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Wireless Sensor Network Application In Agriculture For Monitoring Agriculture Production Process

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ABSTRACT

Wireless Sensor Network (WSN) connects the physical and computational world by monitoring environmental phenomena through ubiquitous devices called sensor nodes or motes. India ranks second in agriculture activities. The agriculture production process is affected by different factors such as temperature, light, soil humidity, soil moisture. Precision agriculture is a field which provides suitable scenarios for the deployment of wireless sensor networks (WSNs). WSNs provide accurate information about environmental characteristics to farmers. This knowledge represents a valuable resource because it helps in real-time decision making such as establishing water management policies. In India there are different types of problems and one of the main problems is the water shortage. Farmers crops are unreliable due to the variability in rainfall amount as well as its distribution. we describe the use of wireless sensor networks(WSN) to improve water management and for controlling other parameters such as temperature ,light ,humidity ,moisture. wireless sensor network(WSN) and other agricultural techniques might help farmer to utilize and store the available water, improve their crop productivity, reduce the production cost and instead of depending just on prediction WSN make use of real time values.

Keywords :

Wireless Sensor Networks, Agriculture Monitoring, Polynomial Interpolation, Water quality monitoring and management, Irrigation management, Environmental parameters.

1. INTRODUCTION

Sensor networks are emerging as a great aid to improve agriculture quality, productivity and resource optimization. To evaluate environmental parameters such as humidity, temperature, moisture etc sensor network is used. Now a days many researchers are working on WSN. Many new technologies in WSN have become available to improve agricultural quality. In WSN large number of sensor node devices are spread over large geographical area. World wide wireless sensor network is used in many applications such as military, health care, agriculture, industrial. Agriculture uses 85 % of available fresh water resources world wide and this percentage will continue to be dominant in water consumption because of population growth and increase food demand [7]. Climatic conditions are continuously changing. So the farmer cannot depend on rainfall. Unplanned use of water results in wastage of water. We have to utilize available water in efficient manner. Sensor network is used to monitor environmental parameters of crop cultivation so that farmer knows when having water or when to use certain pesticides. Precision agriculture has aim of optimizing the production. Sensor network in agriculture is used to identify fungus, plagues infection of plant, right harvesting time (i.e maturity of fruit), controlled irrigation based on soil moisture. In India irrigation system is manual controlled in which at regular interval farmers irrigates the land and sometime it is not possible to irrigate the crop at required time due to this crop get dried. This results in less production as well as profit to the farmer. Using Wireless Sensor Network for agriculture monitoring application human efforts get reduced due to automated irrigation system [4].Farmer can perfectly predict environmental conditions. The soil moisture sensor senses moisture level so that we get information about how much water is to be sup- plied [5]. Proper irrigation management will help prevent economic losses caused by over or under irrigation, movement of nutrients, pesticides [6]. Sensor nodes are deployed over farm. Data sensed by different sensor nodes is given to sink node. Sink node transfer this collected data to gateway over network. Sensor senses the information from sensor nodes transfers data to base station .Actuator receives data from base station interpret them and generate the corresponding action [2].A Gateway forwards data from network to base station.

2. LITERATURE SURVEY

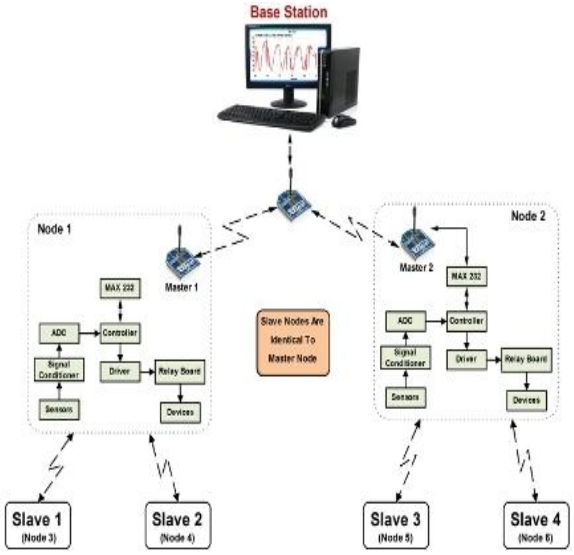
Sensor networks are emerging as a great aid to improve agriculture quality, productivity and resource optimization. To evaluate environmental parameters such as humidity, temperature, moisture etc sensor network is used. Now a

day's many researchers are working on WSN. Many new technologies in WSN have become available to improve agricultural quality.

Precision agriculture is a field which provides one of the most suitable scenarios for the deployment of wireless sensor networks (WSNs). The particular characteristics of agricultural environments – which may vary significantly with location – make WSNs a key technology able to provide accurate knowledge to farmers. This knowledge represents a valuable resource because it enables real-time decision making with regard to issues such as establishing water saving policies while providing adequate irrigation and choosing the right time to harvest the fruit based on its maturity. Due to advancement in technologies and reduction in size, sensors are becoming involved in almost every field of life. Agriculture is one of such domains where sensors and their networks are successfully used to get numerous benefits.

3. ARCHITECTURAL DESIGN

Figure 1. Architectural Overview



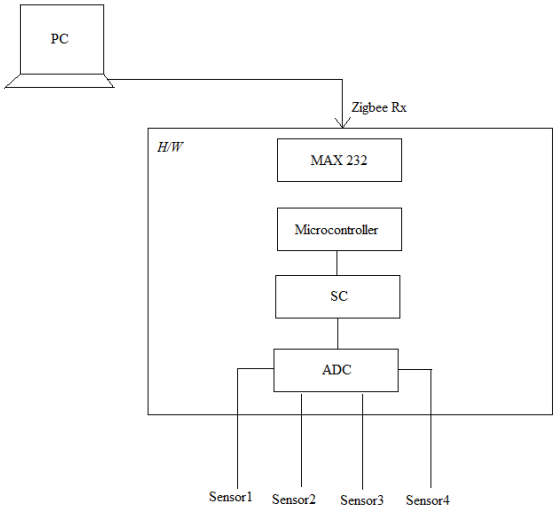
We are taking sensor values from sensor1,sensor2,...sensor n. The sensor values that we have taken are in analog form for future computations we need digital values ,so that we are using ADC to convert analog values to digital form. ADC uses 10 bit register for computations sensor unit acquires data from ADC and forward it to base-station through micro-controller. micro-controller used in automatically control products and devices such as automobile engine system ,remote controls, power tools, micro-controllers, are designed to govern operators of embedded system. micro-controllers consist of CPU,RAM,ROM. micro-controller works on TTL protocol and our base-station unit works on binary values ,so for communication between micro-controller and base-station we are using MAX-232. MAX-232 works on serial communication. Zig-Bee are flexible, they send and receive data over serial port which means they are compatible with both computer and micro-controller.

4. ALGORITHM

1. Start
2. Slave node reads parameter values from soil moisture sensor, light sensor, humidity sensor, temperature sensor.
3. Send data to signal conditioner for noise reduction then ADC conversion
4. Display values on personal PC and Store in Database.
5. Interpolation Algorithm is applied.
6. Generate graphs accordingly.
7. Repeat from 2 to 76after specific time delay.
8. Stop.

5. DESIGN AND IMPLEMENTATION

Figure 2. Overall System Design



Slave nodes reads parameter values from soil moisture sensor, temperature sensor, humidity sensor, light sensor. Then this sensor data is given to signal conditioner. Analog signals require some form of preparation before they can be digitized. Signal conditioning is the manipulation of a signal in a way that prepares it for the next stage of processing. Analog to Digital converter takes this process data and then convert it into digital form. Microcontroller takes input from ADC. The signal sent from the remote control is captured by the microcontroller. The microcontroller controls the channel selection. The MAX232 IC is used to convert the TTL/CMOS logic levels to RS232 logic levels during serial communication of microcontrollers with PC. The controller operates at TTL logic level (0-5V) whereas the serial communication in PC works on RS232 standards (-25 V to + 25V). This makes it difficult to establish a direct link between them to communicate with each other. ZigBee is trans receiver which can work on serial port and used for serial communication between PC and Microcontroller.

6. TENTATIVE RESULTS.

6.1 Result of Device Test.

6.1.1 All OFF

Figure 3. GUI of ALL OFF

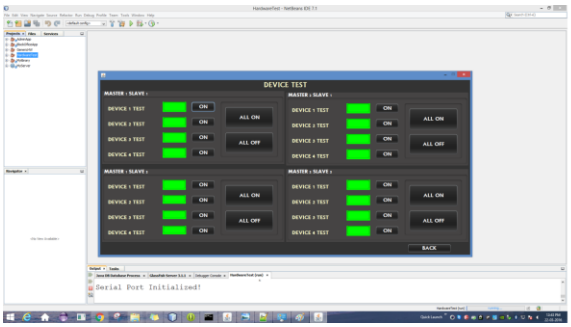
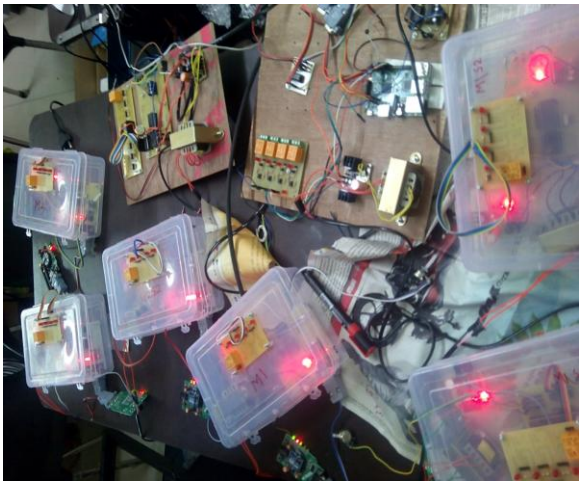


Figure 4. Result of ALL OFF



6.1.2 All ON

Figure 5. GUI of ALL ON

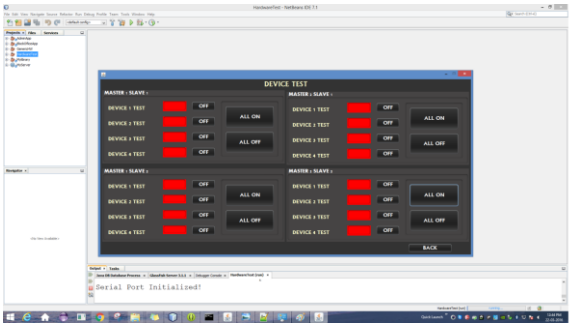


Figure 6. Result of ALL ON

6.1.3 Individual Testing:

Figure 7. GUI of Individual Testing

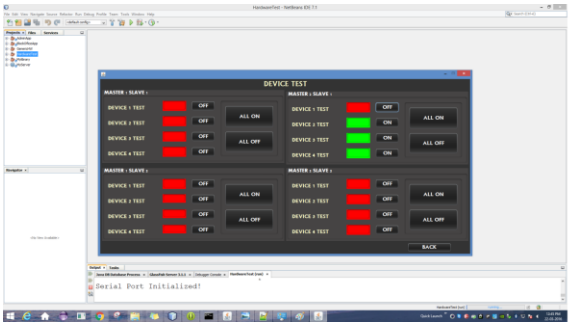
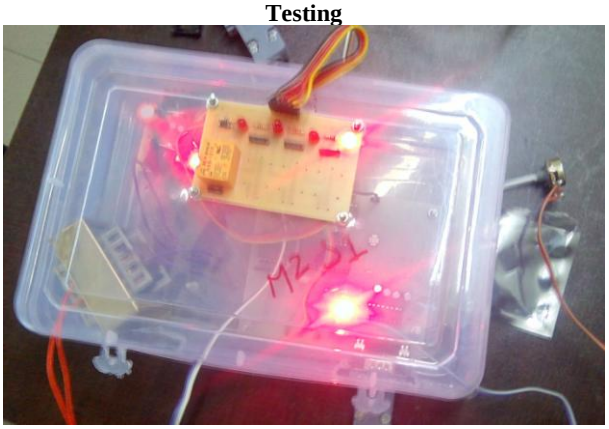


Figure 8. Result of Individual Testing



7. CONCLUSION

WSN is emerging technology and it have wide range of applications. WSN plays an important role in development of precision agriculture. Human efforts as well as electricity get reduced by making real time decisions. Using WSN we can do proper utilization of water so that crop yield can increases to obtain maximum profit .By achieving Multi-hopping load of the system is reduced.

8. FUTURE SCOPE

In future you can improve hardware and software communication to make system efficient and reliable. Also you can modify this system by adding new sensors and valves for supplying agricultural chemicals like calcium, sodium, ammonium, zinc to the field along with Fertilizers.

9. ACKNOWLEDGEMENT

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10. REFERENCES

[1] Soledad Escolar Daz , Jess Carretero Prez, Alejandro Caldern Mateos, Maria-Cristina Marinescu, Borja Bergua Guerra A novel methodology for the monitoring of the agricultural production process based on wireless sensor networks. Computers and Electronics in Agriculture 76 (2011) 252265

[2] Robert W. Coates a, Michael J. Delwiche a,, Alan Broad b, Mark Holler b Wireless sensor network with irrigation valve control. Computers and Electronics in Agriculture 96 (2013) 1322.

[3] Zhao Liqiang, Yin Shouyi, Liu Leibo, Zhang Zhen, Wei Shaojun. A Crop Monitoring System
Based on Wireless Sensor Network. Procedia Environmental Sciences 11 (2011) 558 565

[4] Aqeel-ur-Rehman a,b,, Abu Zafar Abbasi b, Noman Islam b, Zubair Ahmed Shaikh b A review of wireless sensors and networks' applications in agriculture. Computer Standards & Interfaces
36 (2014) 263270

[5] Zhen Li a, b, Ning Wang a,, Aaron Franzen a, Peyman Taher c, Chad Godsey d, Hailin Zhang
d, Xiaolin Li e Practical deployment of an infield soil property wireless sensor network. Computer
Standards & Interfaces 36 (2014) 278287

[6] Xin Dong a,, Mehmet C. Vuran a, Suat Irmak b Autonomous precision agriculture through integration of wireless underground sensor networks with center pivot irrigation systems . Ad Hoc
Networks 11(2013) 19751987

[7] Joaqun Gutirrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel ngel Porta-
Gndara Automated Irrigation System Using a Wireless Sensor Network and GPRS Module (2014)