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Power Efficiency in Agriculture using Wireless Sensor Network.

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***Abstract*-There are various areas in which Wireless sensor network is used like medical, agriculture, military etc. In the recent years agriculture field suffers with different problems like weather, humidity, crop production. Dynamic power management is one of the main problem in the agriculture area. It is used for the capabilities of low power consumption. The energy management is the most important challenges in the field of wireless sensor network. The sensor nodes have conserved large amount of energy. So it is very difficult to change the batteries after a short time period. So to overcome this problem we introduce the design of dynamic power management. With the help of dynamic power management, all the sensor nodes which are used in the field of WSN are stop and when they are needed then wake up again.**

Keywords: wireless sensor networks, dynamic power management, efficiency, sensors, nodes.

I. INTRODUCTION

Today life is very headache and people have no time to present everywhere to complete their task. Because of this situation, there is birth of WSN in which sensors behaves as an alternative of people. WSNs are being working in agriculture area to decrease water wastage and time of farmers. For this, to check the humidity level and water necessity then sensors are fixed in the field of agriculture [1]. Sensors sense according to the necessity of the crop and collect the information and pass it from a network system to microcontroller.

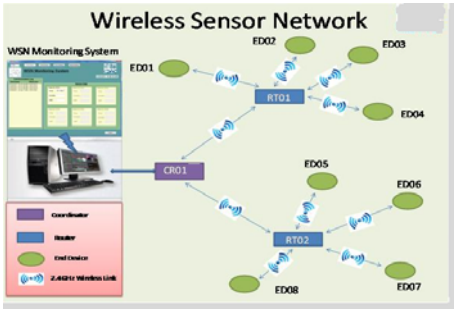

Fig 1.WSN [9]

WSN gather data that is take place and perform some function according to that information. All of these actions change the situation and effect the changes in it etc. because of the connection in between the nodes, all of these changes disturb every mote and all of the information gathered by the mote is routed to the root mote. This root mote is connected to a computer system of higher power that considers a function for which the motes are not planned. The main function is to use the internet and transmit the motes' information to the farmer's computer. The farmer may also communicate with the motes. Farmers will send the commands over the internet to the main computer system. The computer system will exchange the data to the root mote, which then scatter the message to its child motes.

II. TECHNOLOGIES USED

A. Human Observation

Few years ago, monitor the crops is very difficult task. Because in the agriculture field, farmers needs to present all the time in the area. It is very difficult to check the humidity level, moisture, temperature in the soil manually.

B. Zigbee

Zigbee is used in applications that require only a low data rate and long battery life and secure networking. It has a defined rate of 250 Kbit/s intermittent data or a single signal transmission from the sensor or input device. There are various applications that include wireless light switches; electrical meters with in-home-displays, traffic management systems that require short range wireless transfer of data at low rates. [5]

C. Variable rate technology

In the past years, the field was viewed as a uniform field. And if there is a need of water then entire field gets watered. But in the reality the entire field was no need for same amount of water or fertilizer of pesticides. The smartness of precision agriculture comes in the form of variable rate technologies that control delivery of water and chemicals according to what that sub region of the field needs. [4]

D. Remote sensing

The remote-sensing data reveals to the farmer what he already knew: variability is part of the fields. The multi-spectral data is entered into a computer that then calculates the amount of water or chemicals needed, and then automated sprayers vary their application accordingly as the tractor moves across the field.

Remote-sensing data is expensive, and farmers often get together and share the cost by purchasing surveys that span multiple farms. One limitation of remote sensing is time resolution. Ideally fields would be scanned on a daily basis,

E. Wireless sensor network.

In WSN technology in order to monitor the growth conditions of crops, one node has to connect with many sensors, air temperature sensor, air humidity sensor, light sensor, soil temperature/ moisture sensor and so on. An automated green house management system is expected to improve the effectiveness and efficiency of the greenhouse system. [2].

Comparison between technologies.

Parameters	Zigbee	Bluetooth	Wireless	Remote Sensing	Variable rate
Range (m)	70	10	100	5 km	60
complexity	Simple	Very complex	Complex	Complex	Simple
Battery Life	>1year	1 Week	Hours	10 years	Low
Radio	DSSS	FHSS	DSSS	Microwa-ve	OFDM
Data Rate	250kbps	1 Mbps	11 Mbps	1-15 Mbps	10Mbps
Node per Master	30ms	Up to 10 s	Up to 3 s	1 s	Multi master, multi nodes
Data Type	Small data packet	Pictures, files, graphics, audio	Pictures, files, graphics, audio, video	Pictures, files, graphics, audio, video	Pictures, files, graphics, audio
Cost	Less expens-ive	Cheap	Expensive	Expensive	Expensive

TABLE 1. COMPARISON

III. TECHNIQUES USED

A. Precision Agriculture

WSN free the farmer from controlling the wiring of these difficult surroundings. Water system can be checked using pressure transmitters to check the levels of water in tank and pumps can also maintained using wireless devices. Precision agriculture used to control the wastage of water.

B. Accurate Agriculture

WSN check the growth of the crop properly. With the help of this, farmers can know the stages of its crop and he should know the time of harvesting.

C. Irrigation Management

The information related the fields such as temperature level and humidity level are send to farmers by WSN. With the help of this farmers know the each and every plant that how much that plant should want the water. It should inform the humidity level. It should control the quality of the product and cost should be reduced.

D. Green House

Using wireless technologies, temperature level and humidity level also maintained in green houses. If the moisture level and temperature level is not proper according to the plant then it should be noticed to the farmer or manager of the green house via email or message on phone or turn on fans to maintain the variety of system responses. In the green houses, there is need to maintain the weather status at every moment of time.

IV. EXISTING PROBLEMS

The biggest problem in the field of wireless sensor network is power efficiency. WSN handles all the area that have mentioned above. Sensors fixed in the agriculture area used to send data to other nodes using wireless connection. When there are a large number of nodes then power consumption is also very large. With this problem, energy efficiency is very low. There is also very big problem of chain mechanism i.e. to pass information to main source. With this problem, each sensor individually consumes the power and there is increase of power consumption and if there is a use of short range sensors then there is need to increase the radios of sensors to increase their range and in both the cases power consumption will maximize. If number of sensors increase to pass the data then it will introduce time delay in the system. [6,7]

V. PROPOSED WORK

Due to the large area and the node's range should be large, because of this some nodes are unable to communicate with each other. This is because the range of the node is about 30m and the node's radio is used to consume less power in small working area. But there is a problem for those nodes that are out of 30m range. How those nodes are communicate with other nodes? This problem is solved by making packages of data and sends it many nearer nodes which then communicate with other nodes and make the successful path to pass the data to the main node. Each and every sensor contains a transmitter and a receiver that is used to share data with other various nodes. In our proposed work we will develop an algorithm which will monitor that if once the field has got sufficient water for crop, then after how much time there will be requirement of water again. So that sensors should work at that time only. So with the help of this it will increase the power efficiency.

VI. RESULTS AND DISCUSSIONS

Let us consider that the sensor field is a region with a single sink at the center. The entire region is divided into concentric circle around the sink. When a node has sent their data to sink then it will choose the next hop node from the nodes closer ring to the sink.

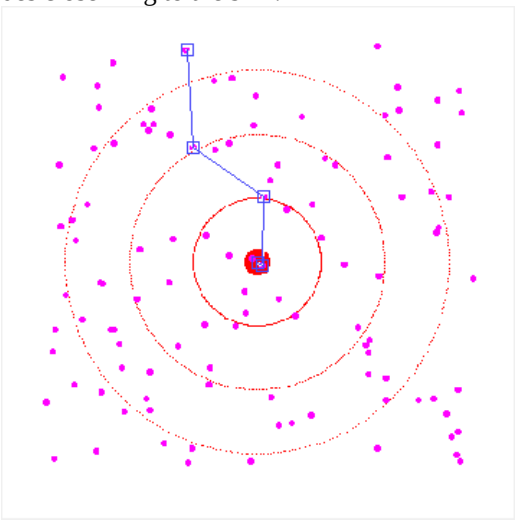

Figure 4. path management.

In the above diagram, let us consider that node n1 wants to communicate with main computer system and transmit its data to main computer system. For the efficient work, nodes choose this path i. e "n1-n8-n20" and in this path nodes select the farthest node to communicate in one region. Because when large number of nodes used then there may be problem regarding energy efficiency. Large number of nodes consume large amount of energy. When the outermost node communicate with the sink then it use only three nodes to send the data to the sink. So less number of nodes used then less consume of power efficiency.

At the starting point, all nodes have 100% power efficiency. This shows in the graph.

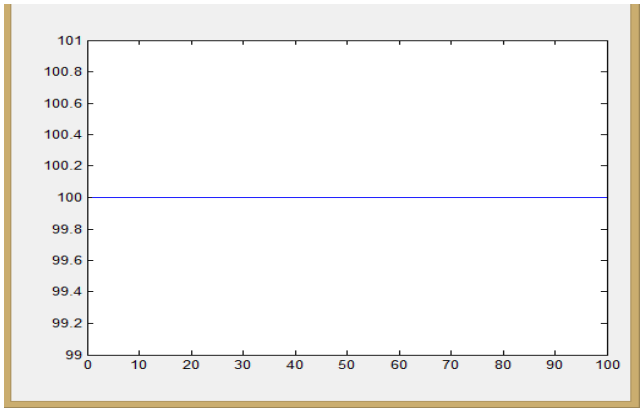

Fig. 5 initial energy stage

In the previous work, the energy efficiency is low even when nodes are not active. Every node consumes 20% battery in the deactive mode. This is shown in the fig. 6

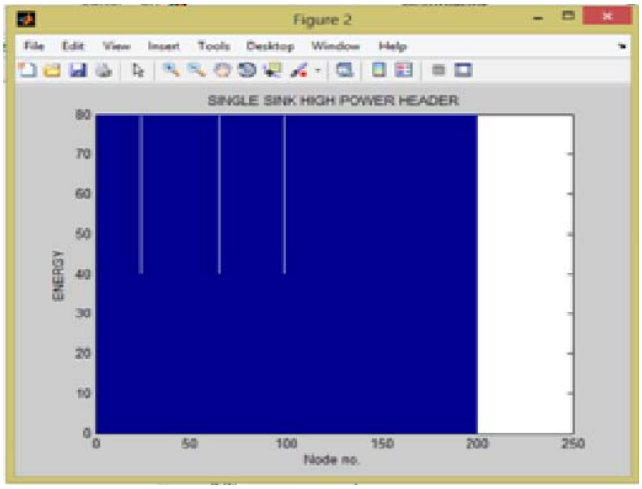

Fig. 6 every nodes consumes energy

Those node are active they consume 40% more battery life and other nodes are consume 20% battery life.

In the proposed work, only those nodes consume energy which are active and other nodes have full energy as 100%. The active nodes consumes 40 % energy. This is shown in fig. 7

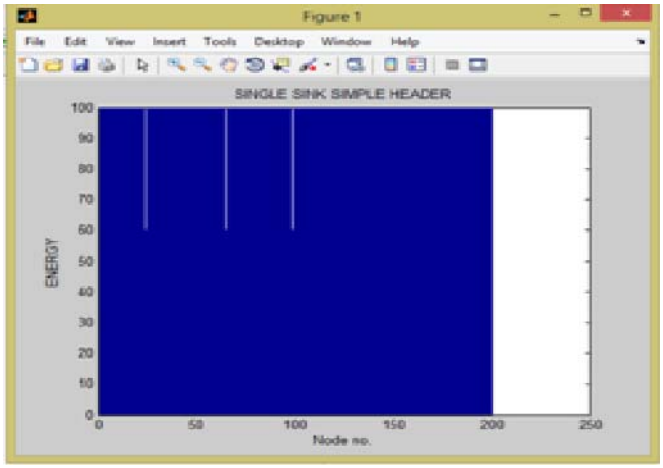

Fig.8 active nodes consume energy.

VII. CONCLUSIONS AND FUTURE WORK.

In this paper we have discuss about the techniques and technologies used in agriculture field. We have also discussed problems in dynamic power management. So to overcome the all above problems we decide some power management techniques for sending, collecting and receiving information on sensors and we also develop some algorithm to decrease the range of sensors by keeping their radio low. In this paper, there is no discussion about the algorithm used for dynamic power management and in our future work I'll discuss the algorithm and proposed work about the prevention of batteries used in the agriculture field.

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