ENEREGY EFFICENT MULTICAST ROUTING IN WIRLESS SENSOR NETWORKS: A SUGGESTED PROTOCOL

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Abstract

A wireless sensor network is made of a large number of sensor nodes in a specific area. Each of them has the ability to gather data from environment. And data gathered will be sent to the sink node. Energy problem is a key issue foe Wireless Sensor Network. Clustring in wireless sensor networks is one of the effective ways, which optimizes energy consumption and extends the life time of sensor networks. Clustering to group a number of nodes to from a cluster that managed by the cluster head. The cluster head is selected by considering nodes residual energy as well as the distance between this node and its neighbors. Therefore, the cluster heads that have minimum residual energy change to ordinary nod and will select a new cluster head with high residual energy. The main goal of clustering algorithms is to minimize the energy consumption and enhance the network lifetime of wireless sensor networks. Our proposed protocol, LEACH protocol conversion protocol is geographically of name GDEDBS. The main goal of this network is to collect information about the surrounding environment. One of the challenges in sensor networks, routing and transmission of data collected in these networks that are very important. In this article, a new method based on hierarchical structure (clustering) is introduced that the network is divided into several layers and each layer can be created clusters. Two Factors,

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energy levels and Latitude of each node in each layer are used to select Cluster heads. Then, Cluster heads using the Multi hop routing to transmit information to the base station. By applying this algorithm to a considerable extent the use of both energy and bandwidth constraints that are important in sensor network can be improved. Proposed algorithm was tested under the simulation introduced, and the results of it have been compared with LEACH that is a basic of the hierarchical method.

Keywords: wireless sensor network, routing, clustering, cluster head, hierarchical

1. Introduction

Multiple routing protocols are divided to:

1) Huge routing protocols

2) Geographical routing protocols

Routing protocols can be also divided to:

1) Hierarchical routing protocols (clustering-based)

LEACH, DBS, PEGASIS, TEEN, APTEEN and …

2) Location based routing protocols (geographical)

GAF, GEAR

3) Flat routing protocols (data based)

Here we introduce a protocol based on GAF an LEACH and by reviewing LEACH and GAF we give information about how they work and describe it geographically.

In recent years there have been a lot of researches about reforming and improving LEACH protocols and some literature has been published.

By considering some items like energy bound remaining (EAR), Distance of bounds to base (DBS) and considering candidate bounds of clusters and sending multiple paces one (PEGASIS) instead of one pacing, omitting additional transmission, dividing network to some parts with equal peripheries and exposing number of bounds with different energy in each part regarding to its distance from the base using head cluster unit instead of the head cluster itself, we tried to have an equivalency of energy between sensitive bound in networks and the other parts.

Since identifying head clusters (the production of clusters) in the LEACH protocol is done with the randomization between numbers 0 and 1 and its comparison with the maximum limit function and creation of random clusters may result in inappropriate clusters , in many methods we have tried to create appropriate clusters. Also, since the nodes of head clusters consume more energy than the ones of non-head clusters, in any methods some attempts have been done to reduce their energy consumption. Because of the consumption of energy of the cluster production phase , some methods are used to reduce the number of these phases or omitting them. The nodes of head clusters which are far from the basic station consume a lot more energy than other nodes. Some suggestions are given to solve this problem such as dividing the network to equal rings and differentiating the number of head clusters in these rings regarding the distance between them and the basic station.

An easier and more optimal method which we consider in this project is using different levels of energy. It means that we divide the network into different sections and distribute the nodes having less energy levels in sections closer to basic stations. In this method the nodes with higher

energy levels are distributed in farther sections to basic station. This method can be used in this case and other similar cases as an apposite method.

Also, using the energy consumption method , we understand that energy consumption of head cluster nodes depends on the number of cluster members. Since the clusters are created randomly, some clusters may have many members and some others may have the minimum of members.

2. Energy consumption in the network

In this thesis statement, the network life gauge is defined as the time between establishing of network and considering it useless. Considering a network useless depends on its utility, for example it can be when a sensor node does not function anymore, when a certain percent of nodes do not function, when the network is divided because of not functioning of nodes close to each other, or when there is not necessary covering. The FND parameter indicates the time of not functioning of the first sensor node in the network. Also the HNA parameter indicates the life time of half of the nodes in the network. This measure is suitable in utilities of sensor networks in which nodes are close to each other and neighboring nodes produce convergent data and even equal ones. This parameter is a suitable measure for estimating the life gauge of the network and energy consumption in it. In addition, the LND parameter shows the time when the last sensor node in the network dies. Using the LND measure in sequential route searching protocols is not suitable , since these protocols depend on clustering and for creation of a cluster , at least two nodes (head cluster and non-head cluster) are necessary. At a result, in these protocols, HNA and FND are usually used to observe the network life gauge and energy consumption in it.

3. Energy consumption

Each sensor node consumes different amount of energy regarding its role and activity. We explain these energies right now.

The results of comparison and contrast of this protocol and LEACH protocol shows that this protocol have optimized in energy consumption more than 18% and also this improves the first node death measure (FND) and the half of the nodes alive (HNA) to 94% and 6 % respectively.

One method of clustering for finding the direction based on energy is a version of LEACH in which finding the direction is done in a multi-step way. In this protocol , assuming that nodes are distributed well-proportioned in the network , the network is divided into concentric rings (or the center of basic station) with equal surfaces. In this article , the network is divided into four sections and using the maximum limit function , some nodes are chosen as samples. The nodes which were not chosen as head cluster for 20 courses , were chosen as the sample nodes. (Also , you can increase the number of nodes in each course by increasing the P). Subsequently, each sample node distributes a public message in its own area. The nodes receiving this message are excluded being samples. For example, in this figure the nodes a,b,c,d are chosen as sample nodes using the maximum limit function of (LEACH). First, the node "a" distributes its own public message in an area with the radius of "r". The node "b" receives this message from "a" and is excluded from being a sample. Also the node "d" is omitted from the sample nodes with this method . So, the nodes "a" and "c" are chosen as head clusters and clusters are formed according to the LEACH method.

3.1. Eelec (Unit nj/bit):

This term is referred to the energy consumed in the receptor electric circuit or the sender ones in order to receive or send one bit of data package. This energy depends on factors like encryption method, modulation, filtering type and distribution of signals.

3.2. εamp (Unit : pj/bit/m)

This term is referred to the consumed energy in the radio relays of sender nodes for sending a bit of a data package in the channel with the length of "d" between sender and receptor nodes. This depends on factors like the ratio of bit error . The following figure shows the energy consumption in sender and receptor nodes.

The sender node consumes energy both for starting its electric radio circuit (putting data on the channel) and for starting its radio relay (transferring the data through the channel). On the other hand, the receptor node consumes energy only for starting its electric radio circuit (for getting data from the channel).

Consequently we have the following equations for calculation of energy of sending and receiving :

$$ETX(L,d) = L\ Eelec + L\ \varepsilon amp\ d^{n} \quad (1)$$

$$ERX(L,d) = L\ Eelec \quad (2)$$

In the abovementioned equation , L is the length of sent or received package , d the distance between the sender and receptor , and n is the symbol for waste during the route. N is equal to 2 for the free space model (fs). This is apposite for the short distances and those without blocks). Depending on the field type and the topology of the network it can even reach 6 . For getting the

simulations closer to reality, for shorter distances from a certain distance , d0 equal to 87.7 meters, we use the free space (fs) model in which we have :

(3)

For distances more than d0 , we use the mp model. In this model we have:

(4) $\varepsilon amp = \varepsilon mp , n=4$

In addition to this , the cluster head (CH) nodes are responsible for combination of data (signals) of cluster members. In complete convergence, a representative signal is formed from combination of node signals.

The necessary energy for combining the data is considered equal with L EDa for each received signal by CH. In this equation Eda is the necessary energy to combine data and in all experiment nj/bit/signal is assumed 5.

The consumed energy by a CH node through a time frame is :

(5) $$ECH = L\ Eelec\left(\frac{N}{kopt} - 1\right) + L\ EDa\left(\frac{N}{kopt}\right) + L\ Eelec + L\ \varepsilon amp\ d^n tobs$$

In the abovementioned equation , N is the number of sensor nodes, L is the number of bits of message of data , dtoBs is the distance between CH and basic station and Kopt is the optimal number of clusters.

The fields in this equation from left to right are :

1- The consumed energy for receiving signals of cluster member nodes (their number is equal to the average number of cluster nodes, CH subtracted by $\frac{N}{kopt}$)

2- The necessary energy for combining the received signals equals $\frac{N}{kopt}$. Its number added by the forming representative signal .

3- The last two fields , just like mentioned in the previous equations, are necessary energy for sending the combined signals to the basic station.

Point:

In the above equation , if the distance of CH node from the basic station is less than d0 (87.7 meters), εamp = εfs and n=2. If it is more than d0 (87.7 meters), εamp= εmp and n=4.

A Non-CH node during a time frame , should send its data to CH only in its own time section. So the consumed energy of each Non-CH node is :

(6) $$\text{ENon-CH} = L\ Eelec + L\ \varepsilon\text{amp}\ d^n tobs$$

In the above equation $d^n tobs$ is the distance between the sensor and the related CH. This number determines n and εamp . (according to the previous point)

The optimal number of clusters is derived from this equation:

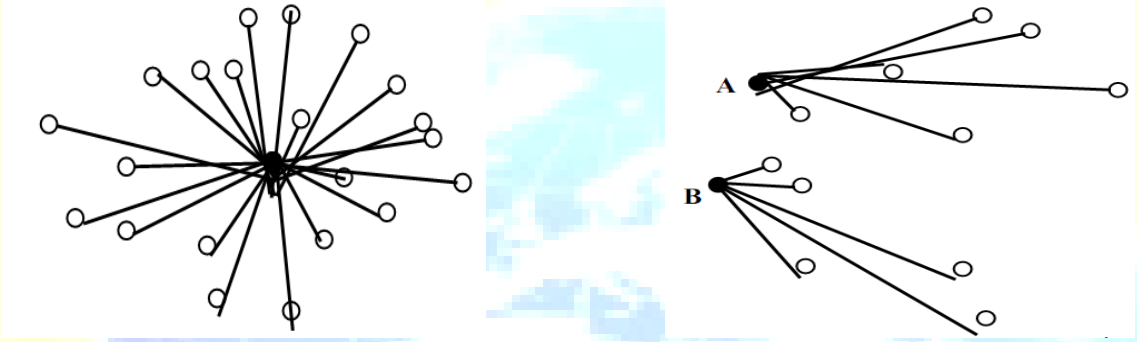
(4-7) $$[6] \quad Kopt = \frac{\sqrt{n}}{\sqrt{2\pi}} \sqrt{\frac{\varepsilon fs}{\varepsilon mp}} \frac{M}{d^n tobs}$$

4. Evaluation of LEACH protocol :

The LEACH protocol has the following features:

The clustering in these protocols are done via the maximum probability function and randomly. This feature resulted in different number of cluster members with each other. Also this may result in some clusters with inappropriate figures.

These two events are shown below:



The Figure (a) : The large number of clusters The Figure (b): the inappropriate figure of clusters

Figure 1.The inappropriate distribution of clusters in LEACH protocol

In the figure "a" the node "A" is chosen as the head cluster by many nodes because it is in the center of other nodes. The effect of this problem is shown like this :

* The CH node should receive all the data of all cluster members and combine and send them . As a result , this CH node consumes more energy than other similar CH nodes (which are fewer). The reason is that according to energy consumption of each node , CH should consume energy for each node as much as L Eelec, L EDA. This could be done as many as the members of relative cluster members.

* For each node, a timing is set. In other words, the CH node , should set the necessary time and state it to other relative non-CH nodes. This time set may not be possible in a frame when there are too many nodes in a cluster. If we want to set a longer time frame, for the clusters with fewer nodes, CH must go to sleep and consume energy for waking again to receive the data of clusters.

In the figure "b" , The nodes A and B are chosen as CH nodes. But because of their long distance with the relative cluster nodes, the cluster shapes are inappropriate and large amount of energy is consumed for connections inside the cluster.

1- The energy of all nodes is the same. (The nodes are symmetrical). This issue results in the following: firstly , the energies of those nodes farther than the basic station finish sooner. Secondly , in the closer nodes , those that have more members when becoming cluster heads or are much farther than the cluster head node when not being head clusters, die sooner.

2- The nodes that become head clusters should publicize the public message in a larger area (the network diameter) for stating to other nodes that they are head clusters. This message consume relatively more energy.

3- The basic station can not state its certain responsibility to certain area of the network.

In the suggested protocol, in order to solve certain problems , we use these two techniques: 1- dividing the network to equal sections 2- using the sensor nodes with different energies in different sections regarding the distance of each section to basic station 3- creating the capability of connection between the basic station and certain parts of the network in a multi-sectional way.

All the assumptions in the LEACH protocol exist in this protocol except the asymmetry of nodes.

5. The introduction of the suggested protocol:

In recent years many researchers tried to improve and correct the LEACH protocol and wrote many articles.

In these protocols , we have tried to make a balance in energy consumption among sensor nodes in the network regarding factors like the energies left by modes , the distance between the nodes and the basic station, consideration of candidate nodes instead of head cluster nodes and multi step sending instead of one step , omitting the redundant transfers, use of genetic algorithm for cluster forming, division of networks to some sections with the same surface and the impose different number of nodes in each section regarding their distance to basic station , use of head cluster set instead of head cluster and …..

Since identifying head clusters (the production of clusters) in the LEACH protocol is done with the randomization between numbers 0 and 1 and its comparison with the maximum limit function and creation of random clusters may result in inappropriate clusters , in many methods we have tried to create appropriate clusters. Also, since the nodes of head clusters consume more energy than the ones of non-head clusters, in any methods some attempts have been done to reduce their energy consumption. Because of the consumption of energy of the cluster production phase, some methods are used to reduce the number of these phases or omitting them. The nodes of head clusters which are far from the basic station consume a lot more energy than other nodes. Some suggestions are given to solve this problem such as dividing the network to equal rings and differentiating the number of head clusters in these rings regarding the distance between them and the basic station. An easier and more optimal method which we consider in this project is using different levels of energy. It means that we divide the network into different

sections and distribute the nodes having less energy levels in sections closer to basic stations. In this method the nodes with higher energy levels are distributed in farther sections to basic station. This method can be used in this case and other similar cases as an apposite method.

Also, using the energy consumption method , we understand that energy consumption of head cluster nodes depends on the number of cluster members. Since the clusters are created randomly, some clusters may have many members and some others may have the minimum of members.

This case results not only in consumption of energy of head cluster nodes but also disturbing the balance of time setting frame for different clusters. For solving this problem , we have limited the number of cluster members by limiting the area of head cluster public message. We will explain the mentioned method. Simulation of this method will be done in the next section.

Since the head cluster nodes which are farther from the basic station (comparing with other head cluster nodes which are closer to it) consume much more energy , after some rounds of network performance , there will be significant difference among the left energies of the nodes . Usually, the farther nodes from the basic station die sooner than other nodes. In this project , in order to solve this problem , we have stated and used the idea of using sensor nodes or different energy levels. Using the different energy levels are applicable in two ways:

1- We divide the network into rings with similar surfaces. Afterwards, we distribute the sensor nodes with different energies in these rings . The order is that in the closest ring to the basic station , the nodes with the least amount of energies are distributed and we do it until the farthest ring in which the nodes with the most amount of energy.

This network dimensions is (M*M) (100*100) is divided into four ring sections. The basic station (SINK) is outside of the network and in a point far from the network area with the distance of 175 meters. The closest section to the basic station has the nodes with the energy E0-2α and the farthest section has the nodes with the energy E0+2α. "α" indicates the difference of energy between two neighboring surfaces.

The dividing the network into rings with the same surface (DBS), is used in [6],[24] and [16]. But in these articles, DBS is used for different purposes. Examples of these purposes are dividing the network for imposing different number of clusters in each section regarding the distance to basic station , the multi-step sending of data by head clusters in different levels and …. . In this article we use DBS for studying the sensor nodes with different energies , regarding distance of each section from the basic station. This method is simulated in the next chapter and its results are compared to the ones of some methods like LEACH.

2- We divide the network into rectangle tapes with the same surface. Then we distribute the sensor nodes with different energies in these surfaces. The order is that the closest surface to the basic station has nodes with the least amount of primary energy and the farthest surface to the basic station possess the nodes with maximum amount of primary energy. The following figure indicates the structure of the sensor network using the method of dividing to three sections.

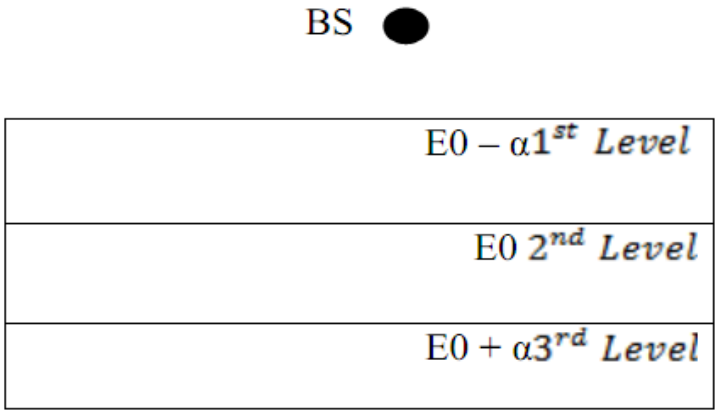


Figure 2. Division of the network to equal tapes

The number of surfaces and the amount of difference in different surfaces depend on the technology of forming the sensor nodes, the cost considered for design and application of network, facilities for distributing different nodes and…. . They could be any number. The fewer the number of surfaces , the easier the applying the network in action.

The assumptions used in this protocol are like the ones of LEACH protocol. Except that in this protocol , the basic station could send different application of sending to head clusters and afterwards to the basic station (in a multi sectional way). Also in this method the asymmetrical sensor nodes are used. (the nodes with different primary energy).

These assumptions are as follows :

1- The basic station is always constant.

2- All the sensor nodes can connect directly with all other nodes in the network (and even the basic station and can process the signals to combine the data.

3- The sensor nodes are very far from the basic station.

4- The spreading channels are symmetrical (the energy necessary to transfer the message from node "A" to node "B" to the proportion of signal to certain noises is exactly equal to the necessary energy for transferring data from B to A)

5- The nodes have always data to send to the basic station and the neighboring nodes have convergent data. (Sending the whole of these data to the basic station is redundant).

6- The nodes are always concordant with each other and can adjust the capability of consuming sending. Firstly for optimizing the energy consumption and decreasing the interference among the cluster data.

7- The basic station is a node with a high primary energy.

8- The nodes are distributed in the network randomly and well-proportioned.

9- The basic station can apply a message (the certain parameter sense) from a certain are of the network in a multi-sectional way .

Regarding that we want to compare the results of this method with the ones of LEACH protocol , first we form the network randomly. Afterwards we save the positions of the nodes in this network for applying all protocols and comparing them .

Also, for the comparison of the two protocols, their situations should be the same and in the suggested protocol , the primary energy of nodes is different . Consequently , for making the situations similar , we consider the total of energy of all nodes in the two protocols equal. It means :

(8)
$$NE_0 = a \sum_{k=1}^{\frac{level}{2}-1} \left(E_0 - \frac{K}{\beta\ Level} + E_0\right) + b \sum_{k=\frac{level}{2}} E_0 + c \sum_{k=\frac{level}{2}+1}^{level} \left(E_0 + \frac{K}{\beta\ Level} E_0\right)$$

The left statement , shows the total of all primary energy in the LEACH protocol. The right statement indicates the total of energy of different levels in the suggested protocol in which the primary field shows the energy of levels close to the basic station. These levels have less energy than primary energies of levels in the LAECH protocol. "a" shows the number of nodes in the first level. The second field indicates the energy in the middle level. "b" shows the number of nodes in the middle level.

The third field indicates the energy of levels far from the basic station which have more energy than the primary one in the LEACH protocol. "c" indicates the number of nodes in the last level.

When the n umber of levels in even , the second field is omitted in the equation and the equation will be as follows :

(9)
$$NE_0 = a \sum_{k=1}^{\frac{level}{2}} \left(E_0 - \frac{K}{\beta\ Level} E_0\right) + c \sum_{k=\frac{level}{2}+1}^{level} \left(E_0 + \frac{K}{\beta\ Level} E_0\right)$$

In the above equation, when the β=1 , regarding the distance of levels from the basic station, the nodes in this protocol have minimum of 1.2 and maximum 2 folds of primary energy compared to LEACH protocol.

In other words , the nodes in the closer half to the basic station have less energy (half of total energy of all of nodes in the similar are in LEACH protocol) and the nodes in the farther half of

the basic station have more energy. (two folds of total energy of all nodes in the similar area in the LEACH protocol). Using the β parameter, we can adjust these minimum and maximum amounts as we wish.

The sensor nodes in the LEACH protocol understand whether they are CH or not by randomizing of numbers between 0 and 1 and their comparison with the maximum limit function. If they are CH , they spread a public message in the diameter of the network. This consumes a lot of energy. Also the non cluster head nodes send an acceptance message to the closest cluster head node , and connect to it. (become members of that cluster). The cluster head receive data from all the cluster members and after combing them , they send them to the basic station.

The cluster heads are formed randomly. Consequently , some clusters may have a lot of members and some may have few. The more ht members of the clusters the more energy should be consumed to receive data and combine them. Also more time is necessary. (This can result in unbalancing the timing frame). If a cluster has many members , it can cause the more energy consumed by the cluster head and even its death. As a result, for balancing the consumption of energy among the cluster heads, we have limited the members of clusters using the area of public message of cluster heads. This solves both of the previous problems . As a result, the suggested protocol considering the previous idea is as follows:

The network is divided to different sections with different energy (Here, two different energy levels). This protocol comprises of two phases: starting (forming of clusters) and transferring information.

In the first phase , the clusters are formed non-randomly and via using the Round Robin technique. The order is that the first node is chosen as the cluster head and publicize a public

message in a circle with the radius of r/2. Each node receiving this message (hearing it) considers itself as a member of that cluster and sends an acceptance message about being a member to that cluster head. This is repeated in all rounds as many as the nodes the number of nodes. This is done on the condition that the nodes are not chosen as cluster heads and they have ample energy to become cluster heads. The nodes becoming the cluster heads in this round cannot become cluster heads and using the Round Robin technique, all nodes become cluster heads. In other words, the nodes becoming the cluster heads in this round cannot become cluster heads until all nodes become cluster heads.

In this protocol, the data transfer phase is exactly similar to the LEACH protocol. It means each cluster head, after receiving and combining the data of cluster head members , sends them to the basic station.

The recommended protocol can also be applied in a multi-step way in which the energy consumption is definitely optimized. The multi-step way is that cluster heads in each level after receiving and combing the data of each cluster head, send them to the cluster heads in upper levels and if there is no cluster head in upper levels , send them to the basic station. But since in the recommended protocol, the nodes do not know their positions, it is difficult to identify the cluster heads in the upper levels . As a result , we have applied this protocol in a one-step way.

6. The calculation of range of public message radius.

The optimal number of clusters (cluster heads) are assumed equal to Kopt for a network with the dimensions Xm*Ym. (the following figure).

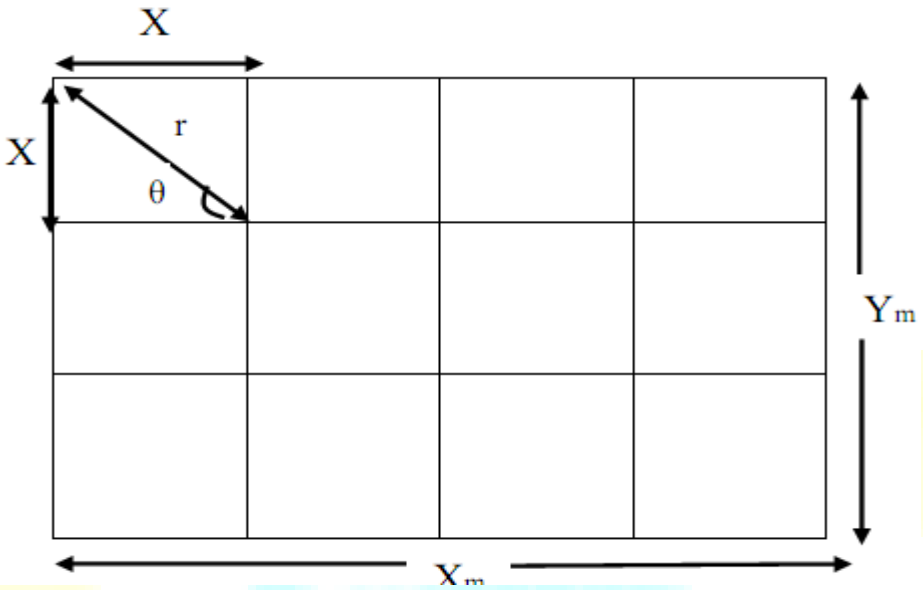


Fig. 3.4 Imaginary domain for a cluster in sensor network

Usually network spreads in a square domain in which instead of Ym*Xm we will have Yn* Xn. So the length and width of every small square are regarded X.

Measurement a cluster can be measured by following formula: (10)

Measurement a cluster = $\frac{Xm * Ym}{Kopt}$

When the candidate in every part must spread its advertising message in the domain of the part diameter can be measured by following formula: (11)

$$\sin(\theta) = \sin(45) = \frac{\sqrt{2}}{2} = \frac{X}{r} \Longrightarrow r = \frac{2X}{\sqrt{2}} = \sqrt{2}\,X$$

On the other hand, the measurement of every part is equal to: (12)

$$X^2 = \frac{Xm * Ym}{Kopt} \quad ==> \quad X = \sqrt{\frac{Xm * Ym}{Kopt}}$$

From (11) & (12) can be resulted: (13)

$$r = \sqrt{2\ \frac{Xm * Ym}{Kopt}}$$

Considering this fact that signals are spread in all the directions so for covering a cluster with r diameter it is enough the signal is spread in r/2 ray.

In this section proposed protocols are assessed. In order to simulate the proposed protocol and LEACH protocol, MATLAB software is used. In all the simulations, sensory network with 100 …. randomly spread in environment and their positions are saved in an Excel file and then in all tests the information of this file regarding the positions of existed ….. is used in order to alike sensory networks till they can be compared to each other. The basic station is located out of network far from the network.

7. Conclusion

As before was mentioned, one of the important purpose of this article is designing wireless sensory networks in order to transfer information and attempting to increase the life of network and avoiding separation by using the dominant energy-saving techniques. Existing different limitations in the networks cause the problems for designing navigator protocols. By overcoming these problems it can be possible to reach productivity in wireless sensory networks. The navigator algorithms try to decrease the traffic and energy consumption by overcoming these problems.

Most of the navigator protocols can be classified into three groups, 1. Flat 2. Hierarchical 3. Location-based.

The flat protocols are the first navigator protocols. In flat protocols nodes usually play the same role and with cooperation with each other do the sensory task. due to many sensory nodes. It is not possible to dedicate an address to each group.

In navigation according to hierarchical model it is possible the nodes with higher energy are used for processing and sending information and nodes with lesser energy are used for sensory of environment. It means the productivity of energy in network. On the other hand, the density and mixing the data in nodes cause decreasing the energy. In addition, stabilize network classification and topology in the sensors and decrease the cost of maintaining topology.

The challenges in this field are the way of choosing head-cluster and organization of clusters. In this article, by using the features of hierarchical navigations approaches introduced the new way to navigate in sensory networks I which by layering the networks and by using of two factors including the rate of remaining energy and node width clustering in each layer is done.

One of the main problems of LEACH protocol is ignoring the distance between nodes and basic station and the opportunity for being a head-cluster for far and near nodes are the same. Regarding the fact that the more the distance to basic station, the more energy the nodes need for sending their data so the far nodes lose their energy earlier and will die. In order to solve this problem the approach is offered in which nodes that are far from the basic station more energy is dedicated and the nodes that have the lesser distance the less energy is dedicated. In other word, by classifying network into two parts, two different level of energy is distributed in network in which whole energy of nodes is the same in two approaches(without classifying and

networking). Classification of network is done in two ways: 1. Classification the network into equal circles 2. Classification into equal rectangular bands.

By simulating and doing different types of tests in which network is divided in several parts with two mentioned approaches and by considering the difference of energy rate in two next nodes we found that this approach considerably improves the evaluation network criteria. This is clear in the extracted figure from the comparing this protocol (GDEDBS) with LEACH protocol:

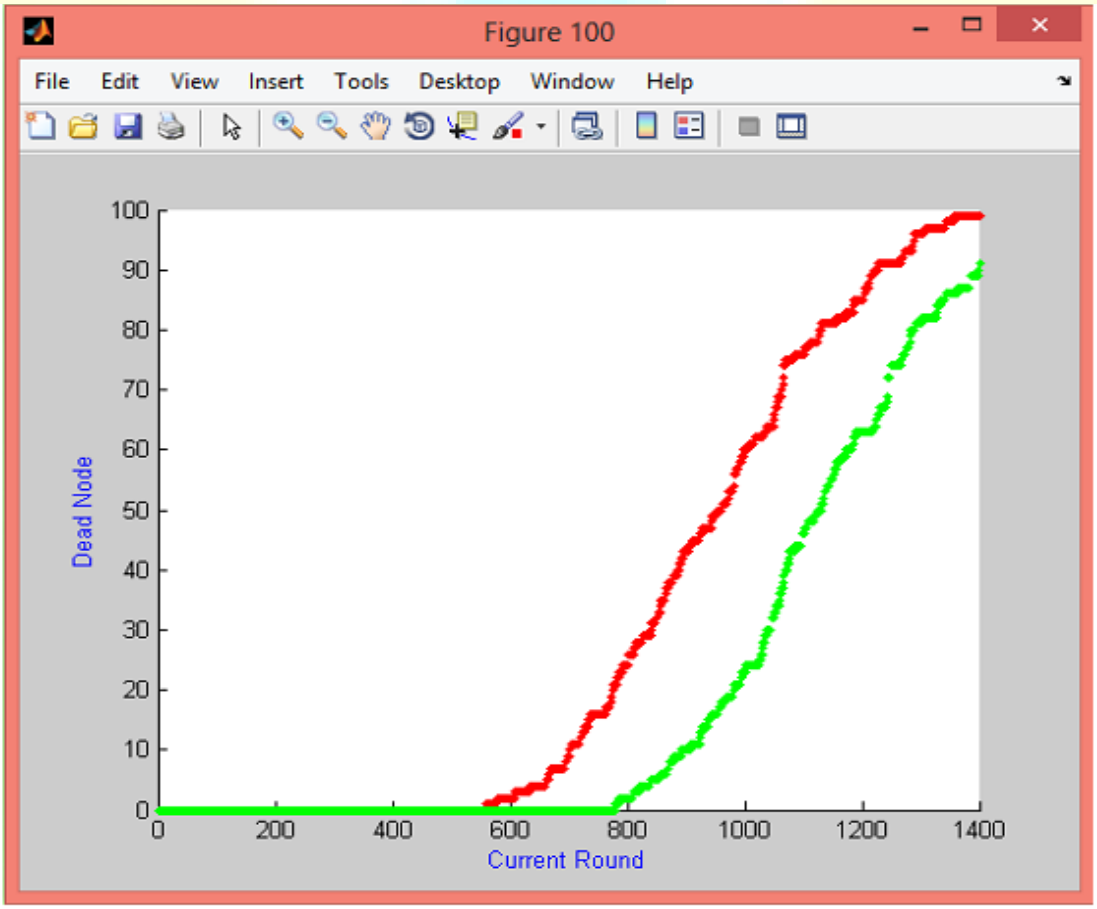


Fig 4. the comparison of GDEDBS protocol and LEACH protocol

Another problem of LEACH protocol is regarding the production of head-clusters randomly, the possibility of producing mal clusters will be took place. It is also possible one cluster is created

by many members while the other clusters are created with lesser members. In order to solve this problem another way is proposed in which every node in head-cluster sends its advertising message in limited measurement and just the nodes in the domain of this message are the members of cluster. In this approach nodes cannot randomly be head cluster. For every nod that is being head cluster until other nodes become head-cluster cannot be head cluster. At the result, nodes energy consumes in a equal way and in fact this approach does the parallelism of consuming energy among nodes of sensory network without knowing the remaining energy.

The results of this protocol indicate improvements by comparison with LEACH protocol. Also by combining two proposed protocols is used for increasing the life of network

References

Amini N.,M Fazili , S. G. Miremadi and M. T . Manzuri. "Distance-Based Segmentation : An Energy-Efficient Clustering Hierarchy for Wireles Sensor Networks " , Proc . of the 5th

Chan T.J. , C.M . Chen, Y.F Huang, J.Y. Lin and T.r. Chen, " Optomal Cluster Number Selection in Ad-hoc Wireles Sensor Networks" ,WSEAS TRANSACTIONS on COMMUNICATIONS,Issue 8. Volume 7, August 2008

Handy M.J. , M Haase , D . Timmermann , " Low Energy Adaptive Clustering Hierarchy with Deterministic Cluster-Head Selection " , IEEE MWCN , 2002-

Saeidmanesh M . ,M. Hajimohammadi, A. Movaghar , " Energy and Distance Based Clustering : An Energy Efficient Clusterring Method for Wirless Sensor Networks " , World Academy of Science , Engineering and Technology 55, 2009.