

AUTOMATIC IRRIGATION CONTROL USING WIRELESS SENSOR NETWORK

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Abstract- In the agriculture field, use of proper method of irrigation is important and it is well known that irrigation by drip method is very economical and efficient. In the conventional drip irrigation system, the farmer has to keep watch on irrigation, which is different for different crops. The purpose of this paper is to provide more facility in agriculture field by using Zigbee. The project describes an application of a wireless sensor network for low-cost wireless monitored and controlled irrigation. Here there are two Microcontroller units, one unit is placed in agricultural field and the other unit is placed in main control unit which is interfaced with motor unit. The field unit will be monitoring the humidity of air and moisture level of the water. It will transmit the information periodically to the main unit. If sensor data is not up to the threshold level, the main unit will turn on the motor. The motor will be turned automatically if threshold level is met. The developed irrigation method removes the need for workmanship for flooding irrigation. Efficient water management plays a vital role in the irrigated agricultural cropping systems.

Keywords- Zigbee, Wireless Sensor Network(WSN), PIC Microcontroller, Humidity sensor, Moisture sensor, Motor, irrigation removes the need of the workmanship.

1. INTRODUCTION

India is a developing country and to make it developed, deforestation is taking place and many industrial developments have been taking place. To introduce some technology and more development for making India developed, lot of power is required. Because of this difficult for the farmers to gain information regarding soil weather that it is good for crop production or not. These results into lots of power waste and to overcome this issue 'ZigBee technology' is used.

This proposed system is an automatic irrigation system using ZigBee which helps to know the conditions of the soil for the irrigation. There is a sensor which gives the information about temperature, humidity and moisture content in the soil if the value of sensed data matches with the threshold values which are required for the proper crop production then it will start irrigation automatically.

Several techniques have been introduced for irrigation in agriculture field using GSM and by using mobile GPRS. 'WSN' (Wireless Sensor Networks) will provide suitable means for the farmers in the development of agriculture and also will help them to invest more and gain more profit [1]. In agriculture field sensor in WSN senses the temperature, soil and humidity which are essential to maintain the fertility of soil [2]. Hybrid sensor network is a wireless network which is designed to communicate with the soil [3]. ZigBee is a wireless communication device which operates under same frequency and transmits data to and from the sensing element and also compares the value [4]. WSN is used in monitoring the condition of soil and to control the energy consumption [5].

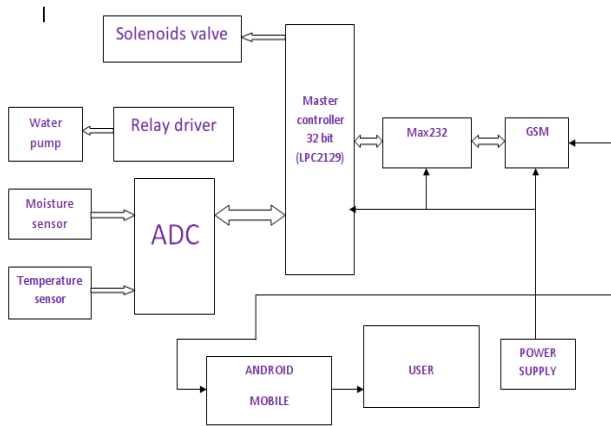
We can optimize the cost of intensive computation and hardware devices using sensor networks which are also small in size and has a precise value [6]. Wireless mobile sensor network conserve the usage of limited battery of sensor to increase the life of network for long and the redundant sensors can change their positions to increase overall network lifetime of the WSN [7]. The optimization and modelling of transmission schemes are used to increase the network lifetime and consumption of energy in the transmitter circuit along with that for data transmission [8]. This paper proposed an automated irrigation system to utilize water in effective way for agriculture using wireless GSM technology. This paper provides a methodology for the establishment of large scale automatic irrigation system by using ZigBee as a wireless sensor technology [9].

2. EXISTING SYSTEM

Many various system have been developed that are being controlled by using GSM. These system uses android mobiles for automatic irrigation control.

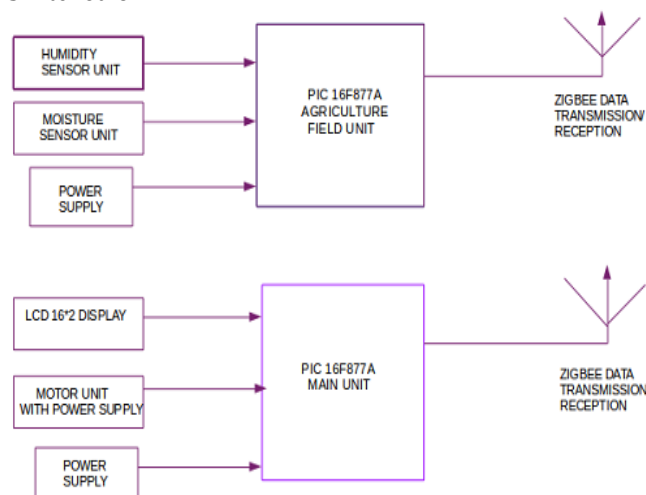
In the existing system the information is passed through the android mobiles. Two android mobiles with required features are use in this system and the wireless connection between two android mobiles are done using GSM. The GSM module and the microcontroller are connected. When the sensor senses the water content of the soil becomes low, it will gives a signal to the

microcontroller and then it gives a signal to mobile which is kept in auto answering mode. Therefore when calling the mobile the buzzer is heard indicating the valves to be opened. This technique of GSM control is very complex and this technique needs an android mobile and GSM connection to operate which is of high cost as compared to propose system. Hence this system is considered to be complex for farmers to operate.



3. PROPOSED SYSTEM

The proposed system is a new technique where the zigbee itself acts as a receiver and transmitter channel. Here two sensors such as humidity sensor and moisture sensor are used in the agriculture field. Humidity measurement determines the amount of water vapour present in the air and send it to microcontroller. The moisture sensors measure the moisture (i.e) water content in soil and then the output of the two sensors are sent to the microcontroller. This received signal is sent to the microcontroller. The received message is displayed through a LCD. If the observed moisture level and the water level in humidity sensor is lower the the fixed level the information is sent through the zigbee to motor unit and the motor starts running automatically which is shown in LCD. If both the moisure content levels and humidity levels after irrigation reaches the fixed level the motor automatically switched off.



4. SYSTEM DESCRIPTION

The design process of the proposed system is divided into five levels and they are as follows

- 4.1 Device Specification
- 4.2 Architecture
- 4.3 Component

4.1. DEVICES SPECIFICATION

S.no	Devices	Specification
1	ZigBee module	10-800m Range
2	Display	LCD(16*2)
3	Sensors	LM-35, SY-HS-220, Soil moisture

4.2. ARCHITECTURE

The proposed system consists of three nodes. Node 1 and Node 2 called as sensing node and Node 3 called as receiver node. The receiver node play an important role in an automatic irrigation system. In Node 1 and Node 2 have same operation, but the address of the destination is different. The address of the destination is set on receiver node. Node 1 and Node 2 sensed the information by using sensor this sensing information transmitted to ADC (A TO D converter). An ADC converts it from analog to digital then transmitted the digital data to UART (Universal Aynsynchronous Receiver Transmitter) for serial communication. This is inbuilt in PIC Microcontroller 16F877A. ZigBee is used for wireless transmission of data.

ZigBee transmits data of Node 1 and Node 2 to the receiver node of ZigBee. This Receiver node sends the data to PIC 16F877A microcontroller and information display on the LCD of receiver node as well as PC. If we want to monitor the particular crop, then press the respective crop type and it will be the display fixed value of crop on the LCD and PC and it compares the threshold value of crop and running value. When running value crosses the fixed value then automatic irrigation operation start.

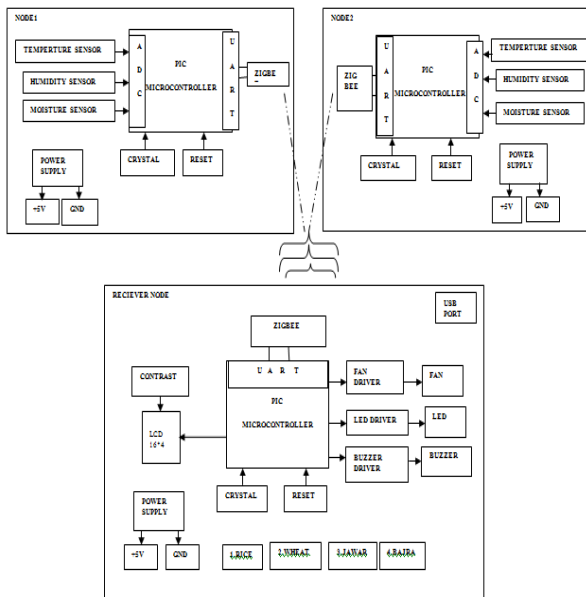
4.3. COMPONENTS

4.3.1. HARDWARE COMPONENT

Hardware component is a physical device that is a part of the system which connects the other component, provide input and output to and from the application. The proposed system hardware components are Temperature sensor, humidity sensor, ZigBee, PIC Microcontroller 16F877A, Fan, Motor pump, Buzzer.

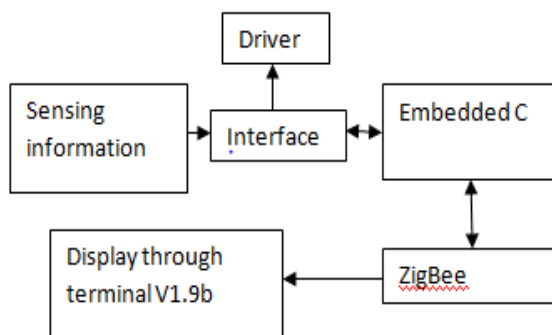
The proposed system consists of a sensor which gives a signal to the microcontroller. There are three channels respectively, for temperature sensor, soil moisture sensor and humidity sensor. Sensory information is converted into digitized with the help of

ADC and it is transmitted to LCD to display. Then this information is transmitted to ZigBee using UART. ZigBee also compares the sensor output with the set values and gives output to the driver. The data are transmitted to ZigBee using UART to the master node. It collects information from node1 and node 2. There are four which can be used to select sets values of a particular crop. Switches are interfaces to Port E Using resistor. There are three relays are used for Buzzer, Fan, Pump Motor. This relay is interfaced to Pin RA0, RA1, RA2, is used to control more power create by a coil of the relay and it amplifies the signal of microcontroller. The information displays from LCD 16*4 and PC.



4.3.2.SOFTWARE COMPONENT

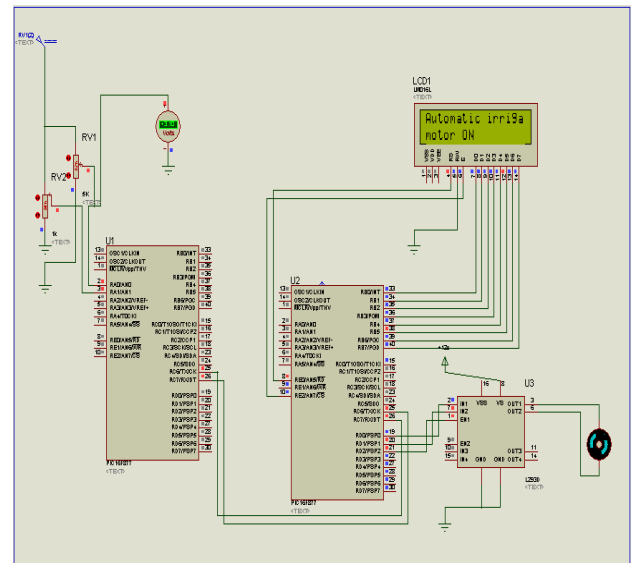
It is interfaced between the hardware and PC.Driver is used in the system instead of motor.



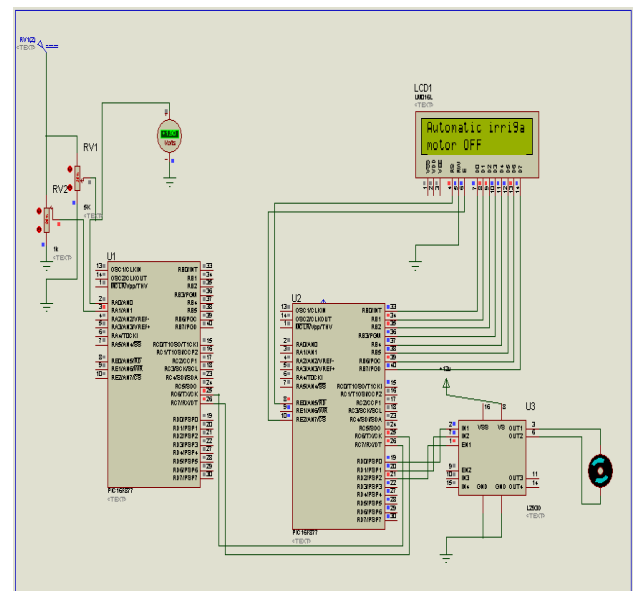
5.RESULT

when the observed humidity and moisture sensors are within the fixed level the motor is in off condition and the LCD display shows the "OFF" condition

of motor. When irrigation system is OFF then the value of crop temperature, humidity, soil moisture is normal .



when Irrigation System is ON then the value of crop Temperature, humidity, Soil moisture crossed the fixed value then buzzer gets ON and displays on master node LCD and PC. Then the irrigation process starts which supply water to the crops and if the value of humidity , moisture for the selected crop is sufficient th motor will be switched OFF automatically.



The proposed system is applied in agriculture field to detect the temperature, humidity, moisture, which will improve the quality and quantity of crop productions .The farmer has the ability to Monitor the Sensors information at his home, the sensor information displays on the LCD as well as PC. The farmer can set crop type such as Wheat, Rice in the master node. Moisture, temperature and humidity value required for a particular crop are set in the microcontroller as a fixed

value. Soil moisture, temperature and humidity sensor fixed in the field. These values are compared with the fixed values. If the actual value crosses the fixed values then corresponding pump, fan or Buzzer switched ON. When the Farmer pressed his or her choice as 1 in master node, crop type rice is selected, then actual values of moisture, temperature and humidity for rice will be displayed on LCD as well as computer

As per the above result we experimentally analysis that it perform automatically operation without taking any man power it also take the accurate result using ZigBee.

6.CONCLUSION

According to our final result we have obtained, a normal farmer can connect this setup to his computer and select the crop type and accordingly he can automatically monitor irrigation system for the crops along with controlling humidity and moisture in his field. From this it is concluded that we have succeeded in using the technology of 'ZigBee' (WSN) for an automated irrigation process using wireless sensor network.

REFERENCES

- [1] Maria-Cristina Marinescu, Borja Bergua Guerra, "The monitoring of the agricultural production process based of wireless networks," no.76, pp. 252-265,2011.
- [2] Aqeel-ur-Rehman , "A review on wireless zigbee networks' applications in agriculture ",Computer Standards & Interfaces, pp.xxx-xxx,2011.
- [3] W. Su, Y. Sankara subramaniam, , " Wireless sensor networks" Computer Networks , no.38, pp- 393-422,2002.
- [4] R. Challoora, N. Yilmazera, S. Ozcelikb, , "An Overview of Wireless Technologies of ZigBee," Procedia
- [5] Nassau Sudha, M.L. Valarmathi, Anni Susan Babu, "Energy efficient data transmission in automatic irrigation system using wireless sensor networks", Computers and Electronics in Agriculture, no. 78, pp. 215-221,2011.
- [6] Shanshan Li, Shaoliang Peng , Weifeng Chen, Xiaopei Lu, "Practical land monitoring in precision agriculture with sensor networks", Computer Communications , no.36 ,PP: 459-467,2013
- [7] Chu-Fu Wang, Chun-Chia Lee, "The optimization of sensor relocation in wireless mobile sensor networks" Computer Communications , no.33, pp. 828-840, 2010
- [8] Ritesh Madan, Shuguang Cui, Sanjay, " Modeling and Optimization of Transmission Schemes in Energy-Constrained

Wireless Sensor Networks", IEEE/ACM Transactions on Networking, vol. 15, NO. 6, DECEMBER 2007

[9] Veeramanikandasamy T, Rajendran, K. ; Sambath K.,Sangeetha, D., " Remote monitoring and closed loop control system for social modernization in agricultural system using GSM and Zigbee technology", International Conference on Advances in Electrical Engineering (ICAEE), pp. 1 - 4 ,2014