ISSN: 2348 - 2117

International Journal of Engineering Technology and Computer Research (IJETCR)
Available Online at www.ijetcr.org
Volume 3; Issue 5; September-October-2015; Page No. 67-71

Simulation of Q-LEACH with Multihoping Technique

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Abstract

LEACH protocol is the clustering routing protocols in wireless sensor networks. The main work in WSNs is to enhance network life-time of the nodes. Different approaches based upon clustering are applied for optimum functionality. Network life-time is always related with energy of sensor nodes applied at remote areas for constant and fault tolerant monitoring. In this paper, we have proposed a technique, i.e. multihoping technique algorithm to enhance the CH selection procedure and data transmission with mobile node criteria so that there will be less energy consumption. This will enhance the lifetime of the network and provide less energy consumption with more network stability. This approach is implemented by using MATLAB and simulation results are presented to confirm the stated goal using several performance measures.

Keywords: *Wireless Sensor Network; LEAH; Multihoping technique, Matlab*

1. Introduction

In this paper we used a multihoping technique along with Q-LEACH to increase the network lifetime of nodes. A wireless network adopting multihop wireless technology without deployment of wired backhaul links. We discuss network characteristics and working principle of proposed scheme for efficient performance. This section presents key concept of proposed network model. In order to enhance some features like clustering process, stability period and network life-time for optimized performance of WSNs we propose this model. According to this approach sensor nodes are deployed in the territory. In order to acquire better clustering we partition the network into four quadrants. Doing such sort of partitioning better coverage of the whole network is achieved. Moreover, it also presents an idea of efficient clustering mechanism which yields significantly in better coverage of whole network. We deployed random nodes in a 100*m*×105m filed. Based on location information, network is divided into four equal parts i.e., (a1, a2, a3, a4).In this paper we used a multihoping technique to increase the network lifetime of nodes. In proposed idea, we implement above mentioned concept of localized coordination in each sectored area. We used same radio model as discussed in [1] for transmission and reception of information from sensor nodes to CHs and then to BS. Packet length K of 2000 bits is used in our simulations. Q-LEACH network is partitioned into sub-sectors and hence, clusters formed within these sub-sectors are more deterministic in nature. Therefore, nodes are well distributed within a specific cluster and results in efficient energy drainage. Concept of randomized clustering as given in [1] for optimized energy drainage is applied in each sector. Assigning CH probability P = 0.05 we start clustering process. In every individual round node decides to become CH based upon P and threshold T(n).by taking 500 rounds In multi-hop wireless networks there are one or more intermediate nodes along the path that receive and forward packets via wireless links. Multi-hop wireless networks have several benefits: Compared to networks with single wireless links, multi-hop wireless networks can extend the coverage of a network and improve connectivity. Moreover, transmission over multiple "short" links might require less transmission power and energy than over "long" links. Moreover, they enable higher data rates resulting in higher throughput and more efficient use of the wireless medium .The parameters that are considered network lifetime and cluster head count. Effective system performance is done and compared the proposed technique with the previous study. The remaining part of this paper is organized as follows: Section 2 discusses the background work to this paper. Section 3 explains the implementation of Q-Leach with multihoping approach in MATLAB. Section 4 shows the results with multihoping parameters network lifetime, and cluster head count. Section 5 gives the conclusion.

2. BACKGROUND WORK

In the previous study Q-LEACH network is divided into sub-sectors and hence, clusters formed within these sub-

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sectors are more deterministic in nature. According to this network divided in the four parts. Doing such sort of partitioning better coverage of the whole network is achieved. Additionally, exact distribution of nodes in field is also well defined. Moreover, it also presents an idea of efficient clustering mechanism which yields significantly in better coverage of whole network. The applied random nodes in a 100m×100m filed. Based on location information, network is divided into four equal parts i.e., (a1, a2, a3, a4). Concept of randomized clustering as given in [1] for optimized energy drainage is applied in each sector. Assigning CH probability P = 0.05 we start clustering process. In every individual round node decides to become CH based upon P and threshold T(n) given in [1]. Overall network is divided into four areas as: Area A, B, C and D. Initially each node decides whether or not to become a CH. Node chooses a random number between 0 and if this number is less then certain threshold T (n). [2].The simulation occurs in two algorithms. We implement above mentioned concept of localized coordination in each sectored area. We used same radio model as discussed in [1] for transmission and reception of information from sensor nodes to CHs and then to BS. Packet length K of 2000 bits is used in our simulations. According to above mentioned flow chart, initially all nodes send their location information to BS.BS performs logical partitioning of network on the basis of gathered information. Network is divided into four quadrants and broadcasts information to nodes. On the basis of threshold some nodes are elected as CH in each division. Normal nodes choose their CHs within their own quadrant based on RSSI. For association nodes send their requests to CHs. TDMA slots are assigned to every node for appropriate communication without congestion. Every node communicates in its allocated slot with its defined CH. The results are given below.

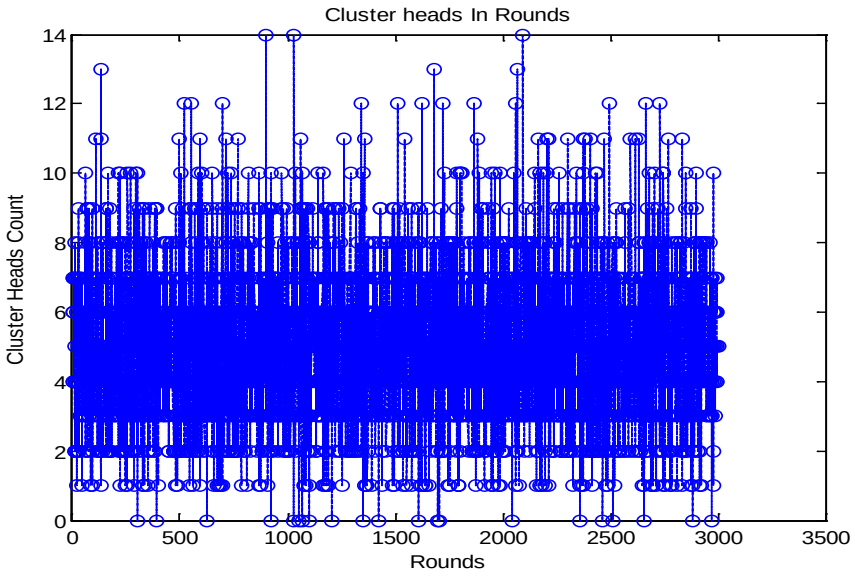

Figure 1:

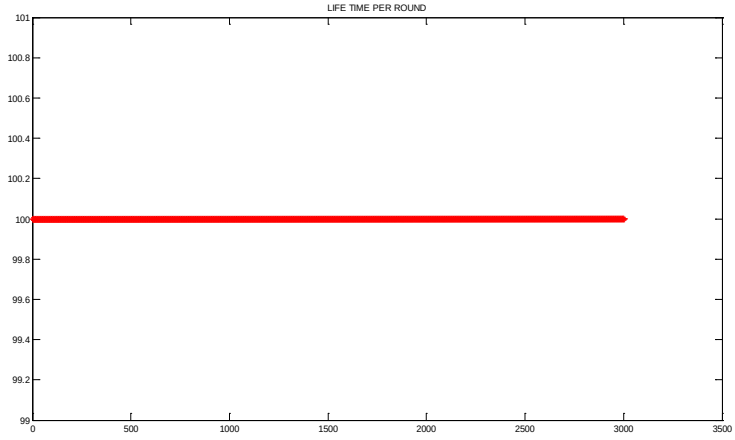

Figure 2:

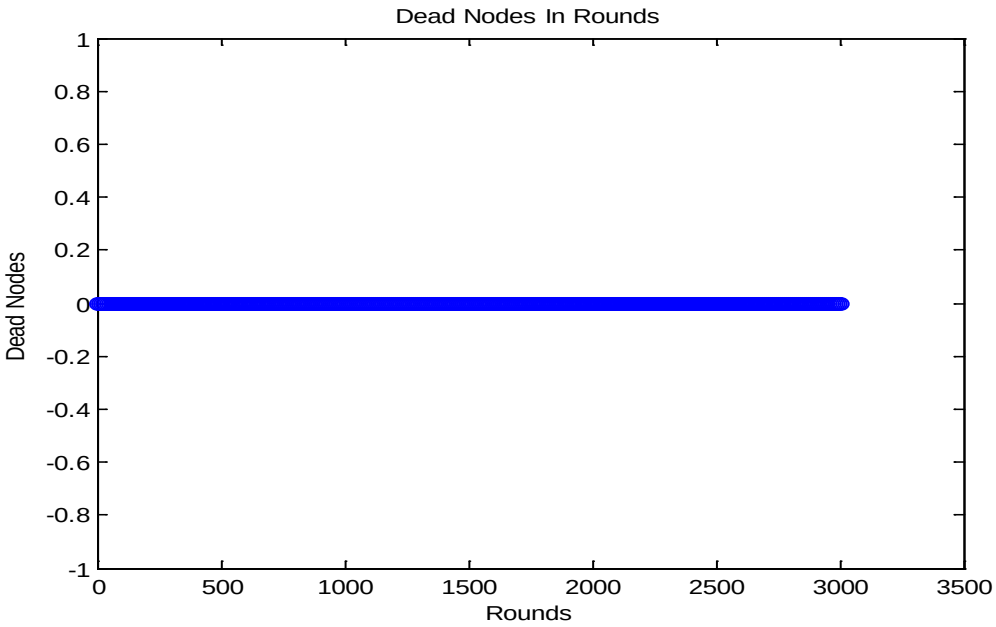

Figure 3:

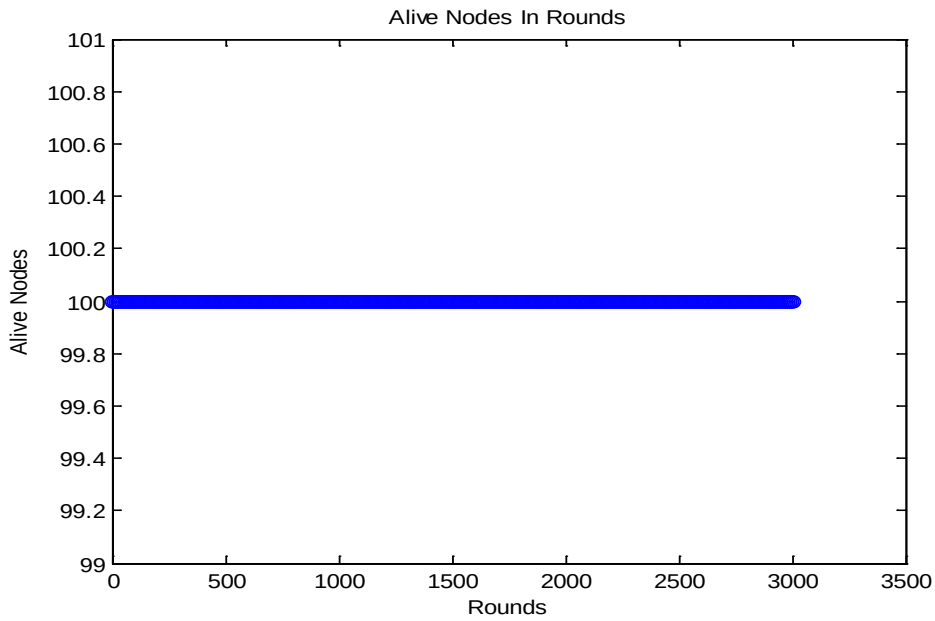

Figure 4:

3. SYSTEM IMPLEMENTATION

QLEACH is quad- Low Energy Adaptive Cluster Hierarchy. Its methodology is described as:

A.ENERGY PARAMETRES:-As for the QLEACH system the energy parameters are most importantly to be known. So, the first step in this process is the initialization of the energy parameters. The energy parameters will be initialized in the beginning.

B.ROUND PROCESSING:-After the initialization of the parameters, the next step to be done is the round processing and hence, it will be done after the initialization of the energy parameters.

C.ENERGY CHECKING:-Now, the three processes i.e. the initialization of parameters, round processing then the value of energy will be checked, whether it is positive or negative. The value of energy will decide the next process to be applied. If the value of energy is negative i.e. it is lesser than zero the nodes energy has drained. This means the node is dead. Hence, the node will be declared dead.

C.NCH ENERGY:-The dead node's NCH energy will be calculated. The intermediate node that is mobile will be checked and its data will be calculated. This is that

intermediate node that will work as an intermediate node between the sink and far located node.

D.FINAL RESULT:-Final result will then be calculated i.e. the performance parameters of the system will now be calculated like the networks lifetime, node lifetime, etc.Now, if the value of the energy of node comes out to be positive i.e. it is greater than zero then it will move on to the next round. Then again the energy residual will be checked. This process continues until the node energy does not come out to be zero or negative. This means that the process will keep on moving to the next node until the node dies. When the energy becomes 0 or negative then that node will be declared dead and for that dead node. The iterations of the intermediate nodes will be increased and the energy of the intermediate nodes will also be calculated and checked. The condition is similar for the energy values of intermediate node as that of a normal node i.e. the energy value will be checked if negative or positive.

The parameter that needs to be kept in mind while designing this system along with system parameter is cost. The cost of the whole system will be reduced as there is lesser number of intermediate nodes and so the energy calculation will be lesser number of times, so this results in cost reduction.

4. SIMULATION RESULTS AND DISCUSSION

The experimental setup for this is that firstly we will simulate the q-leach in generalized in MATLAB. We have taken the 3000 rounds in q-leach and comparing the results with multihoping technique used in q-leach by taking 5000 rounds. We have taken network life expectancy, energy, throughput, cluster head formation as its parameters. And at the last we have compared their parameters results are given below.

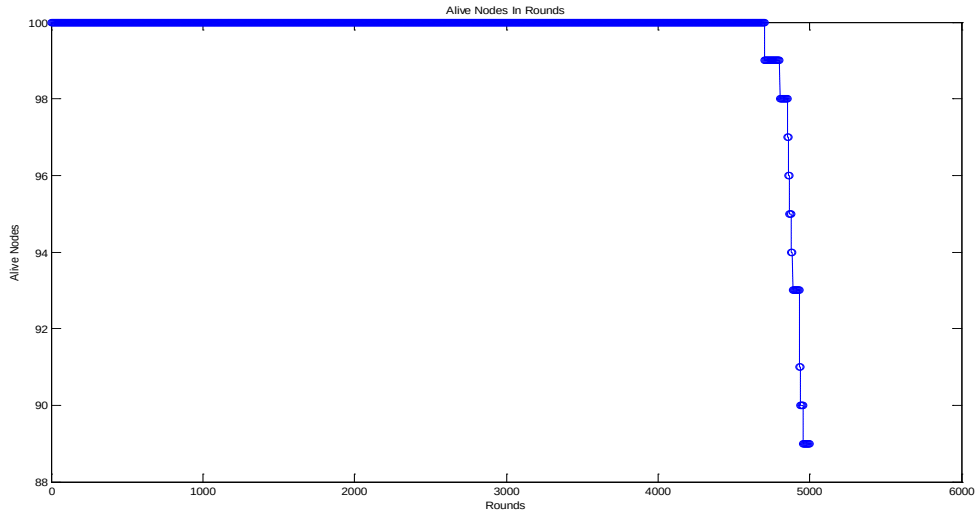

Figure 5:

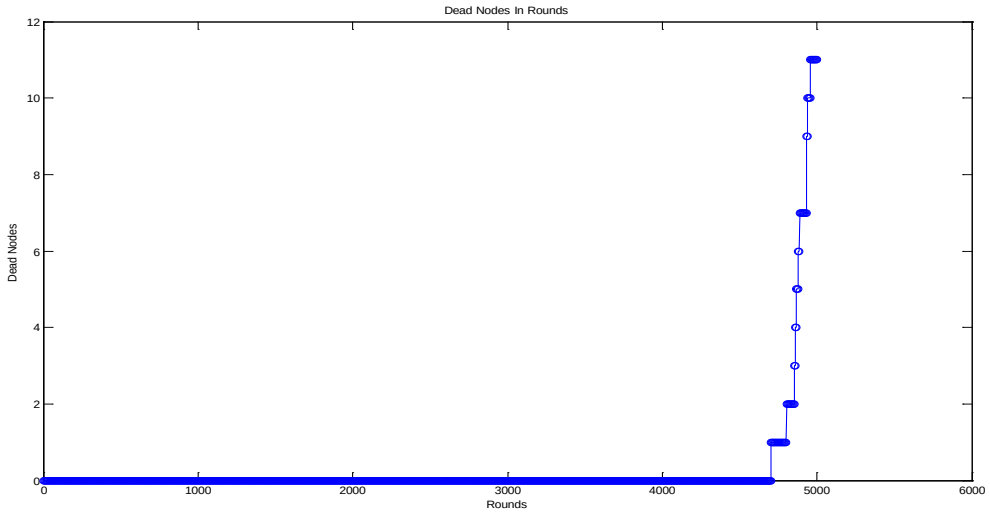

Figure 6:

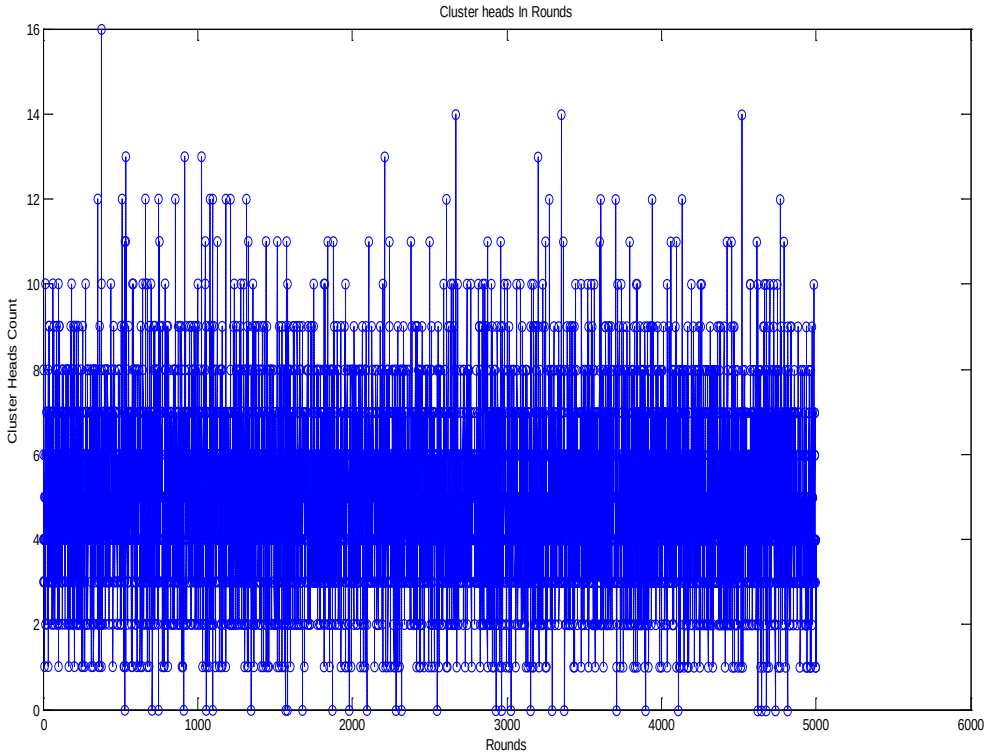

Figure 7:

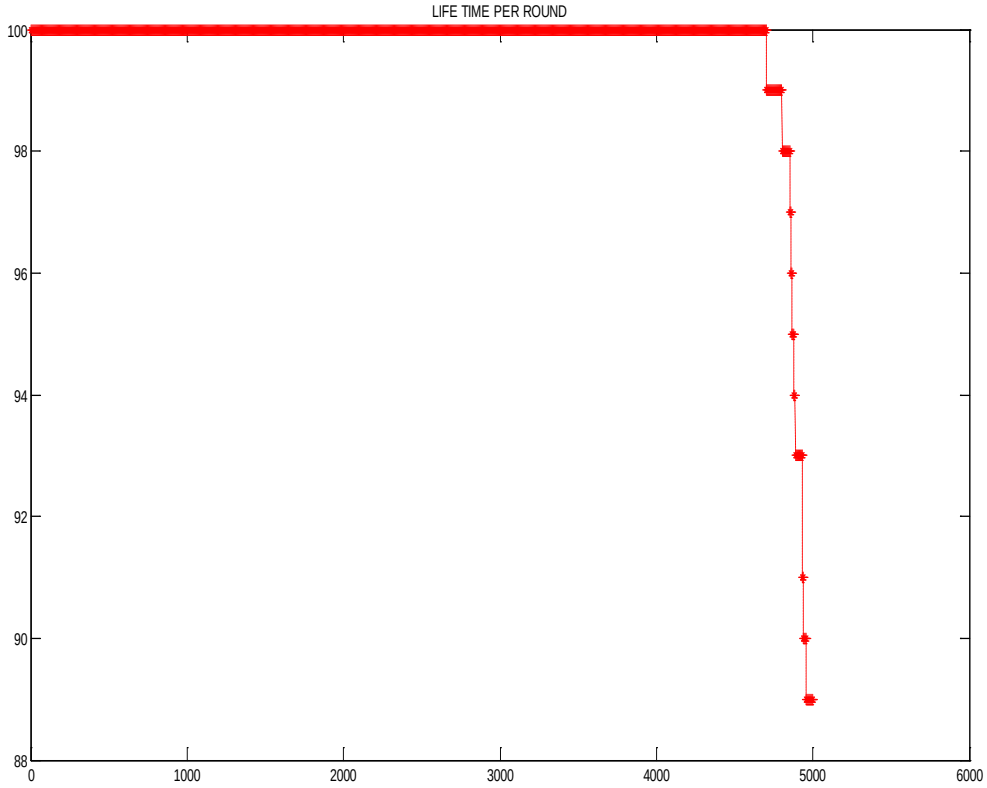

Figure 8:

5. CONCLUSION

In this paper, we have simulated Q-LEACH with multihoping approach in MATLAB.We have calculated network lifetime, cluster head count Thus we have concluded that multihoping approach performs better than Q-LEACH in case Of network lifetime than the previous work done by taking 5000 rounds rather than 3000 rounds.

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