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A Dynamic Two key Factor Technique Security Adoption in WSN (Improved LEACH)

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Abstract- ***Wireless Sensor Networks (WSNs) have great potential to support several important wireless applications, including real-time multimedia communication, medical applications, surveillance using sensor networks, industrial applications, military surveillance and home networking applications. But there are two challenging issues (i) communication bandwidth and (ii) energy are very important to design wireless and mobile systems because these are very much limited in network environment. Therefore it requires intelligent communication and design techniques to increase bandwidth as well as energy efficient protocol. The most efficient routing protocol LEACH (Lower Energy Adaptive Clustering Hierarchy) in wireless sensor networks (WSNs) has been incorporated by Heinzelman et.al. LEACH uses the concept of dynamic clustering when sensor nodes are deploying randomly where number of cluster impact on the network. This paper describes the network quality that depends on different characteristics of data transmission as a Modification on LEACH protocol. In this paper, we discussed and explain the comparison of magnitude, phase, phase delay, group delay, amplitude of broadcasting and energy consumption respectively.***

Keywords: Protocol, Improved LEACH protocol, lifetime, Wireless Sensor Network.

1. Introduction

In recent years, the wireless sensor networks have become one of the hot topic of area of research. Wireless communication has shown its numerous advantages over wired communication and has within the last decade become a regular mode of communication in people's everyday lives.

The list of potential uses for wireless sensor networks seems to be unending, with different applications areas such as security, medicine, industrial machinery monitoring, the military, agriculture and others. These networks are no longer limited to military applications but are used in a wide array of applications including habitat monitoring [1], industrial process monitoring [2], traffic control [3], [4], health care [5], etc. This paper [6] improves the current security mechanisms in wireless sensor networks as well as reducing power consumption. LEACH protocol provides an energy routing protocol. However, it doesn't cover the security problems. Alternatively, this paper aims to provide an improved secure and more energy efficient routing protocol called LS-LEACH (Lightweight Secure LEACH). Authentication algorithm is integrated to assure data integrity, authenticity and availability. Furthermore, this paper shows the improvement over LEACH protocol that makes it secure and how to make it more energy efficient to reduce the effect of the overhead energy consumption from the added security measures. In [7] cluster based routing in wireless sensor networks is studied precisely. Further, authors modify one of the most prominent wireless sensor network's routing protocol "LEACH" as improved LEACH by introducing efficient cluster head replacement scheme and dual transmitting power levels. Our improved LEACH, in comparison with LEACH out performs it using metrics of cluster head formation, through put and network life. Afterwards, hard and soft thresholds are implemented on improved LEACH that boasts the performance even more. In [8] an improved routing algorithm based on LEACH, known as ILEACH, is proposed in this paper. Firstly, the ILEACH employed the residual energy to form clustering, which can avoid the low energy node becoming a cluster head. Secondly, an energy function is proposed to balance the energy consumption among cluster heads. Finally, a data aggregation tree is constructed to transmit the data from the cluster heads to sink node. Wireless sensor networks (WSNs) consists sensors which communicate to sensors by multihop. Generally research is continuing on sensor network through two stages, at the beginning stage is primarily intended for node and the last stage is for network-level issues. The main research works in this stage involve the network layer and MAC layer protocol based on energy optimization, node localization technology, clock synchronization technology and data fusion technology [9].

As the power of the sensor node cannot be increased then how the nodes can be efficiently use in the network so that system energy becomes the prime factor for designing routing protocol. In this paper, we proposed a new energy model in our protocol and compare several aspects with existing LEACH protocol.

2. Leach Protocol

A typical hierarchical routing protocol is LEACH Protocol which is self-adaptive and self-organized. LEACH protocol uses round as unit for the purpose of reducing energy costs and each round is made up with two phases such as cluster set-up stage and steady-state stage. The steady-state phase must be longer than set-up phase. Wireless sensor networks is a subset of ad-hoc network consists static or dynamic nodes for data transmission in the network by self organized way and multi hop way. The main activity of node is data centric and collecting information for the user [10]. It is seen that sensor node performing mainly three functions data acquisition, processing and transmission, which are related to wireless technology, modern technology, computer and communication technology. Here the sensors are used as a basic element of WSNs where sensors are collecting, processing and transmitting information.

2.1. Cluster Head selection algorithm in LEACH

Two phases are in LEACH protocol which is (i) the cluster formation and (ii) data receiving and transmission phase and round as defined the time slot gap between two phases. In the cluster head selection phase sensor node generates a random number which lies within 0 and 1, if that number is less than threshold value T (n) then in that round it selects that node to act as clusterhead, and acknowledge that node to the other neighbor [11]. The formula for T (n) is given below:

$$T(n) = \begin{cases} \dfrac{p}{1 - p * \left(r \bmod \frac{1}{p}\right)}, & if\ n \in G \\ 0 & otherwise \end{cases}$$

r indicates the present round, selection of a node to be a clusterhaed with probability, p and those nodes are still not become clusterhead in previous (r-1) round, will form another set G. We consider here N as the total number of nodes in the network, the approximate number of cluster head to be considered as k , where $p = k/N$. Each node has opportunity to become a cluster head once by this algorithm, if one node become cluster head in a particular round, it will lose to become another time cluster head in other round.

3. Improved Leach Protocol

3.1. Our Energy Model

In our protocol we consider energy for each round. We consider our energy model as given below:

$$Energy = Energy + S(i).E * \frac{(i-1)}{rmax - i} \quad (1)$$

Where i stands for number of iteration, rmax is maximum number of rounds, Energy as our initial energy and s(i).E consider as energy level of each node after rounds.

3.2. Simulation Parameter

Simulation parameters are considered in this paper as:

1) Sensor nodes are randomly deployed and distributed in a square region;
2) Sensor nodes are homogeneous, nodes energy is limited. The node's location does not vary much even after deployed.
3) Base station location consider according to the user or center of the region.
4) Communicate to base station from sensor node in either single-hop or multi-hop.
5) The wireless transmitter, receiver and data aggregation power is according to LEACH protocol.

Set monitoring area according to the simulation, the number of nodes can varies according to the need, hopcount varies with nodes, base station can be considered according to the user. Specific parameters are shown in Table I.

3.3. Analysis of Improved LEACH

Energy consumption of the network under different number of rounds for LEACH and Improved LEACH protocol has been carried out and from simulated result it is observed using Eq. (1) our protocol reduces energy consumption than LEACH protocol, which has been shown in Fig. 2.

3.3.1. Simulation of Improved LEACH

In our simulation we consider 100 nodes randomly distribute within the square area of the 100m*100m, the base station is located in the centre of the region, the base station coordinates is (50, 50). It can be seen from the Fig. 1 that the nodes' are distributed randomly.

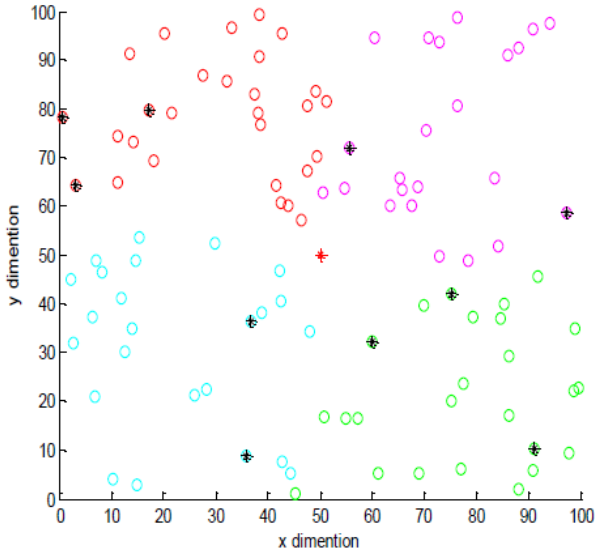

Figure 1: Randomly distributed nodes

In Fig. 1 cluster head are selecting from nodes and transmitting data to base station. Energy consumption is more in LEACH than Improved LEACH. We Consider 100 nodes for simulation LEACH and Improved.

3.3.2. Energy Consumption Simulation

The comparison of energy consumption with node is shown in Fig. 2, where energy consumption by LEACH protocol is more than Improved LEACH protocol. Therefore the energy figures illustrates that Improved LEACH protocol reduces the energy consumption.

3.3.3. Data Received by Base Station

There are effective broadcast by cluster head, because of the effective data transmission fail means retransmission is needed that will send more data to the base station. Here the simulation has been done upto 500s and cluster head stop sending data until the transmitted data reached at destination. Our protocol, Improved LEACH protocol under optimum number of cluster head can improve efficiency of the wireless sensor networks.

4. Conclusions

LEACH and Improved LEACH protocols were implemented in TinyOS with some degree of success. The basic evaluation of these protocols was carried out and different phase

comparison has been made and showed by different graphs. During the design and implementation of the protocols it was clear that performance gains by Improved LEACH better than LEACH. The implemented protocols might prove to be more successful when used for routing packets in sensor networks.

References

[1] Mainwaring, A, Culler, D, Polastre, J, Szewczyk, R and Anderson, J. 2002. "Wireless Sensor Networks for Habitat Monitoring". In Proceedings of the 1st ACM International Workshop on Wireless Sensor Networks and Applications, pp.88-97.
[2] Antoniou, M, Boon, M. C., Green, P. N., Green, P.R., and T.A. York, T.A. 2009. "Wireless Sensor Networks for Industrial Processes". In Sensors Applications Symposium, pp.13 -18.
[3] Liu J and Fang, Y. 2006. "Urban Traffic Control System Based on Wireless Sensor Networks". IEEE International Conference on in Information Acquisition, pp.295-300.
[4] Zhang, H, Pan, C, Yang, J, Dong, H, Qin, Y and Jia, L. 2010. "SN-UTIA: A Sensor Network for Urban Traffic Information Acquisition". In Intelligent Vehicles Symposium (IV), pp. 566 -571.
[5] Milenkovi, A, Otto, C and Jovanov, E. 2006. "Wireless Sensor Networks for Personal Health Monitoring: Issues and an Implementation". Computer Communications (Special issue: Wireless Sensor Networks: Performance, Reliability, Security, and Beyond, 29, pp.2521-2533.
[6] Alshowkan, M, Elleithy, K, AlHassan, H. 2013."LS-LEACH: A New Secure and Energy Efficient Routing Protocol for Wireless Sensor Networks" in 17th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, pp.215-220.
[7] Mahmood, D, Javaid, N, Mahmood, S, Qureshi, S, Memon, A.M, Zaman, T. 2013. "MODLEACH: A Variant of LEACH for WSNs" Eighth International Conference on Broadband, Wireless Computing, Communication and Applications, pp158-163.
[8] Jing, Y, Zetao, L, Yi, L. 2013. "An Improved Routing Algorithm Based on LEACH for Wireless Sensor Networks", 25th Chinese Control and Decision Conference (CCDC), pp-3716-3720.
[9] Roseline, R. A. and Sumathi, P. 2011. "Energy Efficient Routing Protocol and Algorithms for Wireless Sensor Networks-A Survey". Global Journal of Computer Science and Technology, 11(21).
[10] Xun-xue, C. 2009. "Wireless Sensor Network Brief Tutorial", Qing Hua University Press,Beijing.
[11] Mei-hong, H., Cheng-qian, X. and Dong-liang, Z. 2009. "The simulation and analysis of LEACH protocol Based on NS2", Electronic Measurement Technology, vol.1, pp.40-42.