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An Automatic Irrigation System with Wireless Sensors Network using Zigbee

R Kingsly Stephen[1], P. Parameswara Reddy[2], Y. Naga Sumanth[3], K. Sai Sravan Reddy[4]
[1]*Assistant Professor,* [2, 3, 4]*Dept. of CSE, SRM IST, Chennai, India*

Abstract: ***Wireless Sensing Technology is widely used all over the scientific world today. With the technology growing and rapidly evolving, Wireless Sensing Network (WSN) is helping to update the system. The power efficient time is an important problem in the research field of wireless sensor networks. Using the ZigBee technology will overcome the issue. The key purpose of this is to understand how data uses wireless sensor network and monitoring system to move across a wireless medium transmission. This project designs an irrigation system that is automated by using controllable parameters such as temperature, soil moisture and air moisture because these are the important factors to be managed in PA(Precision Agricultures).***
Keywords: surface, drip, irrigation, ZigBee, Humidity Sensor, soil moisture sensor, Temperature Sensor, wireless sensor.

I. INTRODUCTION

In India, where the economy is based primarily on agriculture and climatic conditions are isotropic and are unable to make full use of farm resources. The primary explanation for this is lack of rainfall and land surface water scarification. Continuous extraction of water from earth is rising the water level, as a result of which a lot of land gradually arrives in unirrigated land areas. Another very significant explanation for this is the unplanned use of water, as a result of which a large amount of water goes waste. The most significant benefit of modern drip irrigation systems is that water is supplied near the root zone of the plants drip by drop as a result of which a large quantity of water is saved, the farmers used irrigation technique of India at the present time by manual control in which the farmers irrigate the land at regular intervals. This cycle often absorbs more water, or the water often reaches late because the crops get dried. Water deficiency before visible wilting can be harmful to plants. Slowed rate of growth, lighter fruit weight follows a slight water deficit. This question can be completely rectified when farmers use ZigBee module to use automatic irrigation system.

II. RELATED WORK

WSN' will provide the farmers with the correct means for agricultural production, and will also enable them to spend more and gain more income. In the field sensor of agriculture in WSN senses the temperature, soil and humidity which are necessary to maintain soil fertility. Hybrid sensor network is a wireless network designed for soil communication. ZigBee is a wireless communication system that operates at the same frequency and transmits data from and to the sensing element. Wireless sensor network IEEE 80215.4/ZigBee which manages the entire network and optimizes power consumption using a PAN coordinator. WSN is used for tracking soil condition and regulating energy consumption; MAC protocols play a vital role. Agricultural energy management system based on Beacon wireless sensor network offers real time farm management. Using sensor networks which are also limited in size and have a precise value, we can minimize the costs of intensive computation and hardware tools. Wireless mobile sensor network continues the use of limited sensor battery to increase network life over long periods of time and redundant sensors may adjust their location to increase the overall WSN network life. Transmission schemes are designed and modelled to improve the lifespan of the network and the energy usage in the transmitter circuit along with that for data transmission. In this paper Arduino microcontroller is used for automatic irrigation system with grove moisture sensor and water flow sensor. Arduino microcontroller senses soil moisture content, and data is transmitted using the ZigBee protocol. When the level of humidity exceeds the pre-set level, the water flow inside the pipe is regulated accordingly. All the details, including flow, pressure of water, moisture content etc. Updated in the database, along with the period by which moisture level and motor running time can be tested on display and also on mobile devices via GSM. This paper provides a methodology for the establishment of an automated large-scale irrigation system using ZigBee as a wireless technology with the efficient use of labs and water. Hardware architecture, program algorithm, compact controller and Wireless Sensor Network coordinator in ZigBee etc. Are covered in depth here. In this paper, Multifunctional Samples (MFPz) were used to quantify various soil properties in 2015 International Conference on Pervasive Computing (ICPC) 978-1-4799-6272-3/15/$31.00(c)2015 IEEE such as soil moisture, water flow, soil electrical conductivity etc. A multi-hop ad-hoc fashion network using ZigBee as WSN was used to deploy MFPz across a wide area of the region. IEEE 802.15.4 Wireless

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Microcontroller based radio device was used as the core of the MFPz device. Within this paper the specifics of variable rate irrigation architecture and instrumentation, a wireless sensor network, and software for in-field real-time sensing and control of a site-specific precision linear-move irrigation system were discussed. This paper established an automated irrigation system for maximizing the use of water for agricultural crops. It consists of distributed wireless sensor network consisting of fixed soil moisture sensors and temperature sensors near plant roots. The quantity of water is managed by a microcontroller based gateway device. An effective irrigation management system for the container grown crops is defined in this paper. A wireless sensor network is used for continuous obtaining of soil properties and environmental data. This program scans the locations where water is deficient and intimates the farmer by text massage. This paper proposed an automated system to use GSM and ZigBee technology to make efficient use of water resources for agriculture and track crop production. In the drip irrigation system, the water consumption efficiency is improved by the use of various sensors. The microcontroller obtains the signals from these sensors and is transmitted by ZigBee to the Irrigation Control Center (ICC). The rest of the paper is divided into four parts. Section II explains corresponding paper survey. The section III describes the design sequences of an automatic irrigation system proposed. IV explains automatic irrigation system performance. Concluding remarks can finally be found in section V.

III. DESIGN

WSN has the potential to access the sensors in the proposed network, which offers real-time field data to help achieve real-time tracking, data collection and control from automatic location on fields. Precision agriculture will increase farming productivity and production if the WSN technology can be ready to make the farms.

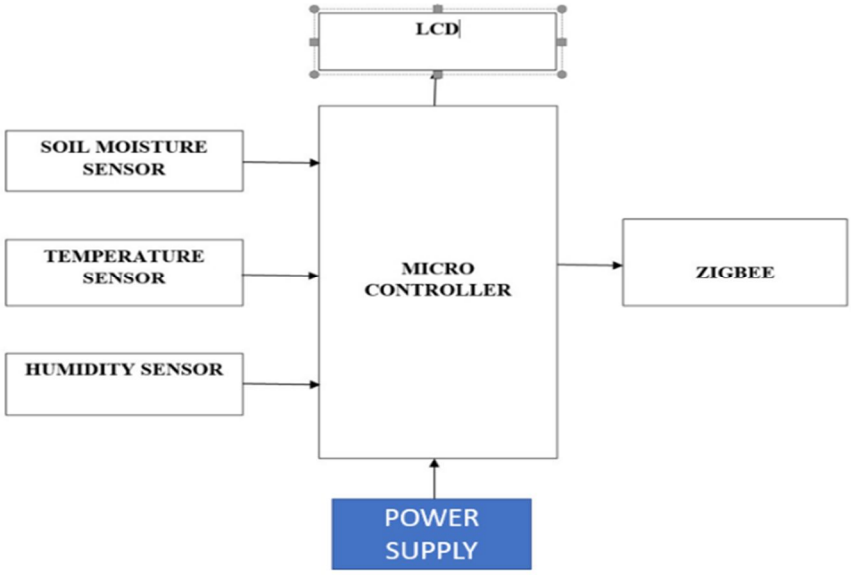


Fig: block diagram

IV. MODULES

1) *Soil Moisture Sensor:* The Soil Moisture Sensor uses ability to measure soil water content (through measurement of soil dielectric permittivity, which is a component of the water content). Just insert this durable sensor into the soil to be measured, and the soil's volumetric water content is recorded in percentage.
2) *Temperature Sensor:* A temperature sensor is usually a thermocouple or RTD unit that provides the measurement of temperature by means of an electrical signal. A thermocouple (T / C) is made of two dissimilar metals, which produce electrical voltage in direct proportion to temperature changes.
3) *Humidity Sensor:* A moisture sensor (or hygrometer) detects, monitors and records both humidity and air temperature. The ratio of humidity in the air to the maximum level of humidity at a given air temperature is called relative humidity. When you are looking for warmth, relative humidity is an significant factor.
4) *ZigBee:* ZigBee is a low-cost, low-power, wireless mesh network standard in wireless control and monitoring applications that target battery-powered devices. ZigBee offers contact which is low latency. Usually ZigBee chips are combined with the radios and microcontroller. 58, Ventilator, motor pump, Buzzer, Relay.

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V. METHODOLOGY

Information of Technology (IoT) can be used to enable farmers to continually update sprinkler status. Data is sensed and constantly modified on the Web page from various sensors such as soil sensors, humidity and temperature sensors, and an android application using the ZigBee Module, to help a farmers verify whether the water sprinklers are on or off at any given time. Different sensors provide the information. This wireless ground irrigation system can be integrated for existing smart control systems. This system is made up of slave nodes and a master station. The frames are transmitted through a ZigBee ad hoc network to the master station. A built-in, fluent, logical irrigation algorithm is given in the station. This algorithm will help us water plants, grass and trees on the basis of a predetermined set of rules. to ensure that the software works properly, we have to follow the following steps:

1) *Step 0:* Connect all of the sensors and all other required hardware in the assembly and connect them to system using ZigBee network.
2) *Step 1:* Begin the model.
3) *Step 2:* Starting power is supplied to the circuit.
4) *Step 3:* You can now test the level of humidity (smaller or larger than). You can monitor moisture, temperature and even track whether or not an intruder has invaded your area.
5) *Step 4:* If, depending on the parameter, this value is more than or less than a fixed threshold, irrigation is not required.
6) *Step 5:* If these values do not exceed a specified threshold, irrigation will begin.
7) *Step 6:* Motor pump start and sprinklers depending on level.
8) *Step 7:* It returns to normal condition as the cycle gets done.
9) *Step 8:* Template finishing.

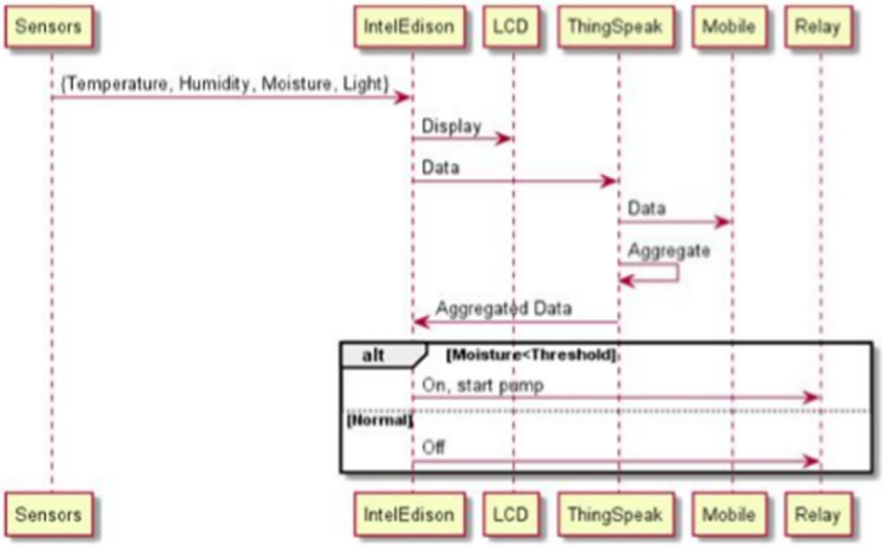


Fig: Sequence Diagram

VI. RESULT

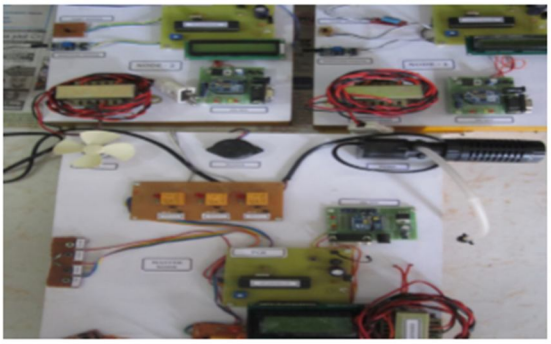


Fig : System hardware setup

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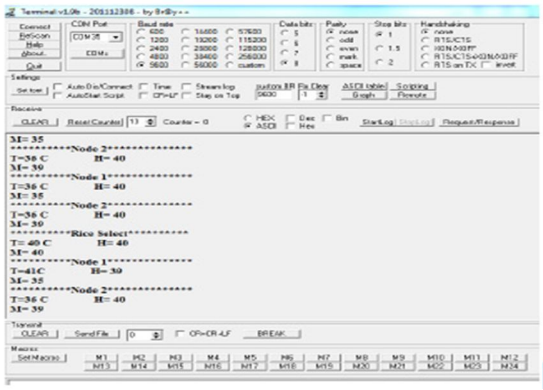


Fig : Computer monitoring system connected with master node.

The farmer has the ability to track the sensor information at home, the sensor information is displayed on both the LCD master node and the Computer. In the master node, the farmer can set crop type such as Wheat, Rice, Jowar, and Bajara. The value of moisture, temperature and humidity required for a given crop is set as a threshold value in the microcontroller. Fixed in the field, the soil moisture, temperature and moisture sensor senses the actual values. The threshold values are contrasted with those. If the actual value reaches the threshold values then ON is switched to corresponding pump, fan or Buzzer. The farmer pressed his or her choice as 1 in the master node, crop type rice is picked, then actual moisture, temperature and humidity values for rice will be displayed on both the master node and the machine via Terminal v1.9b and comapre it and perform the operation automatically.

VII. EXPERIMENTAL ANALYSIS

A. The value of the crop temperature, humidity, soil moisture is natural when the irrigation system is OFF.
B. If the Irrigation System is ON then the crop temperature, humidity value, soil moisture has reached the threshold.
C. When the moisture value has reached the crop threshold, the buzzer gets ON and displays on the LCD and PC master node.

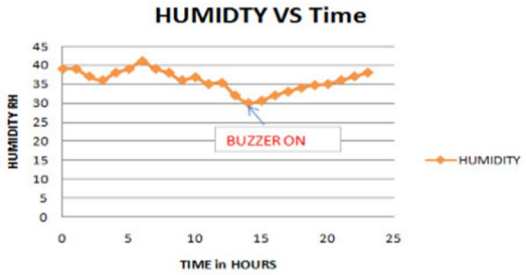


Fig : Buzzer on when cross threshold value

D. When the temperature value crosses the crop threshold, Fan will ON and display on the LCD and PC master node.

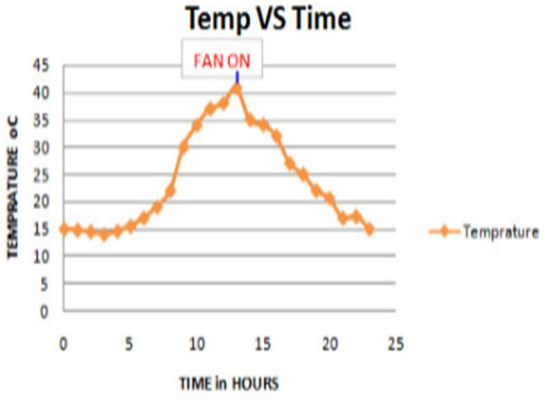


Fig : Fan on when cross threshold value

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E. Once the soil moisture value reaches the crop threshold, Pump will ON and display on the LCD and PC master node.

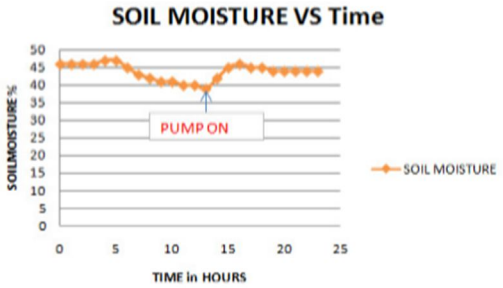


Fig : Pump on when cross threshold value

Based on the above result, we are experimentally analyzing that it performs automatic operation without taking any man power, it also takes the accurate result for monitoring soil quality, enviourmental content and energy efficiency by using ZigBee.

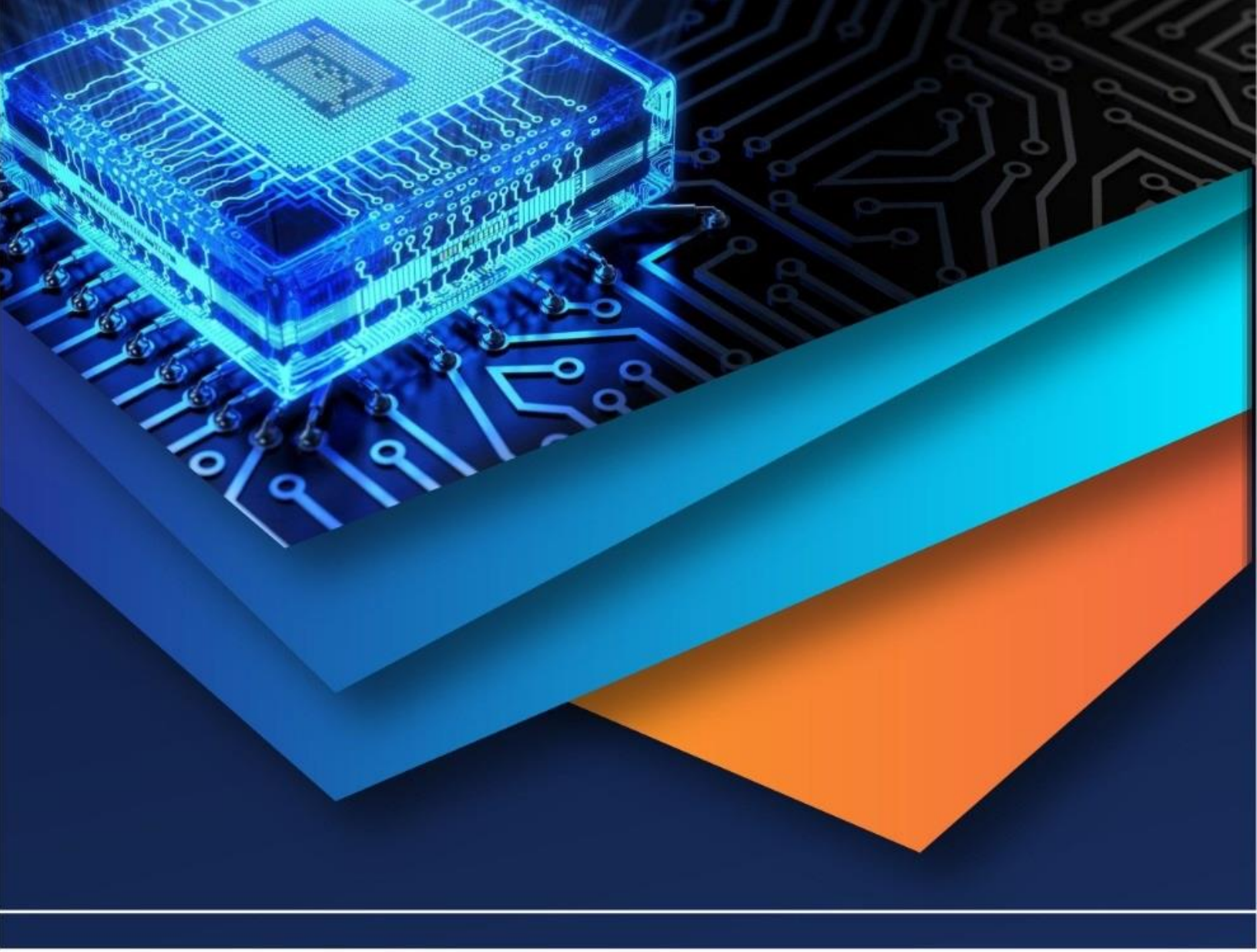
VIII. CONCLUSION

Based on our final result, a normal farmer can link this setup to his computer and select the crop form, so he can track the crop irrigation system automatically along with humidity and temperature control in his field. From this it is concluded that we have been able to use the' ZigBee' technology with wireless sensor network for an automated irrigation process. Iphone will use in future reach to receive messages Directly rather than a personal computer.

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