Author et al. 2019, 7:3
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

International Journal of Science, Engineering and Technology

An Open Access Journal

Reliable and Energy Efficient Routing Protocol in Dense Wireless Sensor Network

M.Tech. Scholar Munna Kumar[1], Prof. Rahul Pandey[2]
Department of Electronics & Communication Engineering
School of Research & Technology, People's University
Bhopal, (MP), India

Abstract- In Improved LEACH it is essential that the current cluster head communicates with all nodes in its cluster in order to find out the remaining energy of each node and it is also necessary to have larger memory and higher processing ability in comparison with D-LEACH to select the cluster head for the next round. The amount of communication and processing consume the major part of nodes energy level, which decreases network lifetime. On the other hand, in the D-LEACH algorithm the current cluster head sends a packet only towards its closest neighbor and then this node decides whether to become the cluster head or not. This technique makes the system able to reduce the amount of communication and processing time, and as a result, saves more energy in our network. Thus, the network lifetime will increase.

Keywords- WSN, LEACH, DEEC, D-LEACH.

I.INTRODUCTION

Wireless sensor networks consist of independent sensors which monitor the environment and communicate with each other wirelessly for sending information to a base station (BS) [1]. For analyzing analogue data sensors connect the real world with the digital world by capturing and monitoring the environment to gain information, which lead to turn analogue data to digital data.

By the use of this information which is obtained from sensors, we can increase productivity, security and it makes us able to consume resources in an efficient manner. Recently, sensors are being used in different environments and for different applications such as in military, agriculture, medical affairs, jungles and cities. In most applications, the single device of wireless sensor networks costs less than $1. They also have low installation costs, smaller sensing transducers and a long lifetime.

Moreover, sensors are adaptive and can be reconfigured to work in different areas. To obtain information from the real world, sensor nodes use a technique called sensing. After sensing, sensors convert the energy, which is obtained from the real world, into electrical energy that can be interpretable by a computing system. Note that this operation is done by the transducer part of sensors. Sensors are classified according to their applications in different environments.

II.THE D-LEACH ALGORITHM

1. Network Model

Suppose N nodes are distributed in a 100 x 100 meter area randomly. The network is divided into five clusters. One of these clusters contains the base station and all nodes in this cluster transmit their data directly to the base station in each round. However, in the other four clusters, nodes send their data to the cluster heads, and the cluster heads communicate with the base station.

A sensor node joins any cluster based on the signal strength which is received from the base station and neighbor cluster heads. If the received signal from the neighbor cluster head is higher than the received signal from the base station, the sensor node joins the cluster, otherwise the sensor node communicates directly with the base station. It is assumed that clusters, the base station, and sensor nodes have the following features:

- Nodes in the network are stationary and there is no mobility in the network.

- Nodes have the same initial energy at the beginning.
- Each node can calculate the residual energy and identity of its own.
- Wireless transmit power of a node is controllable.
- The data is always available to be sent to the cluster heads or the base station in each round.
- Nodes send their collected data to the base station or cluster head based on how they are close to each of them.
- Nodes have no information about their positions.
- Sink or base station is located in the middle of the network

2. Wireless Communication Model

The wireless communication model in [2] was used to evaluate the node energy consumption during communication. In this model, energy consumption is calculated. The radio model which is used for sending and receiving data in D-LEACH is illustrated in Figure 1:

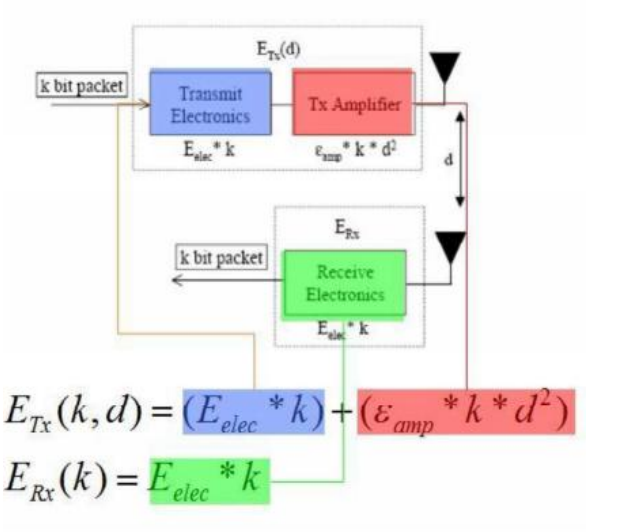

Fig. 1 Radio Model of D-LEACH.

For more illustration flowchart of wireless model is shown in Figure 2 below.

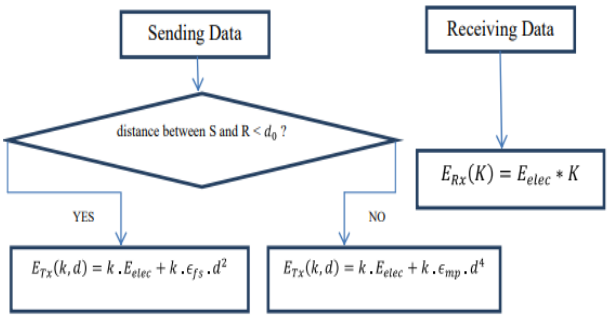

Fig. 2 Flowchart of Wireless Model.

III.PERFORMANCE EVALUATION RESULTS

The parameters which are considered in evaluating the performance of this algorithm are: residual energy of all nodes, the number of nodes alive and also the number of dead nodes. In this simulation, nodes are considered as dead nodes, when their residual energies become zero.

Table 1 Simulation Parameters

Description	Symbol	Value
Number of nodes in the system	n	100
Energy consumed by the amplifier to transmit at a short distance	E_{fs}	100 pJ/bit/m^2
Energy consumed by the amplifier to transmit at a longer distance	E_{mp}	0.013 pJ/bit/m^4
Energy consumed in the electronic circuit to transmit or receive the signal	E_{elec}	50 nJ/bit
Data aggregation energy	E_{dd}	50 nJ/bit/message

The Average Residual Energy

$$Improvment = \frac{new\ result - previous\ result}{previous\ result}$$

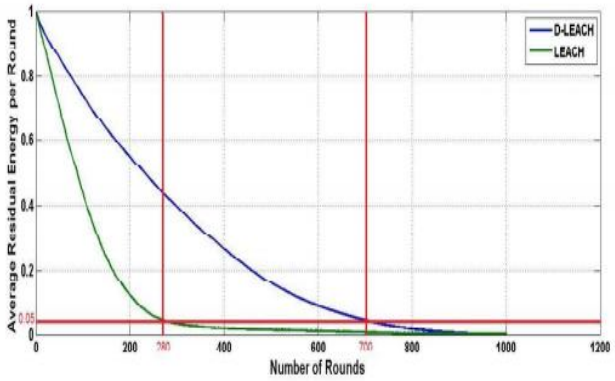

Fig. 3 The Average Residual Energy per Round.

1.The Number of Dead Nodes

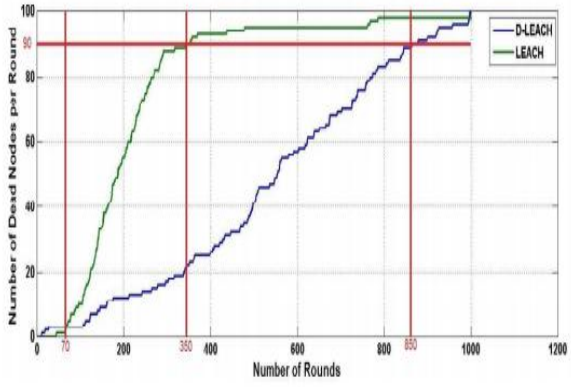

Fig. 4 The Average Number of Dead Nodes per Round.

2.The Number of Alive Node

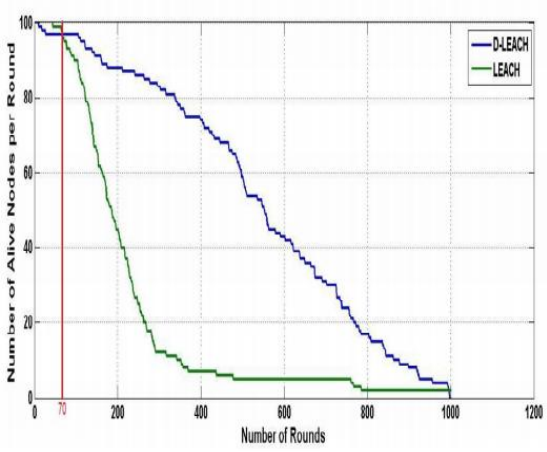

Fig. 5 The Average of Alive Nodes per Round

3. Comparison of D-LEACH and Improved LEACH

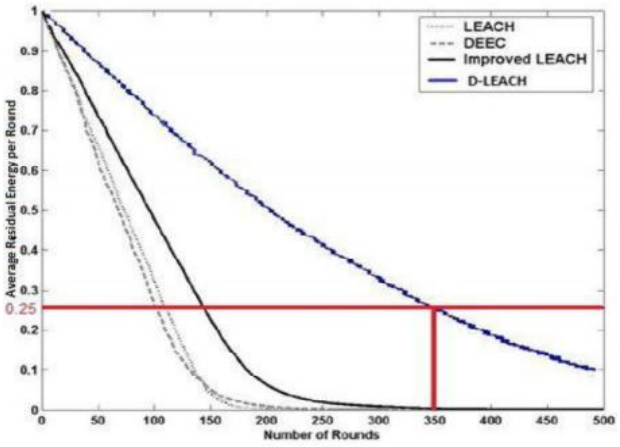

Fig. 6 The Average Residual Energy per Round

IV.CONCLUSION

In conclusion, the proposed algorithm improves some drawbacks of LEACH such as lack of energy balancing and improves the average residual energy of all nodes and the number of alive nodes about 150% in comparison with LEACH.In this paper the D-LEACH routing algorithm is compared with traditional LEACH, Improved LEACH, and DEEC routing algorithms. The results obtained show that DLEACH enhances the network lifetime significantly in comparison with the aforementioned routing algorithms in environment with dimension of $100m^2$ (The results may change for different conditions).

REFERENCE

[1]S. Dulman, T. Nieberg, J. Wu, and P. Havinga. Trade-off between traffic over head and reliability in multipath routing for wireless sensor networks. In Proceedings of the Wireless Communications and Networking Conference, 2003.

[2]Deepak Ganesan, Ramesh Govindan, Scott Shenker, and Deborah Estrin. Highly-, energy-efficient multipath routing in wireless sensor networks. ACM SIGMOBILE Mobile Computing and Communications Review, 5(4):11–25, 2001.

[3]Chalermek Intanagonwiwat, Ramesh Govindan, and Deborah Estrin. Directed diffusion: A scalable and robust communication paradigm for sensor networks. In Proc. Sixth Annual International Conference on Mobile Computing and Networks, 2000.

[4]David B Johnson and David A Maltz. Dynamic source routing in ad hocwireless networks.In Imielinski and Korth, editors, Mobile Computing, volume 353.Kluwer Academic Publishers, 1996.

[5]Nasipuri and S. Das. On-Demand Multipath Routing for Mobile Ad HocNetworks.In 8th Intl. Conference on Computer Communications and Networks (IC3N 99), 1999.

[6]V. D. Park and M. S. Corson. A highly adaptive distributed routingalgorithm for mobile wireless networks.In Proceedings of IEEE INFOCOM'97 Conf., April 1997.

[7] EYES project. http://eyes.eu.org.

[8] I. Dietrich, F. Dressler, On the lifetime of wireless sensor networks, ACM Transactionson Sensor Network 5 (2009).

[9] C. E. Jones, K. M. Sivalingam, P. Agrawal, J. C. Chen, A Survey of Energy EfficientNetwork Protocols for Wireless Networks, Wireless Networks 7 (2001).

[10] http://eetd.lbl.gov/ee/ee 1.html, Lawrence Berkley National Laboratory "What isEnergy Efficiency", 2015.

[11]H. Alemdar, C. Ersoy, Wireless sensor networks for healthcare: A survey, ComputerNetworks 54 (2010) 2688–2710.

[12] J. Ko, C. Lu, M. B. Srivastava, J. A. Stankovic, A. Terzis, M. Welsh, Wireless SensorNetworks for Healthcare, Proceedings of the IEEE 98 (2010) 1947–1960.

[13] A. Hadjidj, M. Souil, A. Bouabdallah, Y. Challal, H. Owen, Wireless Sensor Networks for Rehabilitation Application: Challenges and Opportunities, J. of Network and Computer Applications 36 (2013) 1–15