for the green house application.

Fig-5: Measure of Temperature on cloud

Fig-6: Measure of Humidity on cloud

Fig-7: Measure of Light on cloud

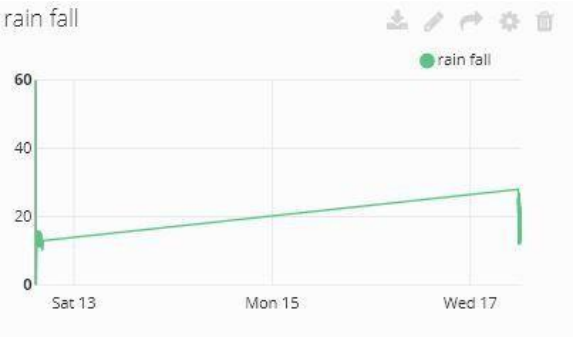

Fig-8: Measure of Rainfall on cloud

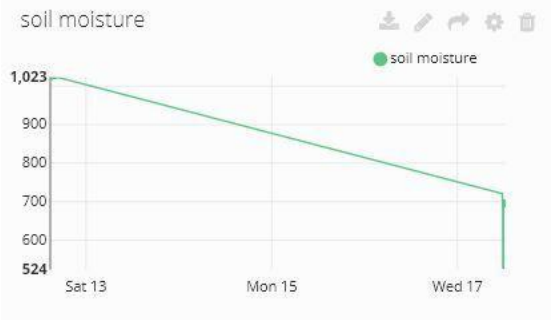

Fig-9: Measure of Temperature on cloud

7. CONCLUSION AND FUTURE WORK

This study has developed a conceptual model and system to design with the help of sensors, motes and gateway and communication protocols to form a real time application. And cloud plays vital role in decision making and collecting the data and maintaining the data for taking the critical decisions in the system.

Further research is required to make the complete system to work automatically without any interference of human being in any conditions.

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