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ORIGINAL ARTICLE

Ensuring Quality of Service Using Multi-Criteria Quadrant Based Clustering (MCQC) Protocol for Wireless Sensor Networks

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ABSTRACT

Wireless Sensor Networks (WSN) has gained a lot of attention in the modern area. Tiny sensing motes with scarce resources are designed to conserve more and more energy. Efficient clustering protocols have been designed for sensor nodes network to enhance network lifetime. The selection of cluster head in the cluster and more optimal clustering method makes network energy efficient. The nearest node to Base station is directly communicated with Base station. This also decreases Energy consumption during information interchange. This research paper introduced an approach in which energy is more conserved in communication between sensor nodes and BS using cluster head in clustering. The proposed scheme selects the Cluster Head on two parameters i.e. Average distance and Residual Energy of Nodes. Due to the division of Network Area into Quadrants and further is divided into sub quadrants make the proposed scheme more and better. In the last, the proposed scheme is compared with two previous schemes by simulation and statistically result which show high network lifetime and stability of the proposed scheme than previous schemes.

Keywords: Average Distance, Clustering, Cluster Head, Energy Efficiency, Multi Quadrant, Residual Energy

Author`s Contribution
[1] Data analysis, interpretation and manuscript writing, Active participation in data collection
[2] Conception, synthesis, planning of research and manuscript writing
[3] Interpretation and discussion

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INTRODUCTION

WSNs with their tiny sensing motes have become a peculiar area of research. Sensing nodes sense, process and transmit the data to end users, Sensing nodes with their sensing capabilities are deployed on a variety of fields. Major applications of these nodes are in industry military, health, environmental monitoring and civil. WSNs consist of sensor motes which are developed based on the MEMS technology[1]. This network in contrast to other conventional networks employs several hundred nodes in its operation. These nodes gather the data; communicate with one another and with BS. WSNs do not follow a fixed topology. Rather node is randomly distributed according to a specific application. Wirelessly connected sensing nodes in this type of network used a various energy efficient mechanism to make their communication more and more energy efficient. Wireless Medias induce infrared devices and radios[2]. This enables the user to monitor the whole network. Sensing nodes can be deployed at various locations. Because of their tiny size and wireless nature of these nodes, these nodes can be installed at locations where a human cannot easily access. So the gathering of data becomes more and more possible and feasible. A sensing node consists of a tiny battery, Radio module, processor, and memory. The basic architecture of a node depends upon application for which it is being employed to sense the data.

WSNs are now used to sense various types of data from diverse fields. Tiny sensing motes with their sensing capabilities can gather information related to temperature, light, noise and other object monitoring[3]. Integration of microsensing modules and wireless nature of tiny nodes makes them more flexible. Hence they can monitor various applications. Peculiar applications of WSNs and their importance are discussed below. Sensors are widely deployed in battlefields in the condition of war. Better eavesdropping and monitoring the forces movement can best be achieved with help of sensor nodes. Tiny size, robust nature, limited resources and efficiently sensing the required data makes sensor nodes To beg used more and more in military-related fields. Main implementations of sensors in the military include eavesdropping. Tracking forces, arms and other military installments[4].

Sensors were firstly deployed in monitoring the environment. In this type of monitoring environmental related parameters such as temperature, humidity and wind pressure is measured to forecast the weather. Other implementation of sensor nodes in monitoring the environment includes fire monitoring, flood monitoring, habitat monitoring, snow monitoring, wildlife monitoring[5]. Now the tiny sensor nodes are usually deployed in disaster management systems. In disaster management operations usually, WSNs help in finding out the places which may be potentially useful for rescue and relief operations. Use of sensors for predicting the main concern for meteorologist, Environmental monitoring is base illustrated in Figure 1.

Sensors have also found their way in medical fields. The medical field now is depending on the sensor for diagnosing different diseases in patients. Different bacteria and pathogens can best be spotted with the help of sensors. Sensing motes can be applied to patients to detect its various mental and physical conditions under the action of different drugs[6]. Other application of sensor nodes includes monitoring person's body temperature, his heartbeat, and breathing rate.

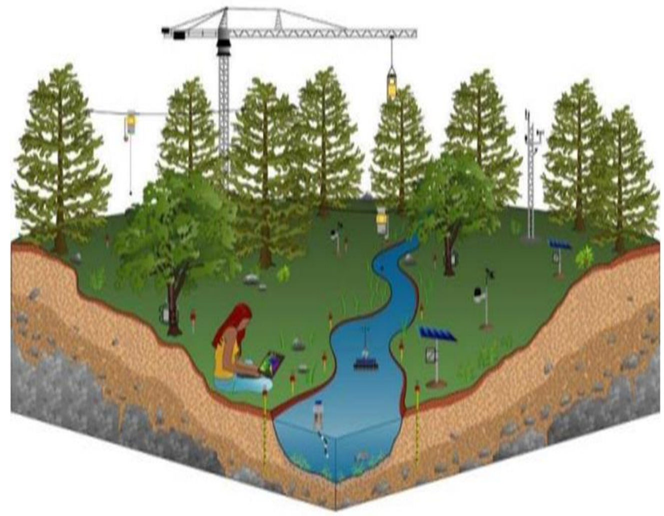

Figure1. Environmental Applications of WSNs

Sensors have marked their way in almost every walk of life. Now in sports sensing nodes can be deployed to monitor player's bodily movement and their heartbeat. In various civil applications they can be used in various industries to facilitate the manufacturing units by detecting faults. On streets sensor can be deployed to measure the intensity of light and then turning the lights on and off according to light intensity. This procedure conserves more and more energy. WSNs are used widely for providing benefit for many applications such as Building Automation/Access control, security, Energy management, Monitoring, Biodiversity Mapping and Disaster relief operation extra [7].

Problem Statement

Previous research has proved that clustering technique is more efficient in terms of energy consumption then Flat or MTE techniques. However, in clustering techniques, cluster head selection is the major area of concern. If non-optimal cluster heads are selected, which decrease the cluster stability and lifetime of the network. From our extensive literature review, two schemes naming SEP[8] and DEEC [9] are proposed. These protocols do not provide any network deployment planning and CHs selection is mostly in single perimeter i.e. Residual Energy due to which the uneven clusters formation and No optimum number of cluster heads selection. This arises from the stability and network lifetime issues.

We concluded that following are the major problems in non-optimal cluster head selection which decrease network lifetime.

- The number of alive node decrease very frequently
- The Energy consummation is increased in every Round
- The number of dead nodes increases very frequently
- The number of packets sends to Base station is less
- The Residual Energy of Nodes also decreases very frequently

The proposed scheme minimizes the above problems. This is discussing in coming sections.

LITERATURE REVIEW

Many routing protocols have been proposed for WSNs over the most recent couple of years. The fundamental point of these routing protocols is to Minimizing the vitality utilization because of whole deal transmission by the course of action of these scattered nodes into various little ranges which are alluded to as a Cluster. In Clustering strategy, sensor nodes of system compose themselves in hierarchical structures. In a Cluster, information gathering and accumulation are performed by Cluster head keeping in mind the end goal to reduce the measure of vitality devour by nodes to transmit information at long distance to the base station. Cluster head determination is normally in light of probability. Noncluster head nodes select their cluster head on the premise of RSSI. Noncluster head nodes then transmit their information to their CH. The cluster head collects data from the member's nodes, aggregates and transmits to the BS.

Heinzelman et al.[10] one of the first hierarchical routing protocols in WSNs are Low Energy Adaptive Clustering Hierarchy (LEACH). In LEACH Protocol dynamic clustering mechanism is adopted in which a node elects itself to become cluster head by some probability and broadcasts its status to the entire network. As the cluster head receives data from all cluster members in its cluster and then transmit their data to the BS, cluster head consumes more energy than a non-cluster head node. Each node in the network will become cluster head during network lifetime. The main drawback of LEACH protocol is an uneven distribution of cluster heads. In LEACH protocol too many nodes may elect themselves as cluster than the desired number of cluster heads which may cause a huge amount of energy consumption due to direct transmission to the base station. Furthermore, in leach, nodes with low battery power can be selected as cluster heads, as they have equal chances to become as cluster heads as nodes with high battery power. Due to this problem, the stability of the network is affected.

B. Heinzelman et al.[11] presented LEACH-C which minimizes the drawback of the conventional LEACH. The conventional LEACH protocol does not guarantee the best possible number of CHs and their effectual locations. The problem is due to the clusters formation method used by the LEACH algorithm. LEACH-C is therefore proposed to enhance the cluster creation part of the LEACH protocol. All nodes are required to send their ID, location, and energy information to the base station during the setup phase of C-LEACH. The base station is responsible for assigning the role of CH to any member node by using its central control algorithm. The central control algorithm first specifies the average energy level and then compares that energy level to the energy level of the received signal energy. The base station picks the optimal number of CHs from the nodes with an energy level greater than the average energy level. A list of IDs of these selected nodes is transmitted by the base station to all nodes. From this list, a node having a minimum distance from its member nodes is elected as CH of that cluster. Some of the disadvantages of using the LEACH-C protocols are given below.

During the setup phase, all the nodes in the network are required to send their information to the base station. This process causes additional energy consumption from each node.

The central control algorithm runs on the base station to select the CHs. The IDs of selected CHs are passed to all nodes. Every node needs to compare its ID with the IDs of CHs to determine its role as a CH. These additional computations consume more energy from the nodes.

The authors in SEP8 were one of the first to address the impact of energy heterogeneity of nodes in WSNs that are hierarchically clustered. Their approach was to assign a weighted probability to each node based on its' energy level as the network evolves. One major characteristic of this approach is that it rotates the cluster-head to adopt the election probability to suit the heterogeneous settings. The authors exploited the capabilities of LEACH to develop an adaptive and well-distributed model to cater for extra energy introduced into the network, which is a source of heterogeneity. Under the model development of SEP, two kinds of nodes with different energy levels were used, constituting a two-level hierarchical WSN in a single-hop setting. In SEP nodes with high battery power have more chances to become Cluster heads which increase the network stability, however, SEP still has the problem of uneven distribution of cluster heads.

Akkaya et al.,[12] estimated the optimal number of CHs among randomized sensors in a bounded region. They analytically determined the optimal value of k in LEACH using the computation and communication energy models and shown that the number of CHs depend on the distance between BS and sensor network system.

The authors of DEEC9 proposed a distributed energy-efficient clustering scheme following the thought of LEACH and SEP8. The idea of the protocol is to elect cluster-heads using probability-based approach to estimate the ratio of the residual energy of each node and the average energy of the network. DEEC is more SEP-like in the sense that, it adapts the rotating epoch of each node to its energy. Recall, that an epoch is a set of rounds in a network. Eventually, the node with high residual energy will become cluster-heads than the nodes with low energy. The goal of DEEC is to design an energy-aware algorithm for a heterogeneous network.

The Xiangning et al,[13] (2007) presented Multi-Hop LEACH is an enhancement of LEACH, which reduces the energy consumption of the CHs in large WSNs. Like LEACH protocol, the formation of clusters and selection of the CHs is done in the setup phase. However, during steady-state phase, the non- cluster head nodes send their data to the CHs. The CHs aggregate and transmit that data towards through other CHs. The most feasible and energy efficient path is selected for that CH which is far from the base station. The method used for the selection of intermediate CH is the distance between the CH and the base station. The CH closer to the base station receives the data from the other CH which is far from the base station. This helps to save energy of those CHs which belong to the clusters with larger distance from the base station as higher transmission energy cost is required for communication with larger distances.

Ingemar et al.[17] presented a probabilistic analysis of hierarchical cluster protocols for LEACH and provided a solution for low-energy and limited-loss optimization. He also extended his results to a multi-level version of LEACH, where clusters of nodes again self-organize to form a cluster of clusters, and so on. Only the heads of the highest level clusters communicate directly with the BS. He showed analytically that under loss-free conditions, the one-level protocol remains competitive in comparison with the two-level version, whereas the benefits of multilevel hierarchies begin to show in loss systems.

Ahamd et al.[14] presented Centralized Energy Efficient Clustering (CEEC) routing protocol is a centralized algorithm for cluster-head selection and its performance is much better in a heterogeneous environment as compared to homogeneous environment. An advance heterogeneous network model is proposed for CEEC, in which sensor nodes with different energy level are deployed in separate regions. In CEEC, BS performs central clustering formation in the network, with help of central control algorithm of CEEC. The advance central control algorithm considers four factors for selection of cluster-heads, initial energy of sensor nodes, the residual energy of sensor nodes, and the average energy of each region and location of sensor nodes. Operation of CEEC is based on rounds, with adjustable duration. Each round is divided into Network Settling Time (NST) and Network Transmission Time (NTT).During Network Settling Time (NST) suitable cluster heads are selected by BS, with the help of central control algorithm. During Network Transmission Time (NTT) real communication takes place towards the BS. In NTT all sensor nodes send their data to their Current Cluster Heads (CCHs), in assigned time slots. Cluster-heads receive the data from its cluster and aggregate the data.

Tahir et al.[15] proposed a scheme whereby a minor number of High-Energy nodes collect position material and enduring energy station of the sensing nodes and convey to the Base Station. This scheme excludes CH announcement phase in order to preserve energy. Based on the energy depletion by various types of nodes, we have to result in an energy model, also known as EEC, for our algorithm which describes the total energy consumption in the networks.

Farooq-I-Azam et al.[16] proposed a different intellectual localization algorithm which uses flexible range beacon signals engendered by unpredictable the communication power of beacon nodes. The algorithm does not use any supplementary hardware assets for alternating and estimations position using only radio connectivity by impassively listening to the beacon signals. The algorithm is spread, so each sensor node concludes its own position and communication overhead is evaded. As the beacon nodes do not continuously convey at the extreme power and no transmission power is used by indefinite sensor nodes for localization, the proposed algorithm is energy efficient. It also provides control over localization granularity. Recreation results show that the algorithm provides good precision under varying radio conditions

RESEARCH METHODOLOGY

First Order Enger Model

First order radio model employed in MCQC scheme. Energy is needed in the overall communication network. Mainly energy is utilized in major three operations in the communication of WSNs. Data transmission; reception and aggregation on CH require a significant amount of energy.

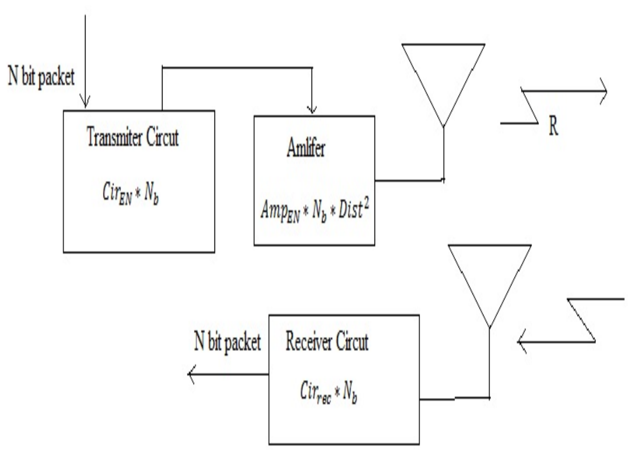

Figure No.2. First order Energy model

Below are the equations for energy consumption during transmitting and receiving the number of the packet. Energy is also used for data amplification and data aggregation. Equation 1 is for energy consumption during data transmission and 2 are for receiving and 3 are for data aggregation.

$$Tran_{EN} = (Cir_{EN} \times N_b) + Amp_{EN} \times N_b \times (di)^2 \quad (1)$$

$$Rec_{EN} = (Cir_{EN} \times N_b)(n) \quad (2)$$

$$Ag_{En} = (Cir_{En} \times N_b) \times (n) \quad (3)$$

Where:

$Tran_{En}$ => Energy dissipated per bit at the transmitter

Rec_{En} => Energy dissipated per bit at receiver

Emp_{En} => Amplification energy

Cir_{En} => Cost of circuit energy when transmitting or receiving one bit of data

N_b => Number of transmitted data bits

di => Distance between a sensor node and its respective cluster head or between a CH to another CH nearer to the BS or between CH and BS.

Network Division

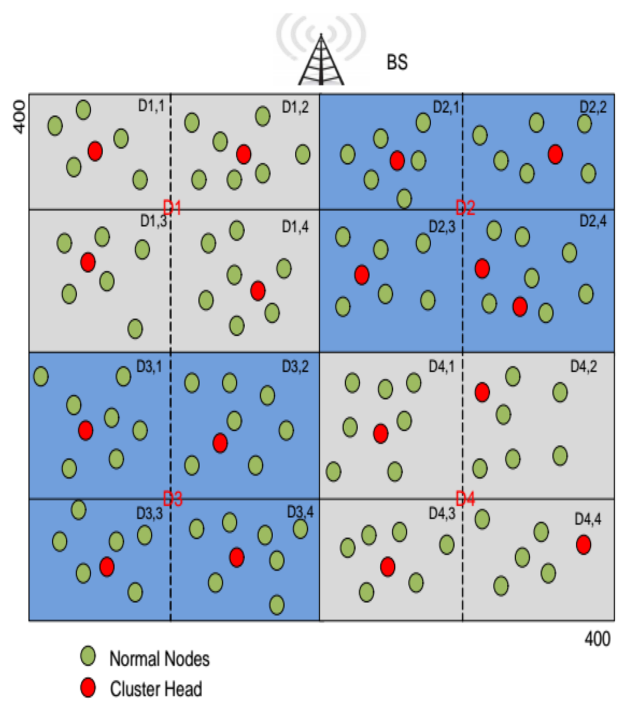

Fig 3. Proposed scheme MCQC network model

Energy conservation is the main goal in any routing protocol of WSNs. If clustering is efficient then it saves more power in the system. Our centralized hierarchal approach takes into account this fact and comes out with more efficient cluster formation approach BS after gathering the whole network information, divides the whole area into four equal Quadrants and these four quadrants are further divided into sub-quadrants. The division of whole network area proved that it is very efficient clustering mechanism. Through this approach nodes of the larger area such as 400 square meters can be part of the optimal cluster. This hindered the complexities which were in cluster formation in other routing protocols. Division of the whole area into smaller parts conserves more and more energy in the system. This increases the network lifetime and stability much folds compared to other conventional routing protocol for WSNs, Equations below show the division of network.

$$di = d_1 + d_2 + d_3 + d_4 \tag{4}$$

Whole network area d is divided into d1, d2, d3, and d2.

This division of area produces good results and comes out to be more energy efficient. This also proves to be helpful in the election of the best node for CH by BS, the election CH is given below.

$$d_n = di(x_m, y_m) \tag{5}$$

In MCQC BS is responsible for gathering whole information related to nodes. BS collects the information of the whole network. This information includes network area, a distance of nodes from each other, from BS, the residual energy of nodes in the network. BS is responsible for the efficient division of the area into smaller sections.

Cluster Metric (CM) is calculated by BS by keeping the information of relative distances of nodes and their energy information, through these CM optimal CHs are selected, which removes the limitation of another routing of protocols and enhance the network lifetime CM depends upon two parameters which are given below.

- Residual energy
- Distances of Sensing Nodes

Nodes with higher residual energy and more closer to its sensing nodes and BS will have a smaller value of CM and will be elected CH. because CH consumes more energy compared to other sensing nodes hence job CH is given to other nodes after some time period. This does not burden a single node who becomes a CH. Whole operations propose scheme is divided into different phases.

Gathering Network Information by BS

The centralized behavior of our proposed scheme compels the BS to gather information about the whole network first of all hello messages are exchanged between BS and sensing nodes in the network. Through these hello messages BS gather information about whole network area. Sensing nodes distance from the BS and from other nodes is also gathered to keep track of all nodes in the network. Nodes residual energy level is collected from network By BS, BS gather all this information and maintain a database about the network from the cluster and elect CHs.

CH Election Phase

A Novel idea of division of whole area into quadrants and further sub-quadrants and precise calculation of Cluster Metrics (CM) by BS due to centralized nature make our routing approach to performing well in energy scare network of sensing nodes CM is the combination of residual energy information and distance of sensing nodes from BS and with one another. Every node maintains a neighbor table which carries information of its own id, its relative distance with other neighbor and with BS. During the exchange of the Hello message at the start of operation, BS gather the information of needs. Now BS has a comprehensive idea about nodes location network. Which node is in which sub-area, what is the residual energy level of nodes and what is the location of each node in the network, depending upon this criterion CM is calculated for every node.

For CM sum of all distances and average distance is given by the following equation.

$$D_{dist(i)} = \sum_{i=1}^{n} di \tag{6}$$

Where Ddist is the sum of all the nodes distance and di is the distance of node i with respect to neighbor j for average distances of sensing node.

$$D_{avg} = \frac{D_{dist\,(i)}}{N} \tag{7}$$

Where Davg is the average distance between sensing mote. Now CM is given by the equations below.

$$CM \propto D_{avg} \tag{8}$$

$$CM \propto \frac{1}{R_{EN}} \tag{9}$$

$$CM = k\frac{D_{avg}}{R_{EN}} \tag{10}$$

Where CM is the Cluster Metric, Davg is the average distance of sensing motes and REN is the residual energy of nodes. The above CM equation suggests that nodes with more residual energy and less distance will have a smaller value of CM smaller value of CM of any node calculated by BS will make it CH. So BS calculated CM for every node in every periodic round. Nodes with smaller values of CM than others in sub-area will become CH. The information of newly elected CH is sent from BS to sensor nodes. CHs with their node IDs will be broadcasted to every node in the network. Nodes in each sub quadrants match the received ID with its neighbor table. If the received broadcast ID of CHs is nodes own ID, then it will elect itself as a CH and broadcasts its message to another sensing node. Otherwise, it will discard the received information of IDs from BS and waits for form broadcast from CH. After CH selection, nodes start an association with CH, nodes association with CH is given in next subsection.

Nodes association and Communication Phase

After proper partitions of the whole network into optimal sub quadrants and calculation of CM BS elects the CHs. After the election of CH, CH sends a broadcast message to every other member node in its cluster. After receiving a broadcast message from CH, member nodes send a request message to CH for the association.

In Communication phase sensor motes after sensing, send their data to CHs, CHs after receiving sense data perform some type of data aggregation to minimize the data redundancy in data. Then finally the data is transmitted to BS. There are chances that some CHs may at large from BS. To make network more and more energy efficient, MCQC scheme used multi-hop communication. In this type of indirect communication one CH send its data to another CH which is aa smaller distance from BS, This CH to CH communication is very energy efficient as CHs does not consume energy in sending data to BS which is at a larger distance from BS. Below is the figure for the whole operation of our proposed scheme.

Properties of MCQC

MCQC protocol tries to reduce the energy consumption of nodes which increases the number of alive nodes and lifetime of nodes. Different properties of MCQC protocol are as follows:

1. Cluster Head Selection: MCQC select CHs on basis of Average distance and residual energy.
2. Energy: MCQC reduces energy usage by restricting far away from communication. A normal node communicates with the CH and then CH forwards it to nearest available CH.
3. Hop-Count: MCQC uses single hop scheme in intra-cluster communication as the distance is low among CHs and their members. It uses multi-hop scheme in inter-cluster communication.
4. Centralization: MCQC makes use of Centralized algorithms for CH selection.
5. Sink Send the IDs of select CHs by comparing the Average distance and Residual Energy.

Simulation Results and statically Analysis

In this section, we compare the performance of our proposed scheme MCQC with DEEC and SEP through simulation using MATLAB.

Table.1 Simulation Parameters

Parameter	Value
Simulation Rounds	500
Area	400m×400 m
No. of Nodes (n)	100
NO. of Clusters (k)	n×0.1
Initial node power	0.5 J
Nodes distribution	Randomly
BS position	(200 x 200)
Energy for Transmission (ETx)	50 x 0.00000001J
Energy for Reception (ERx)	50x 0.000000001J
Energy for Data Aggregation	50x 0.000000001J
Channel IEEE	802.15.4 Zigbee

In MCQC scheme nodes deployed randomly. Figure 5 show node deployment in Area 400m x 400m. The bellow Figure 6 shows the cluster formation in the proposed scheme.

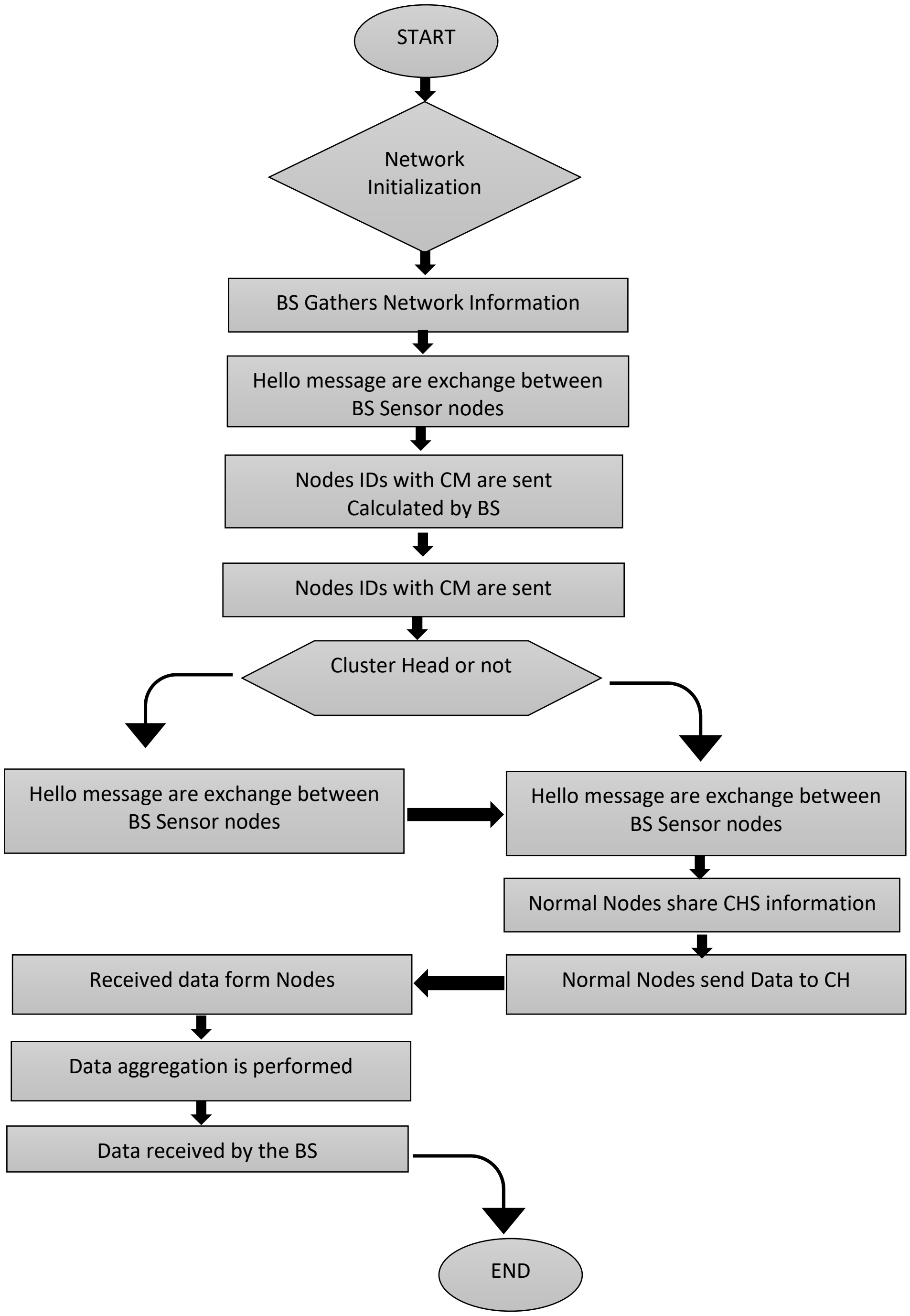
START
Network Initialization
BS Gathers Network Information
Hello message are exchange between BS Sensor nodes
Nodes IDs with CM are sent Calculated by BS
Nodes IDs with CM are sent
Cluster Head or not
Hello message are exchange between BS Sensor nodes
Hello message are exchange between BS Sensor nodes
Normal Nodes share CHS information
Received data form Nodes
Normal Nodes send Data to CH
Data aggregation is performed
Data received by the BS
END

Figure 7 shows Network lifetime of DEEC, SEP, and our Purposed scheme MCQC. From the graph, it clearly shows that in 500 Rounds the SEP alive nodes are 41 and DEEC alive nodes are 73 while our scheme MCQC alive nodes are 90. Its show that DEEC is better then SEP and MCQC are better than DEEC. Our scheme Network lifetime is much better than DEEC and SEP its due to best CH selection technique and using Multi-hop communication.

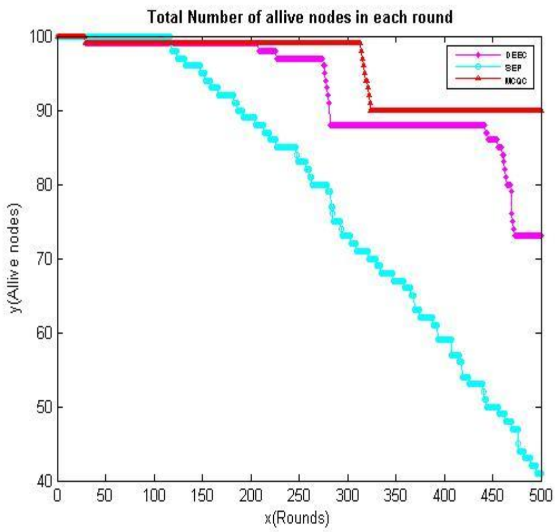

Figure No. 7: Number of Alive Nodes in each round

The Figure 7 shows that the DEEC is 23% better than SEP while MCQC is 7% better than DEEC and 30% better than SEP. The Average of live nodes also shows that our proposed scheme is better than SEP and DEEC.

Figure 8 shows the Energy Consumption in each round. From the simulation Result shown in the figure is clearly show that our Scheme consumes less Energy than SEP and DEEC. The 70 percent energy consume in communication. We use Energy model for communication which uses single hop and multi-hop for communication. Our Scheme using single hop communication in Intra clustering and using Multi-hop communication for inter clustering. This is the main reason for Lowe energy consumption.

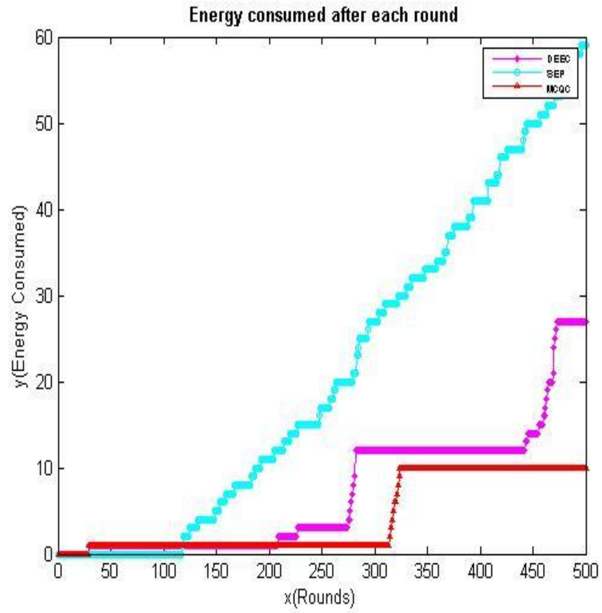

Figure No. 8: Energy Consumed after each round

The Figure 8 shows that SEP consumed the average Energy per round 32 mJ, DEEC consumed average energy per round is 11 mJ while MCQC consumed the average energy per round is 6 mJ. It shows that DEEC consumed 66% less energy than SEP while MCQC consumed about 16% less Energy than DEEC while 82% less Energy consumed than SEP. its show that our Proposed scheme must better than SEP and DEEC.

The figure 9 shows the number of Packets sends to sink. Due to proper CH selection and communication model, the throughput of our proposed scheme is much better than SEP and DEEC. In Round number 200 the SEP send 968 packets to Base station, DEEC sends 1307 packet while MCQC sends 1493 packet. It shows that DEEC is better than SEP and MCQC is much better than DEEC and SEP.

Figure 9 shows the Packets send to the base station in different rounds and by different schemes. From round 50 to round 200, the DEEC and MCQC have sent same numbers of Packet. After round 200 the MCQC send more packet then DEEC. In Round 500 SEP send 4042 packets, DEEC sends 8574 while MCQC 8719 packets sent to Base station. Its show in the above table that there is no huge differs among them. According to the above table, DEEC better 98.5% than SEP while MCQC is 2% is better than DEEC and 100.5% better than SEP. Due to above table result in our proposed scheme give a better result than SEP and DEEC.

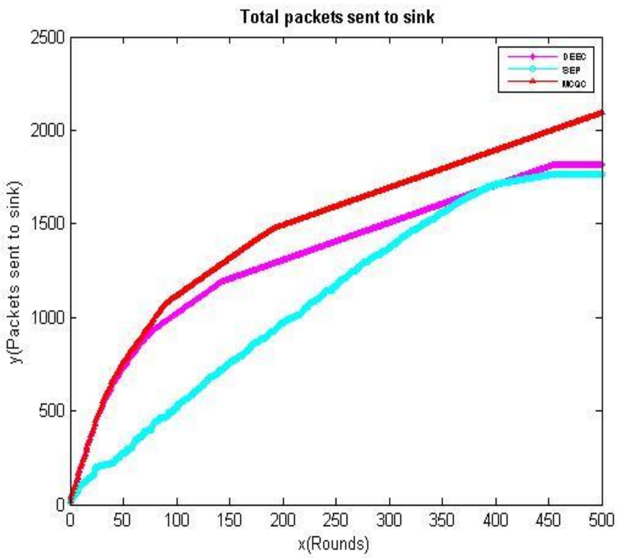

Figure No. 9: Packet send to Sink

The Residual Energy of nodes shows the Network lifetime and stability. Any schemes which have more Residual Energy have to increase network lifetime and stability. The bellow Figure 9 shows that the proposed scheme MCQC Nodes have more Residual energy as compare to SEEP and DEEC. Residual Energy of Nodes in MCQC, SEEP and DEEC is bellow

DEEC Residual Energy=8.1e+003 nJ

SEP Residual Energy = 3.56e+003 nJ

MCQC Residual Energy=8.52e+003 nJ

From the above figure, it is clear that the proposed scheme has more residual energy then SEEP and DEEC. The above discussion and Results our proposed scheme is much better than the DEEC and SEP schemes. Our proposed scheme improves the stability and network lifetime. Its mean MCQC consumes less energy as compared to DEEC and SEP.

From the above Analysis and discussion, we conclude that the lifetime and stability of network mostly effect by Area and Energy. When increases the Area and don't increase initial Energy of nodes that it badly affects the network lifetime and stability but when Area decrease then the network lifetime and stability increase. The network lifetime and stability also depend on the communication

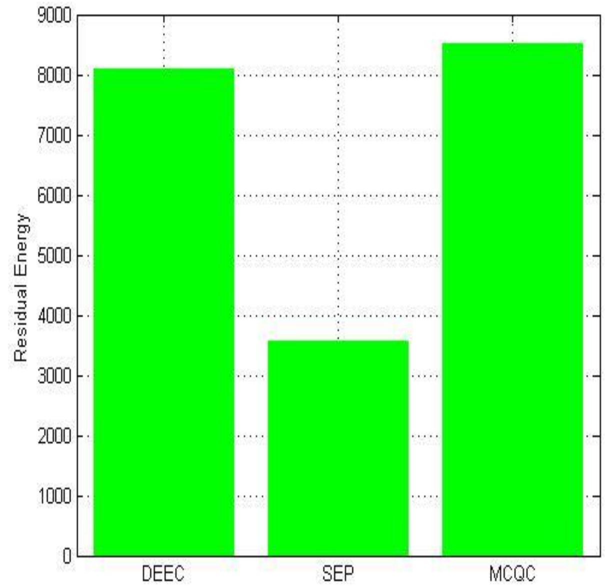

Figure No. 10: Residual Energy in different Schemes

The technique and Mechanism because when don't use best communication technique then the nodes consume more energy for cluster formation. In overall, the proposed scheme gives a better result than DEEC and SEP it's because proposed scheme uses single hope for intracluster communication because the node is near to CHs while using multi hope for inter-cluster communication. Also proposed scheme doesn't make a cluster for that's nodes which is nearer to Bas station that nodes directly communicate with Base station. If the nearest nodes to the BS makes cluster then its consumed extra energy for CH selection. To make cluster head is consumed more energy as compared to direct communication with BS. So one of the best approaches is that the nearest node to the BS directly communicates with BS While fair away nodes from BS use clustering technique.

CONCLUSION

Sensing nodes are deployed in a variety of environment. The sensor can sense the data related to medical, industry, weather and battlefield and ecosystem. Tiny sensing nodes are installed with limited battery resources. These tiny sensing nodes demand energy efficient hardware and software support. Energy conservation is mainly focused on designing routing schemes for sensor networks. In in this paper, we have presented novel clustering approach. Partitioning of the whole area into quadrants and further division of the area into sub-quadrant makes clustering approach more and more optimal and evenly utilized the energy. CH election process is mainly based on residual energy and the distance to the BS and between the sensing node and CH. Cluster Metric is the deciding factor for best CH election. Sub quadrants and CM is the best utilization of given resources makes our proposed scheme the more efficient. Extensive simulation has been performed which outperforms other routing approaches for sensing motes. Network lifetime, stability, throughput, and energy conservation has increased many times due to best resource utilization. Tiny sensing motes seem to conserve more energy when the area is divided into sub-quadrants, and more nodes are alive than others in higher rounds. The stable and optimal clustering in our hierarchical approach seems to be very efficient than other hierarchical and at routing protocols of sensor networks.

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