International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878, Volume-8 Issue-3, September 2019

A Visiting Center based Energy Efficient Data Collection Method for WSN

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Abstract*: Due to the profits raised due to the exploitation of the sink mobility for enlarging the life span of the network made the WSNs highly recognizable. Various complications and restrictions can be seen in the sensing field during the practical conditions. Hence, all the developers faced a challenge for acquiring the efficient outcome for mobile sink to determine the shortest path which can overcome all the complications and restrictions. The main aim of this paper is to give a clear explanation about the energy-efficient routing strategy on the basis of the cluster-based technique, for sinking the mobiles in the WSNs with complications. In this cluster-based technique, the nodes which are chosen as a cluster heads gather the information from the cluster members then send the information which is being gathered towards the mobile sink. Here, initially the data collection is initiated by the mobile sink through the periodical route from the initial site and at that time collects the information directly from all the cluster heads in a range known as single hop range, and in the end go back towards the initial point. Intended for the mobile sink, this design utilizes a procedure for determining shortest route through which one can avoid the obstacles. The algorithm is existing system algorithm whose name is heuristic tour planning algorithm. Anyhow, because of the complications of the programing issue in WSNs by means of obstacles and vast tour time, the conventional algorithms are bit challenging for solving. For overcoming this issue, the developers projected a strategy known as a visiting center based energy efficient data collection strategy. On the basis of the information and data which is being collected by them, they presented an algorithm. The name of the algorithm is visiting center algorithm. This algorithm is used in mobile sink. This helps in determining the route and path for cluster heads and collecting the information from the cluster heads and stores them safely. The data gathering route is initiated in a periodical way from the beginning stage which is the primary work of the mobile sink node, and at that time the information is collected by it from the VC's in the single hop range and lastly gets back to the initial stage. The efficiency of this technique can be clearly observed in the simulation results. The software utilized here for making the process of simulation is NS2 software. This software efficiently verifies the efficiency and effectiveness of the technique.

***Index Terms*: WSN, Cluster formation, Cluster heads, visiting centers, Routing path, H-TOUR-P, VC-EEDC.**

Manuscript published on 30 September 2019
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I. INTRODUCTION

WSNs have been highly utilized in various aspects like monitoring the health, monitoring the environment, military surveillance and various others like Internet of Thing (IoT) [1]-[5]. The main aim of designing the WSNs is to have the high energy efficiency. Anyhow, sensor nodes consist of very limited power supply and they are bit complicated and difficult to replace. The area which needs very high energy is the nodes which are nearer to the sink which are also known as base station. This happens because the nodes completely depend upon the data which is being collected through the sensor nodes which are far-off from the sink. If anyone of the sensors which are nearer to the sink is damaged, then the information gathered from the remaining sensors fails to transfer the information to the sink. Due to the issue mentioned above the entire information fails to go to the destination point, even though the nodes are having the highest energy. Hence, enlarging the lifespan of the network is the main aspect of designing the WSNs, this can be done by lessening the consumption of energy of the sensor nodes, and this is also considered to be biggest channel in this design.

A sensor network is a connection of huge quantity of lesser cost and power multi-functional sensor nodes, these sensor nodes gets distribute highly inside to the system or nearer to the system. The sensor nodes size which exists in the sensor network is very small but they will have very good characteristics like sensing, data processing and the makes the components to communicate with one another. No need of perfection and absolution in the position of these nodes, this happens because of the protocols present in the networks, but their algorithm should have an ability known as self-possessing ability. Anyhow, nodes are forced to give an efficient energy supply and bandwidth. The nodes are capable of making the entire design to consume very lesser power. Due to this reasons and because of vast quantity of nodes the design got a lot of complications and it has become difficult to manage the networks. These complications made the developers to realize about the requirement of the energy alertness at overall layers of the networking protocol stack. Common issues observed in all types of sensor applications are the issues which are interlinked with the physical and link layers. Hence the developers majorly concentrated on the system level power awareness like dynamic voltage scaling,radio communication hardware, low duty cycle issues, system allocating, and energy aware MAC protocols. The efficient and effective route setup is provided and the lifespan is increased which is the major goal of this method.

Various strategies have been projected for overcoming the issues in WSNs mainly for enhancing their life span. In paper [6] the developers projected an algorithm, whose name is cross- layer optimized geographic node-disjoint multipath routing procedure. Most of the latest examinations and experiments utilized mobile nodes for the purpose of lessening the energy usage of WSNs to a greater point.

Similarly, life span of the WSNs also developed a lot. Mobile nodes are more capable of power and they consist of more energy as compared with the static nodes, hence they are utilized more. Mobile nodes are highly utilized in the mobile vehicles with appropriate energy, could gather the information from the entire static nodes by passing through the sensing fields. Mobile nodes collect the information from the static nodes in one-hop or multi-hop way. Various methods have been proposed by the papers [7]-[10]. The data is collected by the mobile nodes which are used as the mobile sink that passed through the sensing field in this paper. On one hand, the consumption of uniform energy is obtained by the mobile sink that decreases the communication overhead for sensor nodes near the sink or the base station. One the other hand, the sparse and disconnected network can be handled using the sink movement. Consequently, with the optimal regulation of the mobile sink route, the lifespan of the network can be considerably prolonged. Several obstacles are enclosed in the sensing field in physical atmospheres. Therefore, an obstacle-avoiding shortest route for the mobile sink is found by a research challenge that is developed so that the lifespan of the network maybe prolonged.

An obstacle-avoiding shortest route is found by the mobile sink that passes over the network with the obstacles in this paper. Simultaneously, when passing through the sensing field, the energy consumption balance amongst the nodes need to be considered by the mobile sink. The cluster-based scheme is used to effectively dispatch the mobile sink which is presented in [11] and [12]. Cluster heads as well as cluster members are the two types in which the entire sensor nodes in the sensing field are distributed with respect to the cluster-based approach. Environment data is collected by the Cluster heads which gathers the information from resultant cluster members, and information is distributed towards the mobile sink at that time. Here the developers assumed that WSNs are capable of tolerating the delay up to some extent and the complete sensing data from the cluster heads can be attained using the mobile sink. The periodical movement of the mobile sink starts its effort from the initial position and lastly returns. When the movement happens, sensing data is being collected by the mobile sink from the cluster heads. Hence, through this approach one can increase the life span of the network. From this paper one can define the network lifetime as the time period from the sensor nodes that begin its functioning until the final stage of the entire static sensors. Anyhow, in physical environments the sensing fields will have different complications and obstructions. Due to these obstructions the scheduling process for this strategy became very difficult and complicated. Hence the major challenge in this examination is finding the shortest path for sending the information without acquiring any obstacles.

For resolving the issue of the scheduling which is observed in the mobile sink, the developers taken some steps for making the issue of dispatch easier in WSNs with obstacles. For overcoming this issue they utilized a method known as grid-based method, through which the developers partitioned the region of sensing into different similar size of grid cells. The primary unit which was present in this paper is the Grid cell. The size of the grid cells will relate to the broadcasting radius of the static sensors. The two dimensional plain present in the experiment is basically partitioned into the similar sized grid cells; obstacles would also have few grid cells. Edges of the obstacles will intersect with the obstacles as well as grid cells might take some part of grid cells. When the grid cell gets occupied by the obstacles then the grid cell is also considered to be an obstacle. Hence, the developers acquired the regularization shape of the obstacles, this is done for making the mobile sink scheduling bit easier. This design will also have a spanning graph which shows the regularization shape of the obstacles. Hence, due to this reasons one can succeed in determining the obstacle avoiding shortest path for the mobile sink.

II. LITERATURE REVIEW

Most of the latest examinations represented the benefits and advantages which have arise while utilizing the mobility of nodes. The traffic issue can be highly resolved when utilizing the mobility of nodes and through this one can even enhance the energy efficiency. By the development in the energy efficiency, one can even enhance the life span of the network. Different strategies have been projected in different papers. In this all will examine about the mobility nodes and their working in the literature.

The name of strategy and scheme projected in paper [13] is VGDRA strategy. This strategy is utilized for the mobile sink for the purpose of lessening the cost needed for communication. The sensor field is basically divided into 2 categories. They are virtual grid and the cell-header nodes. Virtual grid will have the similar size cells. The nodes which are nearer to the center are selected as cell-header nodes. Along with this the virtual back bone structure is also present. The back bone structure is designed in such a way that they also have the cell header nodes. The main work of the mobile sink is to move across the sensor filed. The movement happens for collecting the sensor data; this is done through the interaction between the border cell head modes. The main reason of having one subset of cell header nodes during the process of reconstruction is to reduce the overall cost of communication. One type of programming framework is being projected by the authors in [14]. That is mixed integer programming framework. This framework is applied in the base station for the purpose of lessening the sub optimal energy dissipation. Base station mobility is introduced to WSNs for the reasoning of reversing the sub-optimal energy dissipation trends. One can prolong the network lifespan by utilizing base stations mobility patterns. Paper [15] utilized the method of support vector regression for developing the convex optimization model, through that one can determine the mobile sink.

III. PROPOSED SYSTEM

This section clearly explains about the scheme projected in this paper. This also includes the design of clusters and how the new routes are being maintained nearer to mobile sink latest location. The sensing field is basically categorized into equal portions which are having unequal size clusters. Each and every region consists of the cluster head which was placed at the center point of the region. For having a better communication with all the cluster members cluster head is placed in the middle of the region.

Every hop consists of the cluster head. Every region consists of an algorithm. All the regions utilizes similar algorithm. The name of the algorithm is LEACH algorithm. This algorithm is used for forming the cluster and also having the cluster head selection. Maintaining sink's latest position track is the major effort of the cluster head. This similarly reduces the load for the cluster members in selecting their routes and choosing their paths. Event sensing and reporting to the CH is the main work of the cluster members. They also maintains a communication known as inter cluster communication, this communication happens through the gateways.

The developers introduced Visiting centers in this project. These visiting centers helps in reducing the delay which occurs while meeting each independent node while sending the high priority and emergency data SINK. The role of VC is gathering the data from the nearest nodes. The MAs visit these VCs and deliver the data to SINK.

A. Network model

The below mentioned points are taken as the characteristics into consideration while designing the network model

- Arrangement of nodes in this design is random in nature. This arrangement happens in the complete sensing filed. All nodes are considered to be static in nature.
- The nature of the sensor nodes which are present in the sensing field is homogeneous nature. All the sensor nodes will have the similar energy levels during the starting stage. The value of energy level is 0.5J. Even their bandwidth also be same.
- Sensor nodes utilize their transmission power with respect to the distance to where they have to reach.
- Power of the two mobile sinks which are present in the design is very high. Resource constraints will not be observed in the mobile sinks.
- If observed clearly the movement of the mobile sinks happens in counter clock wise direction. For each half round in the counter clock wise format the number of hops which are present between the source and sink gets reduced. But the foremost objective of the design is reducing the time taken to have each counter clock wise rotation. This can be succeeded through the reduction of the hops in the middle of source as well as sink.
- The readjustment of the routes happens on the basis of the Time of Arrival TOA of sink, and the recent location of the sink. For making the process of readjustment the TOA gets communicated with the cluster head nodes which are very limited in number.

B. Cluster Formation Phase

For the purpose of constructing the cluster one has to partition the sensing field into 'x' equal sized regions. If the size of them is unequal then it becomes difficult to collect the data from the cluster head of every cluster. Because of the LEACH protocol, if there is N number of nodes, only 5% of nodes will work as a cluster heads.

N = number of nodes (N = 100, 200 to 400 and 500to 600)

K = number of equal sized regions which utilize the equation

After dividing the whole network into different regions, one has to select the cluster head for each and every region. In the initial stage, the node which is present exactly by thecenter point of every region would be chosen as the cluster head. Afterwards every rotation of the collection of the data, the node which is very nearer to the center point and the node which consists of highest residual energy might be chosen as the cluster head. The main function of the cluster head is that it must always inform about the amount of nodes present in its region and also nodes that are outside the cluster border to some extent. If the nodes are receiving the messages from above one cluster heads then the node selects the cluster head which is very nearer to them as the primary cluster head, and also informs regarding the remaining cluster heads which are considered as the secondary cluster heads to the primary cluster head. In this proper the communication happens between the primary cluster head and the secondary cluster heads. In such a way, every cluster head have the adjacencies by the nearer cluster heads through the gateway nodes.

C. Adjustment of the Route

As all know sink mobility produces a network topology whose name is dynamic network topology. But this topology has to be adjusted for efficient and effective outcomes. Relating to the latest location of the mobile sink, data delivery route of the nodes is setup by the developers to achieve this process of adjustment. This strategy avoids the flooding of location information as it consumes a lot of energy. In this strategy cluster heads are the only portions which are highly responsible for efficient working. The main work of the cluster head is to maintain the latest routes of the mobile sink latest location.

D. Cluster head's Rotation

Every cluster heads residual energy and the threshold residual energy value is compared when each round gets completed. For particular cluster, the selection of Cluster head will be carried out as long as any of the residual energy of the cluster head decreases below the least threshold residual energy. The CH whose residual energy value is high and which is almost closer to the regions center would be chosen to be a new cluster head. As all no the size of each cluster gets varied they are different in their sizes, so the necessity of continuous re clustering is absent. The developers reduced the energy consumption by avoiding regular re clustering or the cluster head selection procedure. Because of the availability of the two mobile sinks the load of the CH gets lessened and also the quantity of the hops also gets reduced which are planning to reach the sink.

Hence by this developers proved that the strategy designed in this paper works well as correlated with the previous existing ones.

E. Visiting Center

The sensor nodes get divided into zones in the clustering technique. Every zone will be in the circular format and it also consists of a radius, which is centered on a specific sensor node. The selection of the sensor node happens at the midpoint of an area closely occupied by the sensor nodes. Assuming that the number of sensor nodes available here as n, the work of the grouping technique is for dispensing the impact feature present in every sensor towards the entirely remaining nodes present in the design. Here, impact factor received by the sensor node from all the remaining nodes except it is considered to be [n-1]. Once the impact factor gets calculated, the sensor node whose cumulative impact factor is very high is considered to be the Visiting Center Local VCL. The clear strategy of this paper is as below:

- Every network node will have an agent.
- Then the data gets processed locally and then explains about the necessity of eliminating the unwanted data.
- Hence, these agents cooperate with one another for the purpose of avoiding the unwanted information.
- This design needs an agent for every group.
- This agent helps in gathering the information from all the nodes. The name of the agent is the mobile agent.
- The major idea of this design is on the basis of nodes grouping.
- Every group will have a center node. that node is specified as the VCL
- When the sink gains the signal from the source node, then the sink sends the mobile agent to the VCL.
- The mobile agent works between the nodes and its groups by taking the help of the itinerary Local Closest First LCF process. The data which is processed as well as collected by the nodes (agents) is aggregated by this MA to come back to the Sink and VCL using the information which is collected.
- LCF algorithm is explained below:

Algorithm: $\boldsymbol{VisitingCentre\ Selection}$
Input:
Set of n sensor nodes S,
Set of cluster heads $CHS \leftarrow \{ch_0, ch_1 .. ch_m\}$
Transmission range T_r
Output
VC- Set of visiting centers
Start:
1. $\boldsymbol{for} i = 0\ tom$
2. $VC_i \leftarrow \{\emptyset\}$
3. $S' \leftarrow S - CLH$ // remove cluster heads from S
4. $\boldsymbol{for} j = 0\ tom$
5. **begin**
6. $\boldsymbol{for} i = 0\ ton$
7. **begin**
8. $\boldsymbol{if} dist(s_i, ch_j) \leq T_r$
9. $CL_j \leftarrow CL_j \cup s_i$// add node $s_i$to the cluster cl_j
10. **End for**
11. $S' \leftarrow S' - cl_j$ // remove nodes joined in $cl_j$from S'
12. **End for**
13. $L \leftarrow S'$
14. $VC \leftarrow CLH \cup$ L //final set of visiting centers
15. $VC \leftarrow Lin - Kernighan(VC)$//determine shortest path
End
Algorithm: $\boldsymbol{dist\ (P_1, P_2)}$
Input
Two points $P_1$and P_2| $P_i \leftarrow (x_i, y_i)$
Output
Distance d between points $P_1$and P_2
Start:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Return (d)

IV. RESULT AND DISCUSSION

➢ Experimental results

In this paper, the developers assumed that there exist 40 sensor nodes are dispersed without order over a 1000 x 500m^2, this consist of four obstacles. The hole is not considered in this examination. Here, they assumed that the location of the mobile sinks will be in the top-left corner of the two dimensional territory and the value of the coordinates in this paper are (50 m, 50 m). Its periodical obstacle-avoiding movement is initiated by the mobile sink from initial position and comes back finally. Table1 presents the system parameters used in our simulations. There will be a scheduling process in the mobile sink. For making that scheduling process easier they accepted that the information collected by the sensor nodes in named to be the deferral tolerant information., i.e., they may wait for the mobile sink to come and lift them up.

PARAMETER	VALUE
Application Traffic	CBR
Transmission rate	1024bytes/ 0.5ms
Radio range	250m
Packet size	1024 bytes
Maximum speed	25m/s
Simulation time	8000ms
Number of nodes	40
Area	1000x500
Grid size	10m

Table1: System parameters

➢ **Evaluation results**

Here, they utilized the energy efficient VC algorithm for the purpose of making various amount of examinations in the sensing field with obstacles. With respect to life span of the network and the mobile sink moving path, they showed the examination outcomes of the algorithm. These results are specified below:

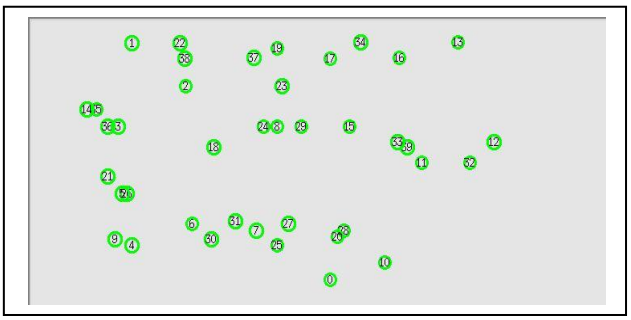


Figure 1: Network Deployment

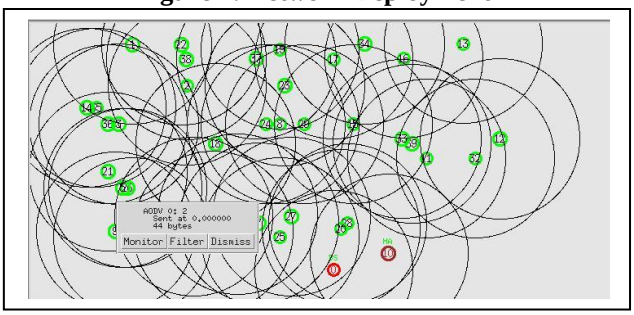


Figure 2: Broadcasting in Network

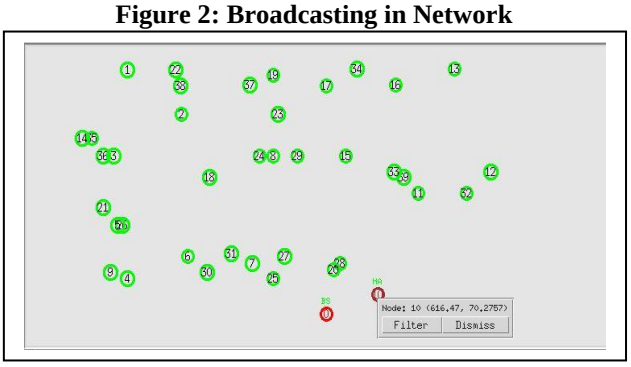


Figure 3: Initial stage of Mobile agent

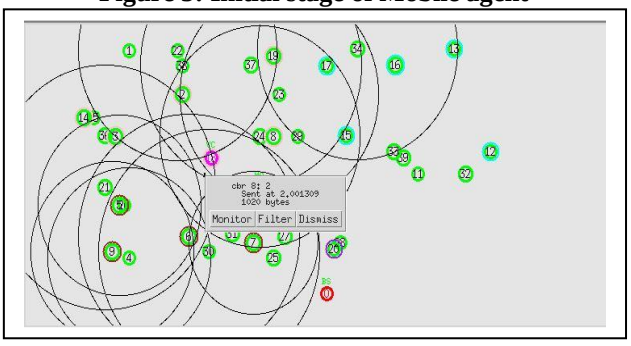


Figure 4: Data transmission at visiting centre

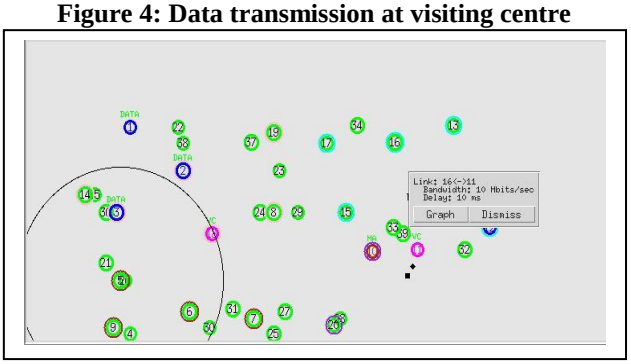


Figure5: Link between data nodes and next visiting centre

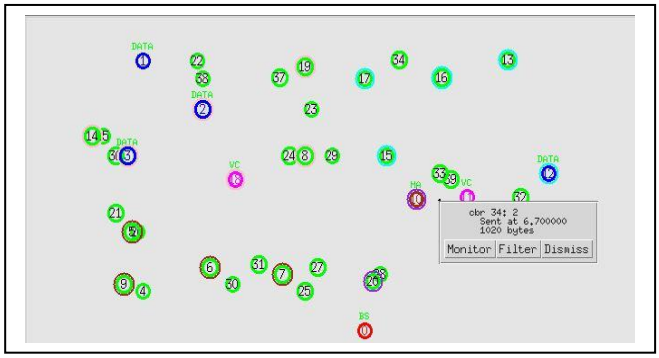
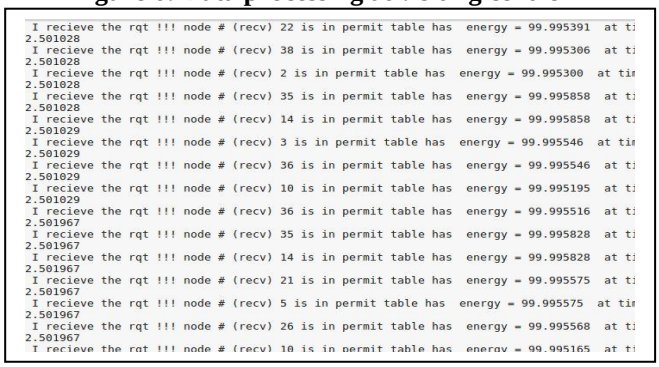


Figure 6: Data processing at visiting centre



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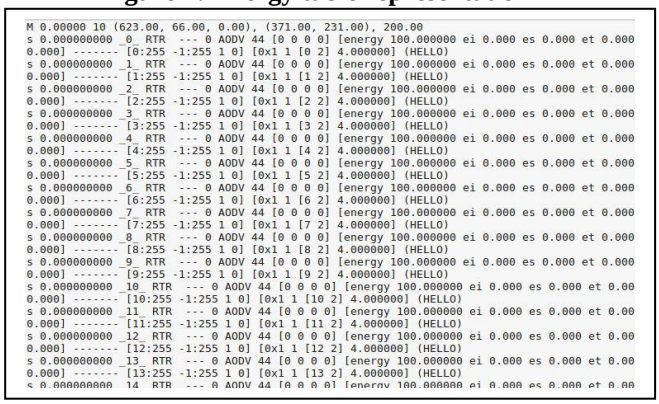
 I recieve the rqt !!! node # (recv) 22 is in permit table has  energy = 99.995391  at ti
2.501028
 I recieve the rqt !!! node # (recv) 38 is in permit table has  energy = 99.995306  at ti
2.501028
 I recieve the rqt !!! node # (recv) 2 is in permit table has  energy = 99.995300  at tim
2.501028
 I recieve the rqt !!! node # (recv) 35 is in permit table has  energy = 99.995858  at ti
2.501028
 I recieve the rqt !!! node # (recv) 14 is in permit table has  energy = 99.995858  at ti
2.501029
 I recieve the rqt !!! node # (recv) 3 is in permit table has  energy = 99.995546  at tim
2.501029
 I recieve the rqt !!! node # (recv) 36 is in permit table has  energy = 99.995546  at ti
2.501029
 I recieve the rqt !!! node # (recv) 10 is in permit table has  energy = 99.995195  at ti
2.501029
 I recieve the rqt !!! node # (recv) 36 is in permit table has  energy = 99.995516  at ti
2.501967
 I recieve the rqt !!! node # (recv) 35 is in permit table has  energy = 99.995828  at ti
2.501967
 I recieve the rqt !!! node # (recv) 14 is in permit table has  energy = 99.995828  at ti
2.501967
 I recieve the rqt !!! node # (recv) 21 is in permit table has  energy = 99.995575  at ti
2.501967
 I recieve the rqt !!! node # (recv) 5 is in permit table has  energy = 99.995575  at tim
2.501967
 I recieve the rqt !!! node # (recv) 26 is in permit table has  energy = 99.995568  at ti
2.501967
 I recieve the rqt !!! node # (recv) 10 is in permit table has  energy = 99.995165  at ti
```

Figure 7: Energy table representation



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M 0.00000 10 (623.00, 66.00, 0.00), (371.00, 231.00), 200.00
s 0.000000000 _0_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.000
0.000] ------- [0:255 -1:255 1 0] [0x1 1 [0 2] 4.000000] (HELLO)
s 0.000000000 _1_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.000
0.000] ------- [1:255 -1:255 1 0] [0x1 1 [1 2] 4.000000] (HELLO)
s 0.000000000 _2_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.000
0.000] ------- [2:255 -1:255 1 0] [0x1 1 [2 2] 4.000000] (HELLO)
s 0.000000000 _3_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.000
0.000] ------- [3:255 -1:255 1 0] [0x1 1 [3 2] 4.000000] (HELLO)
s 0.000000000 _4_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.000
0.000] ------- [4:255 -1:255 1 0] [0x1 1 [4 2] 4.000000] (HELLO)
s 0.000000000 _5_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.000
0.000] ------- [5:255 -1:255 1 0] [0x1 1 [5 2] 4.000000] (HELLO)
s 0.000000000 _6_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.000
0.000] ------- [6:255 -1:255 1 0] [0x1 1 [6 2] 4.000000] (HELLO)
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0.000] ------- [7:255 -1:255 1 0] [0x1 1 [7 2] 4.000000] (HELLO)
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0.000] ------- [8:255 -1:255 1 0] [0x1 1 [8 2] 4.000000] (HELLO)
s 0.000000000 _9_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.000
0.000] ------- [9:255 -1:255 1 0] [0x1 1 [9 2] 4.000000] (HELLO)
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0.000] ------- [10:255 -1:255 1 0] [0x1 1 [10 2] 4.000000] (HELLO)
s 0.000000000 _11_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.00
0.000] ------- [11:255 -1:255 1 0] [0x1 1 [11 2] 4.000000] (HELLO)
s 0.000000000 _12_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.00
0.000] ------- [12:255 -1:255 1 0] [0x1 1 [12 2] 4.000000] (HELLO)
s 0.000000000 _13_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.00
0.000] ------- [13:255 -1:255 1 0] [0x1 1 [13 2] 4.000000] (HELLO)
s 0.000000000 _14_ RTR  --- 0 AODV 44 [0 0 0 0] [energy 100.000000 ei 0.000 es 0.000 et 0.00
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Figure8: Trace file of network

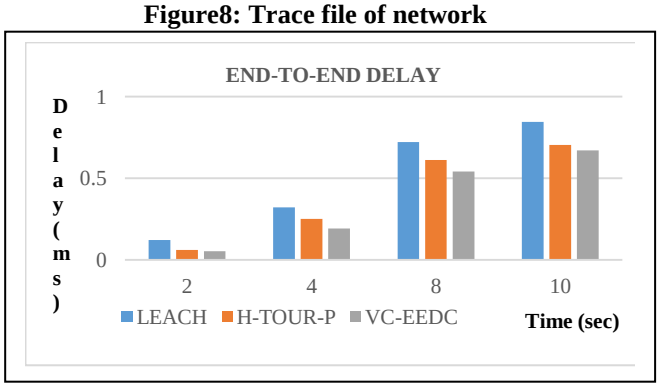

Figure9: Performance on Delay

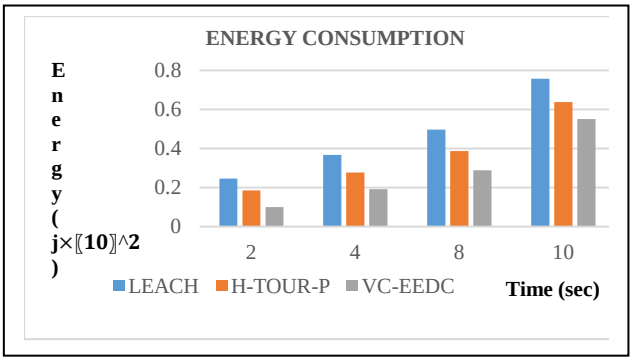

Figure10: Energy level routing

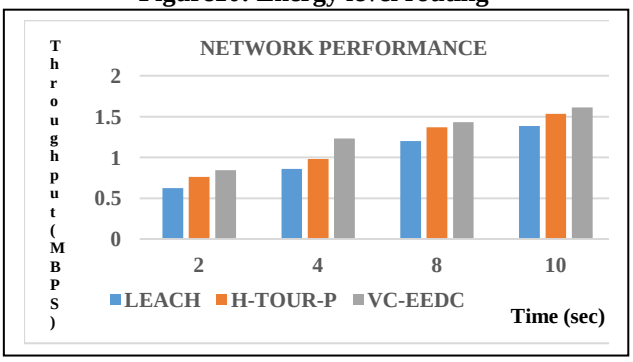

Figure 11: Network performance

In above screenshots, Fig1 shows all the nodes are positioned in network and nodes deployment in network is correctly achieved. Here, all the nodes based on the topology values and the overall properties of NAM window that it must mention are presented. Fig2 shows the broadcasting occur throughout the network. Here broadcasting occurs for communication purpose. All nodes should be involved in this process. Fig3 shows mobile agent place in network as initial process of network setup.

The mobile agent starts from whatever mentioned in network placement.

Fig4 shows that data transmission from visiting center and MA by help of traffic protocol. Here time interval, packet size, and number of intervals represented. Fig5 shows that links between data nodes to next visiting center because of reduce the overhead at VC then shows the bandwidth and delay between these two.Fig6 shows that data transmission from visiting center and MA by help of traffic protocol. Here time interval, packet size, and number of intervals represented. Fig7 shows andrepresents energy table. Here all nodes request data for permission table. In this table, shows the energy levels of individual nodes and time interval.Fig8 shows that trace file represented. Here all nodes data, routing process, time intervals for sending the packets, energy level updates of nodes displayed.

In Fig9, the graph represents end to-end delay as well as it demonstrates a simulation time versus delay graph. The visiting center performance based energy efficient data collection procedure increases the delay time which means decreases the delay between the communication nodes compared to the heuristic-tour planning procedure as well as leach method. Fig10 represents energy consumption as well as it demonstrates a simulation time versus energy graph. The visiting center performance based energy efficient data collection mechanism improves energy values compared to heuristic tour planning algorithm and leach method. Fig11 represents throughput and it illustrates a simulation time versus throughput graph. The visiting center performance based energy efficient data collection procedure expands the throughput compare to heuristic tour-planning algorithm as well as leach method.

V. CONCLUSION

In order to extend the lifespan of the network, mobile sink is utilized in this paper. Several obstacles are enclosed in the sensing field in physical atmospheres. Grid-based method is presented to the WSN for simplifying the mobile sink scheduling using obstacles. Simultaneously, an obstacle-avoiding shortest route is found by constructing the spanning graph for the mobile sink. The heuristic obstacle-avoiding algorithm is applied built on the method of cluster-based for dispatching the mobile sink. Here, a visiting center based energy efficient data collection scheme for minimize the number of obtained tours and more data based on collector we have to collect and increase the life time of network is proposed. The role of VC is gathering the data from the nearest nodes. The MAs visit these VCs and deliver the data to SINK. By using NS2, simulation is conducted and VC-EEDC outperforms the related H-TOUR-P in addition to LEACH approaches in terms of success rate of MAs round trip which is presented in the experimental results. We simulate the performance of proposed using NS2 software tool.

REFERENCES

1. H.-L. Fu, H.-C. Chen, and P. Lin, ``Aps: Distributed air pollution sensing system on wireless sensor and robot networks," Comput. Commun., vol. 35, no. 9, pp. 1141_1150, 2012.
2. Z. Shen et al., ``Energy consumption monitoring for sensor nodes in snap," Int. J. Sensor Netw., vol. 13, no. 2, pp. 112_120, 2013.
3. B. Zhou, S. Yang, T. H. Nguyen, T. Sun, and K. T. V. Grattan, ``Wireless sensor network platform for intrinsic optical _ber pH sensors," IEEE Sensors J., vol. 14, no. 4, pp. 1313_1320, Apr. 2014.
4. M. Dong, X. Liu, Z. Qian, A. Liu, and T. Wang, ``QoE-ensured price competition model for emerging mobile networks," IEEE Wireless Commun., vol. 22, no. 4, pp. 50_57, Aug. 2015.
5. G. Han et al., ``Cross-layer optimized routing in wireless sensor networks with duty-cycle and energy harvesting," Wireless Commun. Mobile Comput., vol. 15, no. 16, pp. 1957_1981, 2015.
6. M. Zhao, Y. Yang, and C. Wang, ``Mobile data gathering with load balanced clustering and dual data uploading in wireless sensor networks," IEEE Trans. Mobile Comput., vol. 14, no. 4, pp. 770_785, Apr. 2015.
7. L. Ji, Y. Yang, and W. Wang, ``Mobility assisted data gathering with solar irradiance awareness in heterogeneous energy replenishable wireless sensor networks," Comput. Commun., vol. 69, pp. 88_97, Sep. 2015.
8. M. Dong et al., ``Mobile agent-based energy-aware and user-centric data collection in wireless sensor networks," Comput. Netw., vol. 74, pp. 58_70, Dec. 2014.
9. S. Guo, C. Wang, and Y. Yang, ``Joint mobile data gathering and energy provisioning in wireless rechargeable sensor networks," IEEE Trans. Mobile Comput., vol. 13, no. 12, pp. 2836_2852, Dec. 2014.
10. W. B. Heinzelman, A. P. Chandrakasan, and H. Balakrishnan, ``An application-speci_c protocol architecture for wireless microsensor networks," IEEE Trans. Wireless Commun., vol. 1, no. 4, pp. 660_670, Oct. 2002.
11. G. Smaragdakis, I. Matta, and A. Bestavros, ``SEP: A stable election protocol for clustered heterogeneous wireless sensor networks," in Proc. SANPA, 2004, pp. 1_11.
12. A. W. Khan, A. H. Abdullah, M. A. Razzaque, and J. I. Bangash, ``VGDRA: A virtual grid-based dynamic routes adjustment scheme for mobile sink-based wireless sensor networks," IEEE Sensors J., vol. 15, no. 1, pp. 526_534, Jan. 2015.

13. O. Cayirpunar, E. Kadioglu-Urtis, and B. Tavli, ``Optimal base station mobility patterns for wireless sensor network lifetime maximization," IEEE Sensors J., vol. 15, no. 11, pp. 6592_6603, Nov. 2015.
14. F. Tashtarian, M. H. Y. Moghaddam, K. Sohraby, and S. Effati, ``On maximizing the lifetime of wireless sensor networks in event-driven applications with mobile sinks," IEEE Trans. Veh. Technol., vol. 64, no. 7, pp. 3177_3189, Jul. 2015.
15. K.Praveen Kumar, Dr. Habibulla Khan, "Design and characterization of Optimized stacked electromagnetic band gap ground plane for low profile patch antennas" International journal of pure and applied mathematics, Vol 118, No. 20, 2018, 4765-4776.
16. K.Praveen Kumar, Dr Habibulla Khan " Surface wave suppression band, In phase reflection band and High Impedance region of 3DEBG Characterization" International journal of applied engineering research (IJAER), Vol 10, No 11, 2015.

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