A Proposed Method to Minimize Energy Consumption in Wireless Sensor Network

Kiran Bala[1] Satbir Singh[2]
[1]Student [2]Assistant Professor
[1,2]Department of Electronics and Communication Engineering
[1,2]GNDU, Regional Campus, Gurdaspur, Punjab

Abstract— Wireless sensor network (WSN) communication is widely used due to several attractive features such as wireless nature, low cost, small size devices, less power consumption. In WSNs without the need of any wires easily data communicate from one place to other place within seconds like as sending important information through audio, pictures, text messages, mobile phones etc. It plays an important role in our life and many applications. In this paper firstly we discussed about the three major problems occurred in wireless sensor network which increases the use of energy consumption an affects the performance of the network. The paper also proposed an idea to minimize the problem of energy consumption in WSN and enhances its performance in terms of energy as well as life time of the network also.

Key words: WSN, Sink Mobility, Nature Inspired Algorithms

I. INTRODUCTION

A WSN is basically a set of various sensor nodes. These nodes are interconnected automatically in the network and make a self-configure and reliable connection without the help of any wire. In a WSN, sensor nodes have three elements namely sensing, processing and transceiver. The nodes in the network are able to sense the object or monitor the target which exists in the surrounding environment. The data is collected through sensor nodes by sensing and then it proceeds to the base station or sink node with the wireless connection. But it consumes large amount of energy. Energy is very critical issue in WSN, because of limited energy in sensor nodes, so to conserve energy introduced the concept of clustering technique; in which out of thousands of nodes, few nodes become cluster head and they manage the entire network. Cluster head is a node which is responsible for maintaining clusters, collect data from nodes in the cluster and communicate with sink. By using clustering saved the large amount of energy. The basic architecture of WSN is shown in Figure 1.

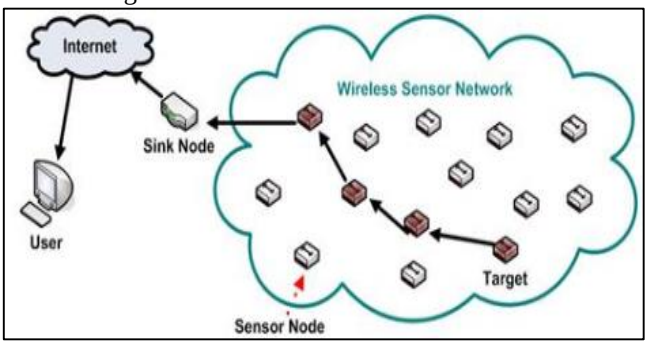

Fig. 1: Wireless Senor Network.

In static clustering only one cluster head node is statically operated until the head node dead. Because cluster head nodes have more responsibility so there is rapid decrease in energy. The death time of head node was too early in static clustering technique. So static clustering is not best to save the energy. Then here need to apply that efficient type of clustering technique for minimizing the energy consumption and prolong the lifetime of nodes network.

The section II describes some major issues which are existing in the WSN, after that Section III discusses the literature work. The section IV describes the problem statement. Then proposed methodology is discussed in section V along with the conclusion in section VI.

II. ISSUES IN WSN

A. *Connectivity:*

Sensors nodes are connected in a network for transferring data. Only the connected nodes in a network can exchange data. To maintain the connectivity every node should have the constant supply of energy. Depletion in energy of nodes leads to loss in connectivity between the nodes and this cause connectivity issue. Every sensor node has its own sensing range and it can connect with at least one sensor node. The sensor node said to be connected if there is a connection between two nodes. Connectivity issue should get considered while deployment of sensor nodes in the network.

B. *Energy:*

Energy is a main issue in wireless sensor network. Sensors nodes are independent devices that need a battery for energy. As wireless sensor network consist of number of sensor nodes and depletion of energy in such nodes cause depletion of network. In a sensor node during communication phase most of the energy get used. Mobile nodes also consume a lot of energy while moving. By optimal placement of sensors one can balance the energy of nodes. This energy issue cannot be handling at the time of node deployment.

C. *Lifetime:*

Life time of a sensor network depend on the lifetime of sensor nodes. Battery depletion of the node lead to low energy and low energy cause failure of sensor node and this failure of node cause failure of whole network. Incremental node deployment increase lifetime of a network by adding new node in place of dead node.

D. *Sensor Node Relocation:*

Relocation of the sensor nodes during regular network operations is very challenging. It thus requires continual monitoring of the network state and performance relocated node in the network. Relocation of sensor node need careful and confined handling it may cause disruption in the data. Sensor relocation takes place after detecting coverage holes. Redundant nodes are relocated to the hole region.

Relocation can also be done if one found node failure in the network. Relocation of sensors took place to balance energy consumption, message overhead.

III. RELATED WORK

In this section, summarize the surveys of energy efficient algorithms for WSNs in the literature.

Stefanos A. Nikolidakis et al., proposed an energy efficient algorithm in wireless sensor network through balanced clustering for energy consumption is equalized cluster head election routing protocol (ECHERP). In wireless sensor network, nodes are resource constrained i.e. limited energy resource. During transmission nodes consume a lot of energy and it becomes dead. For solving this problem proposed algorithm adds new nodes to the system and adjust automatically according to dying nodes and signal to noise interference. In this paper select a random node or node as cluster head with higher energy at a particular time and handle the node mobility. The proposed algorithm measured the energy consumed using Gaussian elimination algorithm by calculating the number of nodes as CH in order to reduce the overall network energy consumption at every single round. The ECHERP also adopts a multi-hop routing scheme to transfer fused data to the base station. The simulation result indicates that ECHERP outperforms several previously proposed protocols, namely LEACH, PEGASIS and BCDCP. [1]

Pu Gong et al., proposed a protocol to minimize energy consumption during data transmission is energy efficient trust aware routing protocol. The ETARP deals with applications of the WSN and operates in extreme environments such as the battlefield. The proposed protocol focus on selecting the path for reducing the energy consumption based on utility theory. In this paper ETARP discovers and selects routes on the basis of maximum utility with additional cost compared to the common AODV(Ad Hoc On Demand Distance Vector) routing protocol. This paper evaluates the performance of energy efficiency and safety performance of ETARP protocol in comparison to LTB-AODV and AODV-EHA. In the simulation results show that the lowest transmission cost for the AODV-EHA protocol and no security in it, while ETARP has the advantages in terms of energy efficiency in transmission and it can maintain the same safety performance as LTB-AODV. The ETARP protocol has more energy efficiency for data packet delivery. [2]

Deepa V. Jose et al., proposed a novel energy efficient routing algorithm using sink mobility for wireless sensor network. The need of energy efficiency in WSNs is necessary because it have limited energy resource. This paper gives an overview of the different routing techniques in which mobile sinks are used to facilitate the routing process and effectively reduce the energy usage. The mobile sink routing algorithm can save the energy in a high level. The proposed routing algorithm with mobile sinks and a static sink and is compared with the existing Shortest Hop path (SH) algorithm on the basis of life time matrices and average energy of the nodes. In this paper the proposed protocol at the destination reduces the number of hops and also reduces the energy consumption. The simulation results shows that have better life time and energy of nodes in proposed routing algorithm as compared to SH. [3]

Nizar Hadi Abbas at al., proposed an optimization idea for energy consumption in the WSN which is based on nature inspired algorithm such as particle swarm optimization (PSO) and ant colony optimization (ACO). This idea has been proposed for increasing the lifetime which achieve by reducing power consumption in WSNs. The PSO is altered based on inertial weight and the acceleration and then this extended version of PSO is put onto comparison with ACO. In this paper the MPSO is faster than ACO because the update of the parameters is faster in MPSO proved by results. MPSO algorithm acts with much better efficiency. The simulation results show that the presented approach for power minimization is faster than the previous works by 10 times and network lifetime may get raises by 8 times. During this approach better efficiency is obtained. [4]

IV. PROBLEM STATEMENT

The above given literature survey has shown that three major problems occurs in WSN. First the Cluster head is static mostly select the central node as CH and through this CH communication is done from sensor node to sink node and it work continuously until it not dead which is the cause of wastage of energy of single CH node and it goes to dead point early. Second, it follows the straight line route due to this burden is increase because large number of nodes travel through this route and collide with each other due to this, the route is overloaded, energy is waste in large amount and also reduce lifetime. Other problem is static approach, in this approach both CH and route are fixed (static) so cannot apply any change in CH and route. In each round only one route and CH maintain all the work in the network.

V. PROPOSED METHODOLOGY

This section contains the various steps to achieve the objectives of this research work.

1) Step 1: Input: First of network will be taken as an input.
2) Step 2: Network static Declaration: In this step declare the area, nodes, sink location, source location etc.
3) Step 3: Cluster Head (CH) selection using optimization algorithm G.A: After that select a CH using the genetic algorithm.
4) Step 4: GA initial parameter Declare: In this step declare the initial parameter of proposed algorithm such as population, iteration, objective, function etc.
5) Step 5: Select best optimal solution for node to be CH: In this step choose best solution for node which is to be CH.
6) Step 6: Start communication as per CH selection: After that start communication with the selected CH.
7) Step 7: Route selection using next block CH: In this step select the route or path for communication using next block CH.
8) Step 8: Load balancing Approach: After route selection next step is following the load balancing approach for maintains the balance in route in time of communication and also after the communication.
9) Step 9: Parameter Calculation: At the last calculate the parameter using proposed algorithm.

The figure 2 has shown various steps required to get the final results using the proposed algorithm.

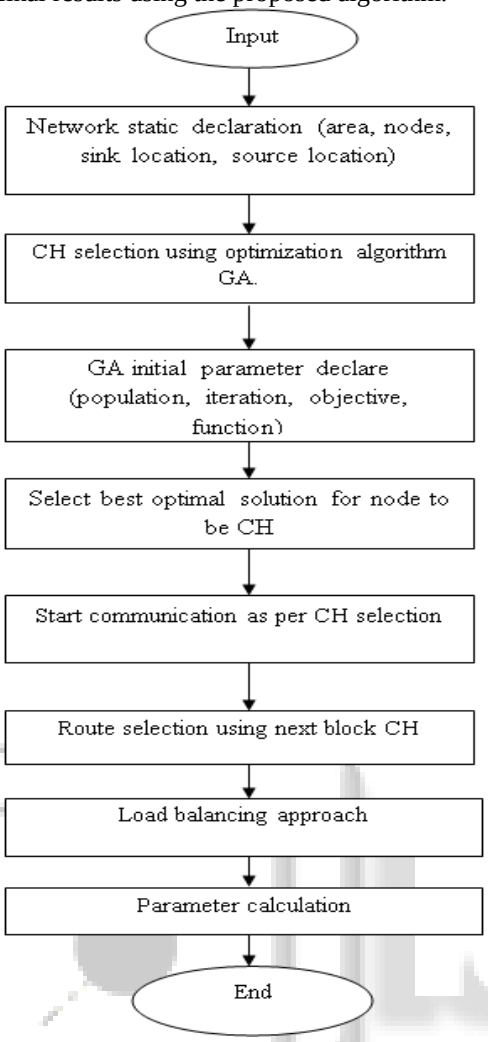

Fig. 2: Flow chart of proposed algorithm.

VI. CONCLUSION

In this paper, we conclude that three major problems are occurs in WSN which affect the energy and lifetime of the network. Different energy efficient routing protocols, algorithms and techniques are used for solving the problems of energy consumptions. But these all are not efficient so we try here to apply the optimization techniques which overcome the problems of this paper because we observe from research in this field that the optimization techniques have better energy efficiency as compared to other techniques.

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