Mobile Sink technique of Wireless Sensor network based on Bio-inspired Algorithm

Mandeep Kaur[1], Er. Amanpreet Kaur[2]
[1]Research Scholar, [2]Assistant Professor - IT Department
Bhai Gurdas Institute of Engineering & Technology, Sangrur

Abstract - The wireless sensor network is the decentralized type of network in which sensor nodes sense information and pass it to base station. The wireless sensor network is also deployed on the far places like forest, deserts etc. Due to such type of the network energy consumption, security are the major issues. This research paper, is based on to reduce energy consumption of wireless sensor networks. The technique is proposed in this paper which is based on the mobile sink. The technique of mobile sink is designed which is based on bio-inspired algorithms. The proposed algorithm is implemented in NS2 and results shows that proposed algorithm performs well in terms of various parameters

Keywords - *ACO, WSN, Mobile Sink, Angle of Trajectory*

I. INTRODUCTION

Today with the increase in the technology wireless sensor networks are developing with new updates. The unique properties of these networks have made their involvement very common in almost every field. The wireless the designing of the protocols has become very challenging due to the involvement of wireless sensor networks. There is a use of a very fine energy budget in these networks. The involvements of high node densities have provided the facility of making the system very vast. The wireless sensor networks consist of numerous small nodes which are also called as energy resource-constrained sensor nodes [1]. The communication of these nodes can be done in a wireless way. There is also the processing of signal tasks which is done through the various computational resources provided by the networks. The Wireless sensor network has many advantages over other traditional networks. These advantages have provided it to be facilitated today in almost all the fields of technology. Although they have some of the disadvantages, which are already being improved. There are a lot of sensor nodes available in a wireless sensor network. In this type of network the size of the network is not fixed. The sensor nodes available in the network are based on how the network is constructed and for what purposes it is constructed [2]. In areas such as military fields and other remote areas the wireless networks have been spreading a lot over the years. The environmental monitoring of all such fields has been in demand. The networks have a lot of sensor nodes attached within one single area. The battery powering is applied to all these networks for the availability of the networks at all times. The networks which are placed in an unprotected environment are not very proper in the case of security. The privacy is deployed in these types of networks due to these reasons. Also it is not possible to charge the batteries of so many nodes in the networks. So, various techniques have been developing to provide the energy consumption of nodes in an easy manner. The clustering technique has proved to be much efficient method in saving energy [3]. The selection of the cluster head is a very important factor. Also the various protocols are required for this method. The involvement of protocols and their selection are very important factors. All these affect the network system collectively in various manners. For the formation of a cluster in the wireless network, it is mandatory for each sensor node to know its location information. The location information of the nodes which are deployed is known. To calculate the estimated distance between two sensor nodes, coordinates (xi, yi) are used. A clustering algorithm is used for the clustering of the sensor nodes on the basis of the minimum distance and highest residual energy. Any of the localization method can be used by the node after the gathering of information regarding the angles, distance and the positions of it [4]. An exclusive and a very simple algorithm that is the K means algorithm is used to solve most of the clustering problem. The numerous nodes that are present in the network are scattered all over the network. For sensing the origin of information in the network it is very important to know the location of each node in the network. The coordinates are used for the representation of the location of the nodes after which the clustering is done through the calculation of minimum distance between two nodes. The stepwise method is used for the calculation purposes. The commonly used method is the centroid method. The process of choosing the paths along which the network traffic is to be sent is known as the routing process [5]. A reactive distance vector routing protocol named as Ad-hoc On Demand Distance Vector (AODV) is used for determining the routes. The K means algorithm and the AODV protocol are added together to form K-AODV routing protocol. The routing takes place in between the cluster head and the members. The indirect communication between the base station and the cluster members is done. A multi-hop communication technique is followed if the base station is far from the cluster head. The packets are transferred from one cluster head to

another according to the distance. Which cluster has less distance to be covered is preferred. Then the information is sent to the base station ahead. Through this process the packets reach the base station. The information sent to the base station is required for the analysis. The K_AODV routing protocol enhances the performances of the already existing protocol techniques [6]. As there is increase in demand of the large wireless networks, there is a need to develop new architectures. For ensuring that there is availability of wireless networks in the fields that are interested, there is a need to improve the already existing mechanisms which can handle the growing number of nodes. The energy consumption of these nodes should also be less because this is also an important factor which effects the selection of network [7]. Most of the networks are limited to handling only small number of nodes and are not much scalable. There can be the use of multiple mobile base stations in the larger networks which can be applied as a solution to such problems. While balancing the workload of the hybrid WSNs, the scheduling technique required should be efficient. The network life time should be prolonged. There are no holes in the region which is to be monitored and also consists of static sensors. A divide and conquer theory in used for this situation. There are a number of steps which are to be followed in this technique. The region that is to be monitored is broken into grid cells which have the size proportional to the communication radius of the sensors within the first step. The data which is sensed or identified by the static sensors is gathered by the grid cells. Although the size of the grid cells are same but they differ in the number of static sensors they have [8]. Due to this reason there might be a difference in the amount of energy that is required to gather data from the network through mobile sinks. The grid cells are divided into different grid cells due to such reasons within the second step. This strategy has been taken from the KD tree algorithm. The energy consumed by the movement of sinks is not considered by the previous step. When the sensors are not divided evenly, then also the energy consumed by the mobile sinks is different which is calculated in the third step.

II. LITERATURE REVIEW

Arslan Munir et al, (2014) proposed in this paper [9], the architecture with heterogeneous hierarchical multi-core embedded wireless sensor networks (MCEWSNs). This is considered along with the multi-core embedded sensor nodes which are used in the MCEWSNs. The performance of SMP and TMP is compared using the base of performance metrics. They involve the run time, cost, speed up, performance per watt, efficiency, etc. Where there is a requirement of the integer manipulation of the sensor data, there the TMA has caused exploitation of the data locality. They are more effective for the MCEWSN applications. They have no communication with the tasks that are parallelized. The results are checked practically by building the prototypes on all the assumptions. There are challenges that are observed in such methods but the results for some applications have been very effective and proven to be beneficial. **Velmani Ramasamy et al, (2013)** proposed in this paper [10], Velocity Energy-Efficient and Link-aware Cluster-tree (VELCT) scheme. This methodology has involved all the demands to be ensured in its technique. There is a construction of the Data Collection Tree (DCT) in this scheme. It is created on the basis of the cluster head location. There is no participation of the Data Collection Node in the DCT for sensing purposes. The only work that it covers is the transferring of data packet from cluster head to the sink. This scheme also minimizes the energy depletion. There is a reduction of the delay in the packet transferring. The traffic that is seen in the cluster head is minimized by much extent through this method. A simple tree structure is formed by this method which helps in reducing the traffic and thereby reduction in the amount of energy consumed. **Dahane Amine et al, (2014)** proposed in this paper [11], an energy efficient and safe weighted clustering algorithm (ES-WCA). It is a combination of five metrics amongst which is the behavioral level metric. This level helps in choosing a cluster node which is a better choice and will never be seen as a malicious node. For checking the performance of this approach, the simulation technique is used. The ES-WCA method is used for self organization of the mobile sensor networks. This methodology aims at creating a virtual topology and helps in reducing the re-election. There is also no need of reconstructing the whole network. The reduction of energy that is being consumed by the nodes is to be considered as a priority. To provide energy conservation facility there is a chance to deplete the redundancy of the network. in future modifications, the internal network processing is to be made by aggregating the related data which is presented in the routing protocol. **Yan Sun, et al, (2012)** outlined in this paper [12], a trust-based structure for data aggregation taking into account the multilayer aggregation engineering of WMSNs, with fault tolerance with an objective to decrease the effect of mistaken data and give quantifiable trustworthiness to amassed results. By separating measurable qualities from various sources and broadening Josang's trust show, the technique proposes how to register self-data trust supposition, peer node trust sentiment, and peer data trust conclusion. As indicated by the trust exchange and trust blend rules composed in our system, the strategy determines the trust conclusion of the sink node on the last amassed result. Specifically, this system can assess both discrete data and ceaseless media streams in WMSNs through a uniform instrument. Results acquired from both simulation study and analyses on a genuine WMSN testbed show the legitimacy and proficiency of our system, which can essentially enhance the nature of multimedia data and also all the more definitely assess the trustworthiness of gathered data. **Jó Ueyama, et al,**

(2014) presented in this paper [13], wireless sensor system is at risk to languish faults over a few reasons, which incorporate faulty nodes or even the way that nodes have been decimated by a characteristic catastrophe, for example, a surge. These faults can offer ascent to major issues if WSNs don't have a reconfiguration system at execution. A fault in a solitary node can leave a part of the framework inoperable until the node recuperates from this disappointment. This paper focuses on an answer that involves utilizing unmanned aeronautical vehicles to diminish the issues emerging from faults in a sensor system when checking characteristic fiascos like surges and avalanches. In the arrangement set forward, UAVs can be transported to the site of the catastrophe to mitigate issues brought about by faults. Tests directed with genuine UAVs and with our WSN-based prototype for surge identification have demonstrated this is a feasible methodology. **Chuan Zhu et al, (2015)** proposed in this paper [14], a Tree Cluster-Based Data-Gathering Algorithm (TCBDGA). This is used for the WSNs and concern with the mobile sink. A tree-construction method is used for this. The tree constitutes of various tree nodes. Subrendezvous points (SRPs) are some special nodes that are elected. There is a reselection of both of them after a certain period of time. Comparisons are made with other networks and the results show that the TCBDGA is able to balance the complete load of the network. Through this method the energy consumption is also reduced. The main problem that is the hotspot problem is completely depleted. This method also gets to increase the lifetime of the network.

III. RESEARCH METHODOLOGY

The proposed methodology will be based on sink relocation in wireless sensor to increase lifetime of the networks. The whole network will be divided into fixed size clusters and in each cluster heads will be selected. The data of nodes in cluster will be aggregate data to its cluster head. The proposed technique will be based on some assumptions under first assumption; sink knows location of all sensor nodes. The sink will move to cluster head where it wants to take data and it will get location from the stored location of cluster head. The Sink node will adjust its location according to signal strength. The location gets its best position when maximum numbers of cluster heads are in the range of sink. In this work, we will be proposed the equation that will calculate signal strength and to judge that how many cluster heads are in the range of sink. The movement of sink will be decided using technique of bee colony optimization. In bee colony algorithm The ABC calculation accepts the presence of an arrangement of operations that may look like some elements of the bumble bee conduct. The "fitness value" alludes to the sustenance source quality that is unequivocally connected to the nourishment's area. The procedure impersonates the honey bee's quest for important sustenance sources yielding a similar to prepare for finding the ideal arrangement. The insignificant model for a bumble bee province comprises of three classes: utilized honey bees, passerby honey bees and scout honey bees. The utilized honey bees will be in charge of examining the sustenance sources and offering the data to select spectator honey bees.

Description of Flowchart

1. The wireless sensor network is deployed with the finite number of sensor nodes and deployed network is divided into fixed size clusters using location based clustering.
2. The cluster head is selected in each clustering using the technique of LEACH protocol in which node which has maximum energy and least distance to the other nodes is selected as the cluster head. The other nodes in the cluster will aggregate its data to the cluster head.
3. The coordinates of the sink is defined as the initial population for the sink movement. The sink will check the signal strength and change its location of the basis of initial population and aggregate the data from where it get maximum data.
4. This step 3 is repeated until required data get aggregated to base station.

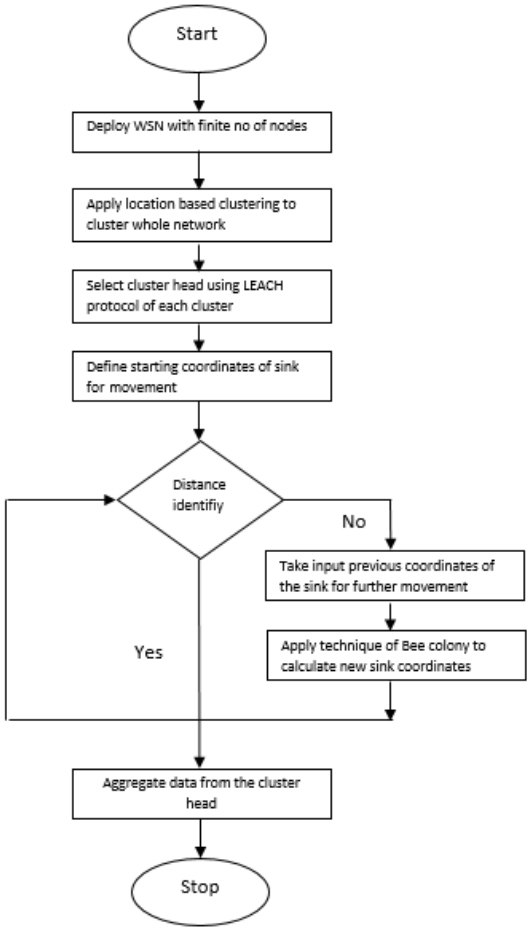

Fig. 1: Proposed Flowchart

IV. EXPERIMENTAL RESULTS

The proposed algorithm is implemented in NS2 and the results are analyzed by making comparisons with the existing approach that uses data window aggregation function with static sink, in terms of various parameters like energy, throughput and packetloss.

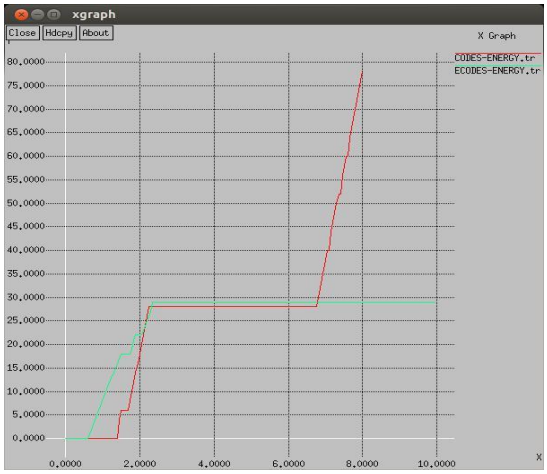

Fig. 2 Energy Comparison

As shown in figure 2, the existing and proposed scenario is compared in terms of energy consumption. In the energy graph it is shown that in the proposed scenario is less due to multiple sink deployment in the network.

Fig.3 Packet loss Graph

As shown in figure 3, the packet loss of the proposed and existing scenario is compared. Due to sink base station packet loss is more and when multiple sinks are deployed in the network packet loss is reduced at steady rate in the network.

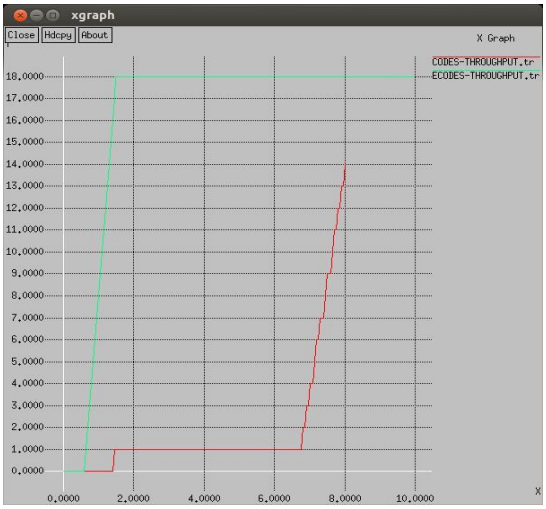

Fig.4 Throughput comparison

As shown in figure 4, the network throughput of the proposed and existing scenario is compared and it is been analyzed that network throughput is increased at steady rate due to multiple sink deployment in the network.

V. CONCLUSION

In this research paper, it is concluded that wireless sensor networks is the self configuring type of network in which sensor nodes sense information and pass it to base station. The energy consumption is the major issue of this network due small size and far deployment of the sensor nodes. In this research work, mobile sink technique is proposed which is based on the bio-inspired algorithm which increase lifetime of the network. The performance of the proposed algorithm is analyzed in NS2 and results shows that proposed algorithm performs in well in terms of various parameters

VI. REFERENCES

[1]. Navin Gautam and Jae-Young Pyun," Distance Aware Intelligent Clustering Protocol For Wireless Sensor Networks", Journal of communication and networks, Volume 12, Issue 2, pp 122-129, 2010.

[2]. Ankita Joshi, Lakshmi Priya.M," A Survey of Hierarchical Routing Protocols in Wireless Sensor Network", MES Journal of Technology and Management.

[3]. Ines Slama, Badii Jouaber, and Djamal Zeghlache," tiple Mobile Sinks Deployment for Energy Efficiency in Large Scale Wireless Sensor Networks", Springer e-Business and telecommunication of the series Communication in computer and information science, Volume 48, pp 412-427, 2008.

[4]. P. Madhumathy, D. Sivakumar," Reliable Data Gathering by Mobile Sink for Wireless Sensor Networks", International Conference on Communication and Signal Processing, pp 1348-1352, 2014.

[5]. Chu Du , ZhangBing Zhou, Lei Shu," An Efficient Technique of Scheduling Mobile Sinks in Hybrid WSN", IEEE Annual conference of the industrial electronics society, pp 3885-3891, 2014.
[6]. Junyoung Heo, Jiman Hong, and Yookun Cho," EARQ: Energy Aware Routing for Real-Time and Reliable Communication in Wireless Industrial Sensor Networks", IEEE Transaction on industrial informatics, Volume 5, Issue 1, pp 3-11, 2009.
[7]. Luana Dantas Chagas, Eduardo Pereira Lima, Pedro Fernandes Ribeiro Neto," Real-time Databases Techniques in Wireless Sensor Networks", IEEE International conference on networking and services, pp 182-187, 2010.
[8]. Moshaddique Al Ameen & Jingwei Liu & Kyungsup Kwak," Security and Privacy Issues in Wireless Sensor Networks for Healthcare Applications", Springer Journal of medical system, Volume 36, Issue 1, pp 93-101, 2010.
[9]. Arslan Munir, Ann Gordon-Ross, Sanjay Ranka," Multi-Core Embedded Wireless Sensor Networks: Architecture and Applications", IEEE Transaction on parallel and distributed system, VOL 25,Issue 6, pp 1553-1562,2014.
[10]. Velmani Ramasamy, Kaarthick Balakrishnan," An Efficient Cluster-Tree based Data Collection Scheme for Large Mobile Wireless Sensor Networks", IEEE Sensor Journal, Volume 15, Issue 4, pp 2377-2390, 2015.
[11]. Dahane Amine, Berrached Nassreddine, Kechar Bouabdellah," Energy Efficient and Safe Weighted Clustering Algorithm for Mobile Wireless Sensor Networks", Elsevier International conference on Ambient system, networks and technologies, international conference on sustainable energy information technology, Volume 52, pp 641-646, 2015.
[12]. Yan Sun, Hong Luo, and Sajal K. Das," A Trust-Based Framework for Fault-Tolerant Data Aggregation in Wireless Multimedia Sensor Networks", IEEE Transaction on dependable and secure computing, Vol. 9, Issue No. 6, 2012.
[13]. Jó Ueyama, Heitor Freitas, Bruno S. Faiçal, Geraldo P. R. Filho, Pedro Fini, Gustavo Pessin, Pedro H. Gomes, and Leandro A. Villas," Exploiting the Use of Unmanned Aerial Vehicles to Provide Resilience in Wireless Sensor Networks," IEEE Communications Magazine volume. 52,Issue. 12, pp 81-87, December 2014.
[14]. Chuan Zhu, Shuai Wu, Guangjie Han, Lei Shu and Hongyi WU," A Tree-Cluster-Based Data-Gathering Algorithm for Industrial WSNs with a Mobile Sink", IEEE Access, volume 3, pp 381-396, 2015.