INTERNATIONAL JOURNAL
FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Energy Aware Dynamic Cluster Head Selection Mechanism with Wireless Sensor Networks for Agriculture Application

Vrushali Gade[1], Prof. M. M. Jadhav[2]

[1, 2]*Electronics and telecommunication, Sinhgad College of engineering, Pune, India*

Abstract: In this proposed work arduino based node are designed for experimentation. The sensor such as moisture, temperature, light, humidity is preferred, which is based on Agriculture application. The data collect from this entire sensor are stored and transferred using RF module. An energy conservation technique based on modified LEACH protocol will be used to store energy consumption in the node. This in turn may enhance the lifespan of cluster. The major design challenge for WSN is energy efficiency and lifespan of the network. The sensor nodes utilize limited energy, they are powered by batteries, which should be either replaced or recharged. To reduce other cost of agriculture, concentrate on measuring agriculture parameter, monitoring to enhance productivity of crop in agriculture.
Keywords: wireless sensor network; modified LEACH protocol; Cluster head;

I. INTRODUCTION

The wireless sensor network has become most important area of research. It is possible to monitoring and control Agriculture parameters in rural area due to the development of technology in Wireless Sensor Networks. The physical and digital word link by capturing and showing real word phenomena and these converting into a format and can be processed, stored. Sensor provides tremendous benefits. They can help to increase productivity, enhance security and enable new application [1].

The wireless sensor network can be defied as a device network that can carry the information, which is gathered from monitoring field through a wireless links. The data is forwarded through multiple nodes; data is connected to other network. Sensors detect some kind of input from both the physical and environmental condition such as heat, light, and respond to them. The output of sensor is an electrical signal for further processing that can be transmit to a controller.

The main purpose to define hierarchical protocol is to minimize energy consumption. LEACH is most popular routing protocol to reduce energy consumption that use cluster based routing. The low energy adaptive cluster hierarchy (LEACH) is protocol based on request response protocol. The objective of this protocol is to exceed the lifespan of network by lowering energy consumption along with maintaining cluster head.

In this proposed work new method is introduced for selecting cluster head based on voltage, which is provided through pot, ultimately its result in minimize energy consumption along with enhancement in network lifetime.

II. RELATED WORK

The aim of research is to mimimize energy consumption and enhance the lifespan of network. The hierarchical protocol is based on grouping of nodes into cluster, the most important purpose behind hierarchical routing is the sensor nodes communicate directly with leader node in their own cluster refered as cluster head[1].

In DBES-LEACH protocol[2], two new distance based routing protocol proposed which are DB LEACH and DBEA LEACH. The cluster head is selected according to the position of sensor node to the base station.

EAC [3] has introduced two main factors distance and energy. A cluster head is selected according to rest energy of node and other nodes select their cluster head based on their cluster head. Cluster head generate TDMA schedule and send plan to cluster member.

LEACH-R protocol [4] was proposed, which is based on LEACH protocol. This algorithm sends data in multihop way to enhance the network lifespan as compared to LEACH. The selection of cluster head is improved by LEACH-R protocol.

In GCMRA [5] protocol, in this proposed work observe hot spot issue and present grid based clustering together with routing algorithm. The protocol is technique based on location, the entire area is split into section, nodes in each section consider as a cluster.

MODLEACH protocol [6] is extension to LEACH to increase lifetime and capacity of network for wireless sensor network. MODLEACH is variant of LEACH that can utilize in other cluster routing protocol for better efficiency. The cluster head only is replaced in MODLEACH, when its energy decrease lowers than threshold. The double transmission power stage also introduced by MODLEACH.

III. PROPOSED SYSTEM

The modified LEACH protocol is proposed system, which is LEACH protocol extension. As shown in block diagram, node consists of hardware and some analog sensors such as moisture, Temperature, Light sensor and humidity sensor. These sensors are utilized to check the environmental reading. Here the sensors are connected to the inbuilt 10 bit ADC of ARDUINO μC. The analogue reading is converted to digital and is saved in the internal RAM memory of μC. Also we are sending the data to remote server using RF module.
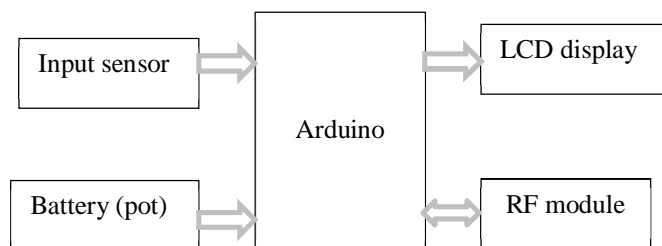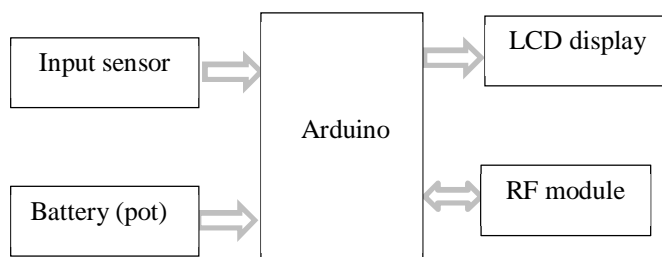

Fig. 1. Master

Fig. 2. Slave (cluster head)

Fig. 3. Slave (cluster slave)

A. Master

The designing a remote farm server, having a graphical user interfaces to display all the data from the slaves in the respective columns. The server will communicate with the slaves using RF trans-receiver. The protocol used is the Modified LEACH.

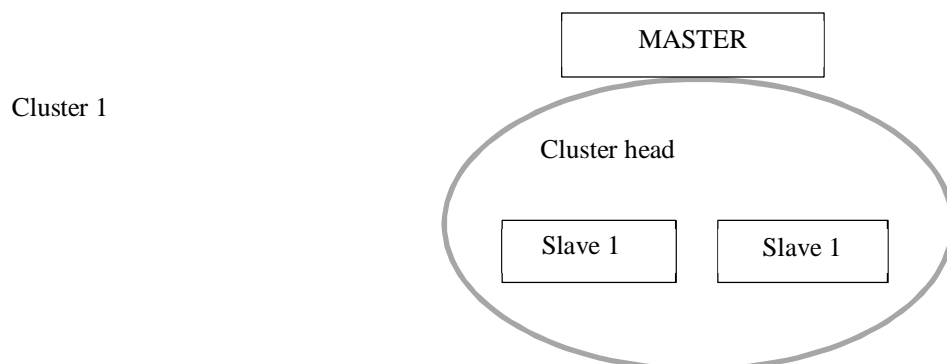Network structure for LEACH protocol:

Fig. 4. Network structure for LEACH protocol

The master select cluster slaves, and cluster head communicate with each other using request and respond protocol. The inter cluster communication is based on time division multiple access.

B. Dynamic cluster Head selection Technique

WSN consider 1 Master and 2 slave's structure, configured using RF. In this network Modified LEACH protocol is used.

LEACH protocol: A hierarchical clustering algorithm introduce for sensor networks, called Low Energy Adaptive Clustering Hierarchy (LEACH). LEACH is a cluster-based protocol. It includes distributed cluster formation. LEACH randomly selects a few sensor nodes, it act as cluster heads (CHs) and rotates this role to evenly distribute the energy load among the sensors in the network.

In LEACH, the data arriving from nodes is compressed by the cluster head nodes that belong to the respective cluster, and send an aggregated packet to the base station in order to minimise the amount of information that must be delivered to the base station. LEACH uses a TDMA MAC to minimize inter-cluster along with intra-cluster collisions. However, data collection is centralized and is performed periodically. Therefore, when there is a need for constant monitoring, this protocol is most appropriate by the sensor network. Those nodes are not cluster heads that only communicate with cluster head in request response manner, according to schedule, which is created by cluster head.

Modified LEACH protocol:

In Leach Protocol the Cluster head has to communicate both sides that is collect data from Base stations and transmit data to Master. Due to this the Cluster head uses more energy than the Cluster slaves. Send battery voltage of cluster head as well as the cluster Slaves to the Master. If the Cluster head's Battery is draining fast then the new cluster head is selected into the cluster that has the most energy level (Battery voltage). So, because of this there is a balance between energy levels along with all the nodes in the cluster. This technique helps in maintain an Energy balance through which the network life increases.

IV. EXPERIMENTAL SETUP

The display unit plays important role between human word and machine word to establish good communication. Arduino is interface with 16 Character and 2 Line display as showing in Fig. 5. The character is display on LCD display.
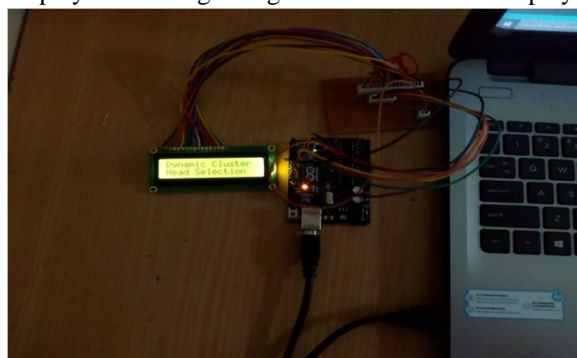

Fig. 5. Interfacing of Arduino and LCD

The sensor such as moisture, temperature, humidity, LDR is interface with arduino for displaying results, which display the environmental real time value.
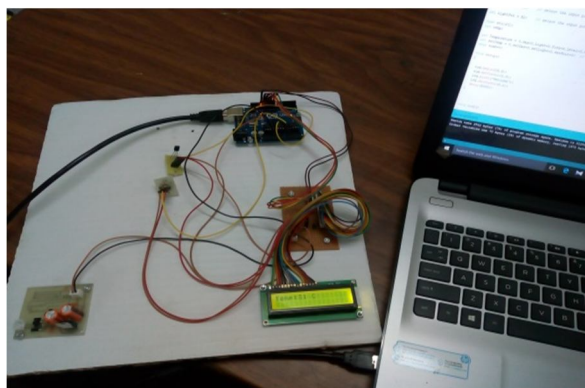

Fig.6. Interfacing of Arduino and sensor

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue VIII, August 2018- Available at www.ijraset.com

In fig.7. Arduino interface with sensor, LCD display, RF module, and battery (pot).The sensor is used for sensing, and its value display on LCD.
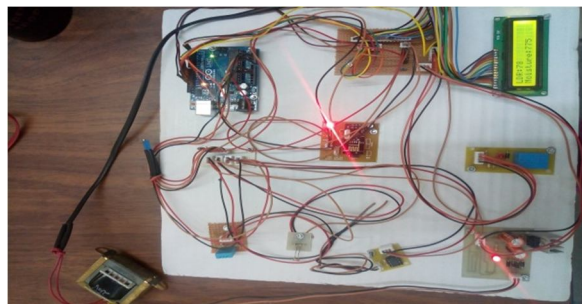

Fig.7. Slave

V. RESULT

Cluster head is dynamically selected depending upon battery voltage. So as the number of slaves in the network increases the transmissions via cluster head remain fairly constant since the cluster head is dynamically changed and the battery voltage of cluster head remains constant. .

Fig.7: CH = 1

Here the CH keeps changes so the network life remains fairly constant even though the slaves increase.

Fig.8: CH = 2

The cluster head is changed, which is depends on the battery voltage of the slave. The slave, which has more battery power will become a cluster head.

VI. CONCLUSION

This paper use wireless sensor network to collect real time data from nodes and transmit to the base station by using RF modules. The agriculture based parameters are sensed,analaysed and displayed, it is received, for monitoring agriculture for increasing productivity of crops. The modified LEACH protocol helps to maintain life time of WSN node.

REFERENCES

[1] C. P. WaltenegusDargie, "Fundamentals of Wireless Sensor Networks," A John Wiley and Sons, Ltd., Publication, 2010.

[2] T. G. Nguyen, C. So-In, and N. G. Nguyen, "Two energy-efficient cluster head selection techniques based on distance for wireless sensor networks," in Computer Science and Engineering Conference (ICSEC), 2014 International, 2014, pp. 33-38.

[3] M. Mohamed-Lamine, "New clustering scheme for wireless sensornetworks," in Systems, Signal Processing and their Applications (WoSSPA), 2013 8th International Workshop on, 2013, pp. 487-491.

[4] N. Wang and H. Zhu, "An energy efficient algrithm based on leachprotocol," in Computer Science and Electronics Engineering (ICCSEE), 2012 International Conference on, 2012, pp. 339-342.

[5] S. Jannu and P. K. Jana, "Energy Efficient Grid Based Clustering and Routing Algorithms for Wireless Sensor Networks," in Communication Systems and Network Technologies (CSNT), 2014 Fourth International Conference on, 2014, pp. 63-68.

[6] D. Mahmood, N. Javaid, S. Mahmood, S. Qureshi, A. M. Memon, and T. Zaman, "MODLEACH: A Variant of LEACH for WSNs," in Broadband and Wireless Computing, Communication and Applications (BWCCA), 2013 Eighth International Conference on,2013, pp.158 163.Communication Systems and Network Technologies (CSNT), 2014 Fourth International Conferencenon,2014,pp.63-68.

INTERNATIONAL JOURNAL
FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)