International Journal of Engineering Research and Development
e-ISSN: 2278-067X, p-ISSN: 2278-800X, www.ijerd.com
Volume 11, Issue 02 (February 2015), PP.58-61

Enhancing the Energy Parameter of Leach Protocol For Wireless Sensor Network

[1]Ruby Yadav, [2] Rajender Patel, [3]Sunil Lavadiya
[1, 2, 3]Marwadi Education Foundation's Group of Institutions, Rajkot-360003 (Gujarat)
(Electronics and Communication Department)
[2]Head of Department, Marwadi Education Foundation's Group of Institutions, Rajkot-360003 (Gujarat)
[3]Assistant Professor, Marwadi Education Foundation's Group of Institutions, Rajkot-360003 (Gujarat)

Abstract:- This paper presents a very new version of LEACH protocol, called as modified LEACH (MOD_LEACH), which focuses more on reducing the energy consumption within the Wireless Sensor Network. We evaluate both LEACH and LEACH-C through extensive simulation using NS-2.35 and the results shows that MOD_LEACH performs better and more energy efficiency than LEACH protocol.

Index Terms:- cluster, LEACH protocol, wireless sensor networks, routing protocol, MOD_LEACH

I. INTRODUCTION

HE Wireless Sensor Network consists of nearly about hundred and thousands of small tiny devices, which are distributed autonomously, called as sensor nodes. These nodes used to monitor physical or environmental conditions such as temperature, acoustics, sound, pressure, vibration and motion. Since the nodes are battery operated, the energy plays an important role in WSN. As a result, many more protocols have been proposed for initializing the energy consumption of these sensor nodes.

Typically, each and every node in a sensor network consists of one or more sensors, a radio transceiver or other wireless communication devices, a very small microcontroller and the energy source. As in most of the cases of WSN applications, energy plays an important role, since energy source is a battery. The important goal is preserving the consumed energy of each node, which should be considered, while making a routing protocol for wireless sensor network.

In WSN the main objective behind the routing protocol is to make the network more useful and much efficient. Routing protocol is categorized into 3 parts based on the structure of network, which are flat routing, hierarchical routing and location based routing. In flat routing, for collecting or generating the data and routing to the destination, all the sensor nodes of the network performs the same functionality and works together. The directed diffusion protocol and (SPIN) Sensor Protocol for Information via Negotiations protocol are some of the examples which belongs to this flat routing. In the hierarchical routing, the whole network is partitioned into many clusters for the improvement of scalability and utilization of the energy of the nodes efficiently. LEACH protocol is an example for this. Whereas in location based routing, each and every nodes locations are monitored continuously, for finding the routing path for the communication purpose. Global Positioning System (GPS) devices are used along with network nodes. Examples are GRS (Geographic Adaptive Routing).
Many routing protocol have been proposed in the literature such as LEACH protocol.

LEACH is Low Energy Adaptive Clustering Hierarchy. It is considered as the very most popular routing protocol which uses the cluster based routing for minimizing the energy consumption. In this paper we propose an enhanced LEACH protocol that will further improve the consumption and making it energy efficient.
In section 2 we discuss in details the Leach protocol, section 3 the disadvantages of the Leach protocol, section 4 contains related work, in section 5 we introduce our proposed protocol MOD_LEACH protocol and in section 6 we conclude the paper.

II. LEACH PROTOCOL

LEACH protocol is the first hierarchical cluster based routing protocol, proposed by Wendi. B. Heinemann, et al. for wireless sensor network. It divides the nodes into clusters, and a dedicated node in cluster with extra privileged called CH (Cluster Head). Leach selects the CH randomly and assigns this nodes by following the policy of round robin management for ensuring fair dissipation of energy between nodes. The CH

18th December 2014, ruby.yadav1127@gmail.com
18th December 2014, ruby.yadav1127@gmail.com

is then responsible for creating and manipulating the TDMA (Time Division Multiple Access) schedule and in order to reduce the amount of information transmitted to the BS(Base Station), the CH aggregates the data from the nodes where these data is needed using the CDMA (Code Division Multiple Access). All the other nodes are the members of cluster.
Leach is divided into rounds:

A. Set-up phase
B. Steady state phase

A. SETUP PHASE

Each node decides independently if it will become a CH or not. The decision takes into account the node that hasn't been a CH for longer time is more likely to choose itself rather than the nodes which have been a CH recently. By sending the advertisement packets or broadcasting the ADV messages to all non CHs, the CH informs that they become the cluster heads. With the strongest received signal strength, the non-CH nodes picks the advertisement packet.

The members nodes informs the CH, that they have become a member to that cluster by sending "join packet" contain their IDs using the CSMA. So, the CHs knows or gets the information about their member nodes and their IDs. On this basis of all received messages within the cluster, CH creates a TDMA schedule. Randomly pick a CSMA code, and broadcast the TDMA table to cluster members. After that steady state phase begins.

B. STEADY STATE PHASE

All the non-CH nodes start transmitting the data, after allotment of the TDMA slots, to the CH. The nodes will keep its antenna in ON state only when the data transmission begins. In the other time, it remains OFF in order to save power. The CH will always be in the ON state. Once all the information is received from the nodes (non-CH) by the CH, it does an intelligent data aggregation on the received data and send it to the BS.

III. DISADVANTAGES OF LEACH PROTOCOL

Leach suffers from many drawbacks which are:
1. Random selection of the cluster head; that does not consider the energy consumption.
2. Some cluster contains more number of nodes and some less.
3. Unable to cover the large area.
4. Non-uniformly distributed CHs; where some CH s are located at the edge of the cluster.
5. Different size of the cluster, which leads to difference in the frequency of sending data from node to CH and CH to base station differs.

IV. RELATED WORK

A. V-LEACH PROTOCOL

In V-LEACH the cluster contains; CH (it is the responsibility of the CH towards sending data that is received from the cluster members to the BS), vice-CH (in case if the CH dies, the node will become the cluster head), cluster node (collects data from environmental surrounding and sends the data to the CH). But in original LEACH, the CH remains always in ON for receiving data from cluster members, aggregate the data and then send it to the base station, which might be located at a far distance from the BS. The CH dies earlier than other nodes because of the operations it performs of sending, receiving and overhearing. Hence the cluster will be useless and there will be no data transmission. It has the advantage that there will be no need of electing a new CH every time.

B. C-LEACH

LEACH doesn't take the responsibility of the placement and the number of cluster heads. In this an enhancement over the LEACH was proposed. The protocol is known as the LEACH-C which uses a centralized clustering algorithm and after that following the same steady state phase as the original LEACH. At the time of set-up phase of LEACH-C, each and every nodes sends its current location and residual energy information to the BS. Once the energy cost of communication with BS becomes higher than energy cost of cluster formation. LEACH-C no longer performs good performance and dependence of BS location becomes a major disadvantage.

C. LEACH-M

It is an improved version of LEACH called multihop leach (LEACH-M). No matter the distance from the CH to BS, the CH communicates with the BS. So it will consume a lot of energy. The focus will be on the heterogeneous sensor networks, in which two types of sensors are displayed:

High capacity sensor and simple sensors. The sensors which have large capacity processing capabilities and communicates very intensively and acts as cluster head, while others which are simple sensors have limited power, affiliated to the closest CH in their neighborhood and communicates with it directly.

V. PROPOSED WORK

Step 1:

- At the starting all the nodes send its residual energy to the Base-Station.
- Base-station generate the Threshold Value and broadcast to all participate node and compare with the Threshold Value and here I use other two parameters like residual energy and distance of each participation node to Cluster-Head
- Total three parameters 1) Random value > Threshold value

2) Residual Energy

3) Vicinity

- Using above parameter Cluster-Head decide in the first round. In the second round I ignore the previous condition used by the LEACH is like that newly select CH is become a previously selected CH are not? It is because of the residual energy parameter.

Step 2:

- After decide CHs, all CH send two parameter to the Base-Station :

1) Distance of CH

2) Residual Energy.

- Based on above step parameters Base-station chose the MASTER-CH. So, other becomes SLAVE-CHs.
- During the communication only MASTER-CH can communicate with the Base-Station. Other SLAVE-CHs send data to MASTER-CH.
- In each round MASTER-CH become different by the BS because of each round residual energy of nodes become different for CH.

Step 3:

- During communication participate nodes communicate with SLAVE-CH using TDMA time slot and SLAVE-CHs communicate with the MASTER-CH.
- Finally, MASTER-CH sends data to BS using CDMA technology.

Step 4:

- So, using this HYBRID algorithm I can enhance lifetime of network and residual energy of each node, and also I can design cluster based on VICINITY.

REFERENCES

[1]. National Inst. Of Standard and Technology, "Federal Information Processing Standard Publication 197, the Advanced Encryption Standard (AES)," Nov. 2001

[2]. J. Daemen and V. Rijmen, "AES Proposal: Rijndael," AES Algorithm Submission, Sept.1999

[3]. Jagadguru Swami Sri BharatiKrishnaTirthji Maharaja: Vedic Mathematics: Sixteen Simple Mathematical Formulae from the Veda, pp. 5-45. MotilalBanarasidas Publishers, Delhi (2009)

[4]. Huddar, S.R.; Rupanagudi, S.R.; Kalpana, M.; Mohan, S., "Novel high speed Vedic mathematics multiplier using compressors," in Automation, Computing, Communication, Control and Compressed Sensing (iMac4s), 2013International Multi-Conference on, vol., no.,pp.465,469, 22-23 March 2013

[5]. William Stallings, Cryptography and Network Security, Principles and Practices, 4th ed. Pearson Education, pp. 134-161, 2006

[6]. Charlie Kaufman, Radia Perlman, Mie Speciner, Network Security, Private Communication in a Public World, 2nd ed. Pearson Education, pp. 41-114, 2006

[7]. T. K. Moon, "Rudiments of Number Theory and Algebra," in Error Correction Coding Mathematical Methods and Algorithms, 1st ed. New Jersey: John Wiley & Sons, 2005, pp. 175-188,193-209.

[8]. Ahmad, N.; Hasan, R.; Jubadi, W.M; "Design of AES S-Box using combinational optimization", IEEE Symposium on Industrial Electronics & Applications (ISIEA), pp. 696-699, 2010.

[9]. Berent, Adam. "Advanced Encryption Standard by Example", Document available at URL http://www.networkdls.com/Articles/AESbyExample.pdf (April 1 2007) Accessed: June 2013

[10]. Li, Hua, and Zac Friggstad. "An efficient architecture for the AES mix columns operation." Circuits and Systems, 2005. ISCAS 2005. IEEE International Symposium on. IEEE, 2005.

[11]. Khandekar, P.D.; Subbaraman, S., "Low Power 2:1 MUX for Barrel Shifter," Emerging Trend in Engineering and Technology, 2008. ICETET'08. First International Conference on, Vol., no., pp.404, 407, 16-18 July 2008.

[12]. R.K.Bathija, R.S.Meena, S. Sarkar, Rajesh Shah Tinjrit, "Low power high speed 16*16 bit Multiplier using Vedic mathematics", International journal of computer Application, volume 59, December 2012.

[13]. Huddar, S.R.; Rupanagudi, Ramya R.; Yadav S.; Jan S., "Novel Architecture for Inverse Mix Columns for AES using Ancient Vedic mathematics on FPGA," International Conference on advances in Computing, Communication and informatics (ICACCI). IEEE 2013.

[14]. Ambika R, C. S. Mala, S. K. Pushpa, "FPGA Implementation of AES using Vedic Mathematics," International Journal in Innovative in Engineering and Science, ISSN (Online) 2347-3207.

[15]. Divan Raimagia, Charvi Chanda, "To make trust relationship between BGP speakers with help of secure private key", Engineering (NUiCONE), 2012 Nirma University International Conference DOI: 10.1109/NUICONE.2012.6493249 Publication Year: 2012 , Page(s): 1 - 7.