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Data Acqusition and Monitoring system in Agriculture Field

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***Abstract*—**Feeding of the world in the 21st century is the biggest challenge, especially for smart farm business. As the development of Internet of Things, massive amount of sensors are supposed to be developed as the public infrastructure, Irrigation, Agriculture automation. With the development of in-depth applications in IOT, service discovery and crop growth monitoring and selection,scalability,irrigation decision support, these cases are important as powerful semantic features and challenges to the end users. To handle this challenges, here we are attempting to develop the model which includes Database of the sensor. Due to challenges of interoperability, data analysis, research, just naming few. Here we are attempting to prove the application of efficiency in Digital Agriculture use case. In this literature review number of use cases and implementations have been studied to derive a subtle pattern of applicability in digital agriculture and at the end a scheme is proposed to implement smart Agriculture use case. In this paper no of use cases and implementations have been studied to derive a subtle pattern of applicability in digital agriculture and and we proposed to implement Smart Agriculture monitoring and Data Acquisitions system application to exploit the software paradigm privileges. Here I have to use different technologies like RF, Bluetooth, Wi-Fi and Xbee.here I have to compare those technologies with different sensors create wireless sensor network and create Database which stores the data.

Keywords*—WSN; Field monitoring, Zigbee, Wi-Fi, sensors.*

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I. INTRODUCTION

In the paper our main focus is to maintain, control or monitor the agricultural trends or system making it easier for the user, to get data at regular interval about the field. In many areas where one person is not enough to monitoring the field status and control that things. To improve we have to focus on that agriculture monitoring system and to collect more area information and transfer to the web server for whom person that can work on that field like scientist, farmers, and government officers as well as many more that need to survey the agriculture field.Many technology were used in agriculture field such as remote sensing, global positioning system(GPS), geographical information system (GIS),with satellite system provide images of great areas where as wireless sensor network (WSNs),used for precision agriculture , additionally give better spatial and temporal variability than satellites, they are also permitted to collect soil electrical conductivity.

Here we have used various sensors to create a well-established agricultural monitoring systemlike DHT11/22, soil moisture sensor, image sensor. DHT11/22 sensor is used to measure the temperature and humidity of the environment or surrounding, soil moisture sensor basically used to measure the soil moisture level and the image sensor is used to keep the track of field activities, thereby sending the data to the user.

In previous trends the issues where mainly about the data transfer as well as to monitor the activities happening in field efficiently .Hence for this we have made use of Zig Beeprotocol, transmitterreceiver methods and Wi-Fi methods which has an advantage over the traditional use of Bluetooth features, thus making it more efficient in terms of data transfer and monitoring .For convenience we have tried to show the difference between various methods for data transfer used in agriculture field Table-1.

In that table we discusses different parameters which used in the communication field. Three protocols are compered here. Compared to zigbee and Wi-Fi, Bluetooth have more limitations. So that in this paper I will create sensor node with the two protocol zigbee and Wi-Fi. Table shows that range of Wi-Fi and zigbee is more compared to the Bluetooth. To collect data form different nodes we have to create WSN that will collect all the node information and give to the user.

Parameters	Zigbee	Wi-Fi	Bluetooth
Data rates	20,40,and 250KBPS	11 & 54 MBPS	1 MBPS
Network Topology	Ad-hoc , Peer to Peer, Star , or mesh	Point to Hub	Ad-hoc, very small network
Range	10-100 meters	50-100 meters	10 meter
Power	Very low	high	high
Operating Frequency	868 MHz, 900-928 MHz, 2.4GHz	2,4and 5 GHz	2.4 GHz
Device joining Time in Existing Network	30ms	3-5 sec	10 sec

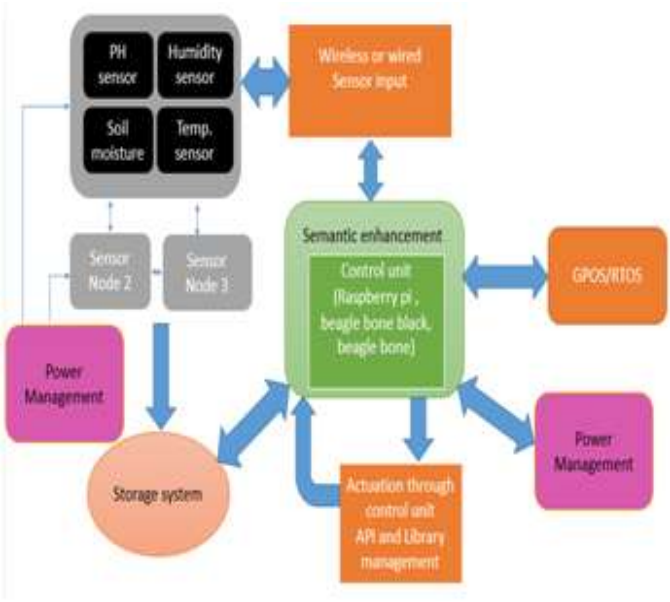
Table 1 comparison

Wireless sensor connection based smart sensor network cancombine sensing, computation, and communication into a single, small device. Because sensor carries its own wireless data transceiver, the time and the cost for construction, maintenance, the size and weight of whole system have been reduced. Information collected from these sensor nodes is routed to a sink node via different types of wireless standers are used namely: Wi-Fi, zig bee and Bluetooth. Of these, zig bee is the most promising standard owning to its low power consumption and simple networking configuration. The prospective benefits of using the WSN technologies in agriculture resulted in the appearance of a large number R&D projects in this application domain. The job of the sensor network in this paper is to provide constant monitoring of field –environment factors in an automatic manner and dynamic transmitting the measuring data to the farmer or researchers with WSN based on Zig bee and Internet. The real time information from the field will provide a solid base for farmers to adjust strategies at any time.

II. System Architecture

A. *Plateform framework*

Figure 1 shows the proposed system architecture that includes four major units 1).sensor unit 2). Zigbee transceiver unit 3).platform 4). Web server 5). Wi-Fi module 6). Rf module. Here raspberry pi as server used. To acquire the sensor data Arduino is used to interface with the different sensors like Dht11, soil moisture, Image sensor, Ph. sensor, illumination sensor and many more which is used in agriculture field. According toplatform framework has been design in different layers the system architecture is describe the framework.



The sensor layer is includes numerical sensor of physical values in agriculture production, to build ubiquitous sensor network. The sensor module collect the data of that field and processes that data and transform to information and stores in data base.

The transmission layer next to sensor layer, it collects the data from the sensor layer using internet and consolidate with collection point of geographic information. It is in wired network from or wireless and the data is process, analyze and transfer to upper layer of the framework which is shown in fig.1.

The control or authority layer uses the output of transmission layer as input and that data summarized as input parameters, and using automatic control algorithmit controls task of agriculture production.

In application layer it display and express various business logic of the related farming field through collective interface.

B. *System architecture*

According to proposed platform frame work we have to design system architecture where the all layers satisfied with some application. Here for the server raspberry pi is used and for client some MCU or Arduino is used. In this we have to main node as Arduino–Uno or oli-max board or LPC2148 development board used as main chip in node. For the base station we have to use RASPBERRY PI board. In this project5 we have use the R-pi as gateway or server which is used to receive data from the different or multi terminals node and transfer to user, the status of weather which is suitable or not for the agriculture field.

III. Wireless - Network Aquring Unit And Receving Unit

In sensor node there are acquiring unit which includes different sensors like soil moisture sensor, temperature sensor, image sensor, humidity sensor, water level detector as well as illumination sensor etc. Here in acquiring unit Arduino-Uno board connected to sensor that is control unit in which it converts physical quantity to electrical signal that is processed and transmit through Zigbee, Wi-Fi, Rf module which works on 2.4 GHz using UART protocol. Transmitter module connected to Arduino via serial port and data transmit through the zigbee module to base station. FDTI driver is to be install in the pc to configure the Zigbee module and the XCTU is the free program available to configure Zigbee in two parts, transparent mode (AT) and AP mode (API). AT mode is limited to point to point communication between two Zigbee. API mode is communicate like point to multipoint wireless configuration, multiple node can be connected to API mode.

Now receiving unit or base station unit configuration process can shows in fig.3.In that flow diagram we can analyzed how the base station works, here Raspberry pi as base station and receiver module connected to the pi to get the data form the nodes. That data communication through Zigbee communication protocol and this data sent to the Qt real time application.

IV. Raspberry Pi As Server

Raspberry pi is small SoC device which includes all the interface properties like minicomputer, it covers all interfacing properties for the connecting peripherals or any device or sensors etc.

A. Features:

It includes RAM, CPU/GPU, USB hub, Ethernet port, Slot of external memory card which is used to porting OS. These are the common features which is in the all the model of Ras-pi. But the main difference between R-Pi model B and B+ is the micro SD card slots available in the B+ model and 2 Additional USB port also available in the B+ model.

B. R-Pi as Gateway

In agriculture field, sensor node communicate with R-Pi via Wi-Fi, Zig Bee and RF module so that different location sensor data is available on the R-pi. That data can be communicate web server via internet cloud. For that we have to enable SSH server in the OS. Here I am using the Rasbian.

C. SSH

It is known as secure shell, which is used to provide secured channel in client server architecture rather provide remote access in terminal of Ras-pi to other system in the same network. XMING or VPN server is used to get Whole Raspberry pi set up in the other system. We have use XMING. Setup of XMING and Raspberry pi is shown in below fig.

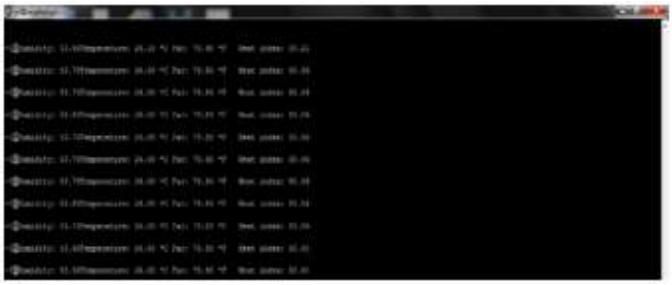


Figure 2 sensor output on pi

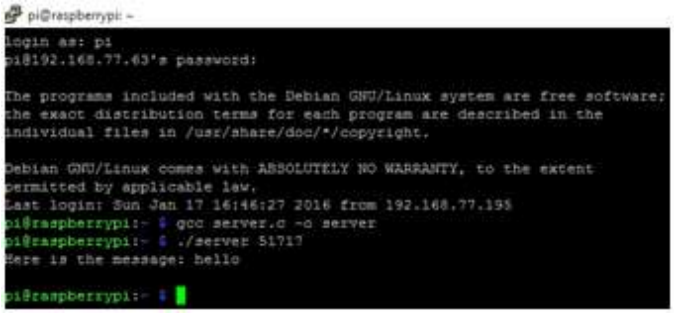


Figure 3 socket creation

D. ZigBee, WiFi, Rf module

For configure the Zigbee we are using the XCTU software. Wi-Fi module ESP8266 is uses to communicate the base and client. RF module also communicate that type of one Tx and another is Rx connected to each other.

V. Impelmentation

Figure 6 communication between client and server

First we connect the Arduino board with the sensor and measure physical quantity and it converts appropriate signal to transmit base station through zigbee module for that we have to follow the detail which can be described above. Then raspberry pi can communicate via zigbee receiver module which is connected to the pi. At the end of client module the DHT11 sensor is connected, it measures temperature and humidity. Fig.4 shows the client side result. Fig.5 shows the server side we get monitoring output and that data can be modified every specified time delay. For that we create socket creation. The steps involved in establishing a socket on the server side are as follows:

1. Create a socket with the socket () system call
2. Bind the socket to an address using the bind () system call. For a server socket on the Internet, an address consists of a port number on the host machine.
3. Listen for connections with the listen () system call

4. Accept a connection with theaccept () system call. This call typically blocks until a client connects with the server.

5. Send and receive data

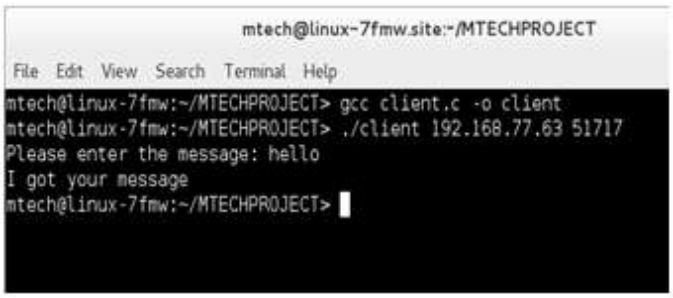


Figure 4 client output

Here figure 5 and 6 are communication between client and server . figure 7 is used for communicating base station via zigbee protoclo. Same goes for the Rf protocol and wifi protocol.then all the information should be send to the user via web server using installing apeache server in the pi module . so we get the appropriate connection between user and field.

VI. DATABASE CREATION

Here we are creating Database using MySQL. Creating Database in Pi there where installing the Packages of the SQL server. Then after creating Database which demonstrate result of nodes status. It is informing to the user to what the field situation should be. In Database there may include sensor data, location, type of sensor, communication media which may be used in the client and server as well as giving the record of that data for another person may use for reference.

Figure 5 Database that includes nodes information

VII. CONCLUSION AND FUTUREWORK

Here we are creating wireless sensor network that have different protocols like Zigbee, Wi-Fi, RF that will connect with same pi and get the data from that. These embedded system will help in agriculture field to monitoring field. Here we have to use cloud for the future work to create database and store the information on that database and get that information anywhere, any field in the web. It is useful for the scientist, farmers government officers etc.due to my proposed system we have different data that can available on database. For future work we are using semantically enhanced data that can be used by many purpose.

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