An Analysis on Improvement of Lifetime in Wireless Sensor Network

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Abstract. Wireless sensor networks (WSNs) are uncommon networks wherein nodes are furnished to study the tangible world by abundant minute, economical and intelligent sensor nodes(junction) scattered across required field of interest. All of sensor nodes are independently self-reliant in detecting, strategy and wirelessly specific surroundings situations at the base station (BS). Clustering is the form of grouping nodes into clusters and LEACH is mainly used in cluster formation in which it regularly change the cluster head to send the data towards destination. MTE algorithm is also useful in multihop environment for transmitting data from one cluster head to another and distance is calculated to send the data accurately. In the existing approach, they used hybrid technique like multi-hop and clustered routing technique to diminish energy consumption this is based totally on LEACH and minimum transmission energy (MTE) protocols for distributing facts to the BS. In our proposed work, we improve the network performance by forwarding the data to the nearby Cluster Head (CH). This get better the consumption of energy at each node if the distance of the node is larger to transmit it towards the BS.

Keywords: WSN · Base station · Node · Energy
Cluster based routing algorithm · Cluster head · LEACH and MTE

1 Introduction

WSNs are unrecognized correspondence shape that makes utilization of a massive variety of self competent sensor nodes, to shape a network. Every node in a WSN is prepared for detecting environment, processing locally the records and sending it to one or more prominent assortment of goals through a wireless link (Fig. 1).

WSNs or sensors are hardware devices that are small in length, utilize low energy, feature in excessive densities, are self reliant and trademark dismissed, and are robust to the climate. The chronic analog sign got from the sensors is changed over through method for an analog-to-digital converter into digitized sign and sent to controllers for in like manner dealing with [1]. There are various other networks which have different security requirements and challenges to overcome the problems [2].
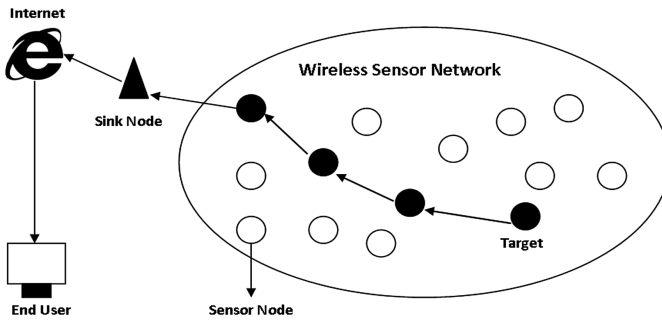
Fig. 1. WSN architecture

2   Classification of Custer Based Routing Algorithm in WSNs

Clustering algorithms play a pivotal role in reaching software specific goals. Cluster based routing algorithms are characterized into 3 wide classes as appeared in Fig. 2. The protocols mentioned underneath schemes are in brief discussed in this text [14].

(a) *Block Cluster based Routing Algorithms*
(b) *Grid Cluster based Routing Algorithms.*

3   Leach (Low Energy Adaptive Clustering Hierarchical Routing Protocol)

LEACH is oneself- devise with reconstructable cluster grounded routing protocol. This uses hierarchical procedure to pass on the data. Data is grouped and sended to the BS. Each and every one of the points is confined to the groups of invariant size and the CH
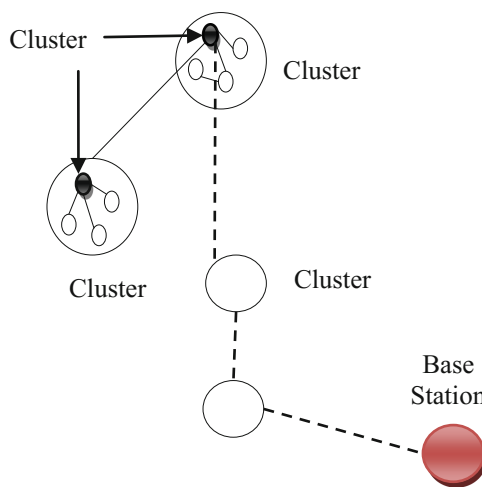

Fig. 2. Clustering

is investigated each group [3]. All junctions gather the real data and sent to its specific CH utilizing TDMA motivation [4].

CHs will other than propagate the data to the BS. Vitality will be depleted, if a proximity junction will holdout the CH and that CH junction will fail miserable which will decrease the life being of the network. T + o stay away from this kind of condition a substitute center point is picked as a CH after each cycle of working and criticalness will be stabilized. LEACH settlement has below fundamental operations:

- Framework building stage
- Data correspondence stage
- Building stage: In the building stage neighbour junctions form a group consistently and a CH is chosen randomly from that group of junctions for each cluster. In this stage a number in between 0 and 1 is picked arbitrarily, while building groups and the very same is separated and a limit, t(s). The junction is called as a CH in the ongoing cycle, if picked esteem < t(s); something other than what's expected, the node stays as a member node. The limit t(s) is enrolled by utilizing condition [5–7].

4 Literature Survey

Nayak et al. in this study, WSNs have been utilized as a part of numerous zones like health care, agriculture, defense, military, disaster hit areas and so on [8].

Sharma et al. this paper proposes another methodology i.e. manufactured artificial bee colony is an swarm based totally optimization technique for energy efficient routing algorithm and the compressive sensing is likewise used to growth the energy rate or overall performance [9].

Singh et al. this paper proposes a new procedures i.e. artificial bee colony is an swarm fundamentally based optimization procedure for energy efficient routing algorithm and the compressive sensing is likewise used to increase the energy rate or overall performance [10].

Dayanand et al. in this study, another hybrid algorithm is proposed which fuses each allotted and centralized algorithms for determination of the cluster head (CH) [11].

Baroudi et al. on this work, they propose a realistic system, suggested as wirelessly energy - charged WSN (WINCH), for battery upkeep; it includes energizing. This structure coordinates a routing process in which the CHs are chosen ideally [12].

Sharma et al. in this study, they have considered traffic heterogeneity, and analyzed its impact on well known hierarchical clustering based routing algorithm in the area. Also, they've got proposed a stepped forward CH selection mechanism beneath the traffic heterogeneous scenario [13].

5   Proposed Work

The formation of clusters in WSNs is a proficient planning toward the arrangement of nodes in the sensor n/w effectively. LEACH will permit efficient stability which is ordinarily used clustering protocol in which CHs and their appended starting nodes are irregularly changed. On the other hand, LEACH entails all starting nodes to passing their information to the related CHs at once which influence energy of starting nodes due to the tremendous fee for lengthy distance transmissions. Consequently, source nodes which are at from the CH deplete their power rapidly than different nodes. To determine the constraint of energy, they planned the method which utilized multiple hop for inter-nodes conversation the usage of minimum transmission energy (MTE) algorithm in which starting nodes ahead their data to the CHs through midway nodes inner every cluster. Every starting node inside the cluster forwards. Its message to the connecting node while in transit to the CH so as to decrease the energy of transmission. In the present approach, the MTE algorithm used to produce a cluster with straight direction among nodes right down to their CH till the data reached to destination. This route is designed the use of Dijkstra's straight route routing algorithm and nodes deliver their observed information to the CH with propagation for multiple hop. Each non-CH node needs to communicate their data to its near successor inside the route to arrive at his CH. Correspondence is the aim of the critical exhaustion of battery's energy, because of reality that SN (Sensor Nodes) consumes a lot of its vitality in transmission and gathering of data. The MTE algorithm used to generate a cluster with smallest direction between nodes all the way down to their CH till the packet arrived at to BS. This route is designed the use of Dijkstra's shortest route dispel (routing) algorithm and nodes deliver their suspected information to the CH with multi-hop propagation. Every non-CH junction have to spread its packet to its proximity inheritor in the course to attain his CH. disclosure is the principle motive of the sizeable depletion of battery's strength, due to the reality that junction node waste a large quantity of its energy in information communication and receipt.

Unlike communique, data processing uses smaller quantity energy. For this purpose, every node accepts data packet from its inheritor. Inside the manner to perform the data blend and condenses the packet earlier than sending it to the next node in line till it arrives at the CH. When a CH gets statistics from all other junction nodes, it plays numerous crucial signal handling skills on the data to clump and reduce it. In this phase, the junctions gather and transmit discovered data to the CH. The CH sent the obtained data straightly in the direction of BS. We improved forward the above drawback with our proposed method and enhance the energy utilization of nodes to augment the time being of the network (Fig. 3).

Proposed Algorithm

Step:1 Start
Step:2 Initialize the network
Step:3 Place the sensor junctions randomly in the network
Step:4 Divide the whole network into 4 grids of similar size

Step:5 Consider the grid area as cluster of nodes
Step:6 Select CH by using the two parameters such as:

    a. Energy of the node
    b. Distance from BS

Step:7 Now group members compile the data to the cluster head
Step:8 CH propagate the data to the another CH which is close to BS
Step:9 Then data reached to BS from the nearby CH
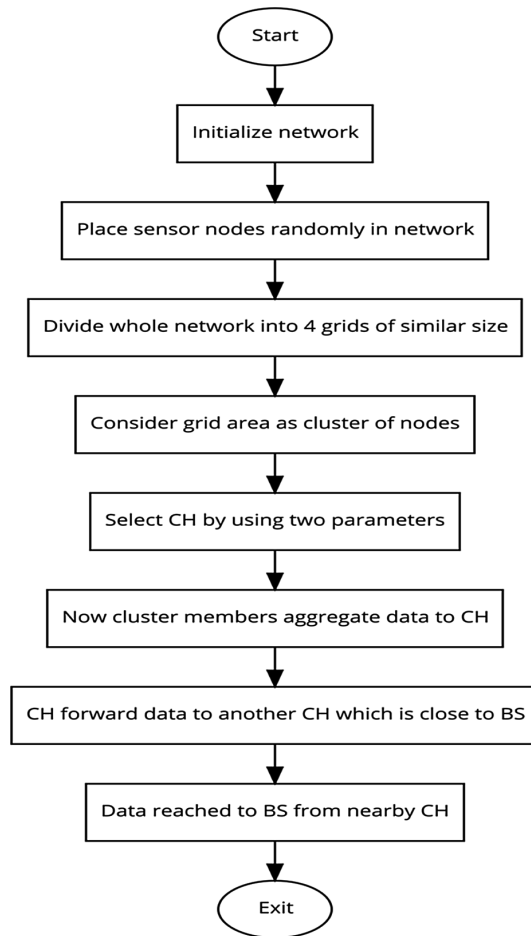Step:10 Exit.

Fig. 3. Flowchart of proposed algorithm

6 Result Analysis

We used MATLAB tool for the simulation for the node deployment. MATLAB makes utilization of in wide assortment of capacities, together with signal and image handling, correspondences, control configuration, test and size, financial modeling and analysis, computational science and parallel preparing. The present PC systems have tremendous registering force as customary CPU centers and also throughput-situated quickening agents, for example, pix processing units (GPUs). MATLAB programs are declarative and naturally express data-level parallelism as the language provides several high-level operators that work directly on arrays. Traditionally, MATLAB is used as programming language to write various types of simulations. It is used extensively to simulate and design systems in areas like control engineering, image processing and communications. These programs are typically long running and developers expend significant effort in trying to shorten their running times. In the proposed work, we estimate the whole network by analyzing the influence on the energy. Table 1 demonstrates simulation variables used (Figs. 4 and 5).

Table 1. Simulation parameters

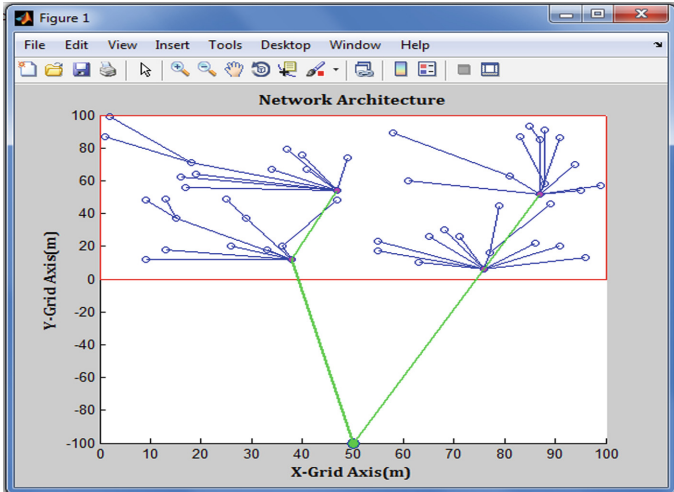| Variables	Value
Transmission and receiving energy	50 nJ/bit
Energy amplification for free space	10 pJ/bit/m2
Energy amplification for multi path	0.0013 pJ/bit/m2
Nodes initial energy	0.5 J
Data aggregation energy	5 nJ/bit/message
Packet size	2000 bits
Percentage of CH	5%
Number of nodes	50
Network size	100 m × 100 m
Base station position	50 m × −100 m

Fig. 4. Initial network architecture
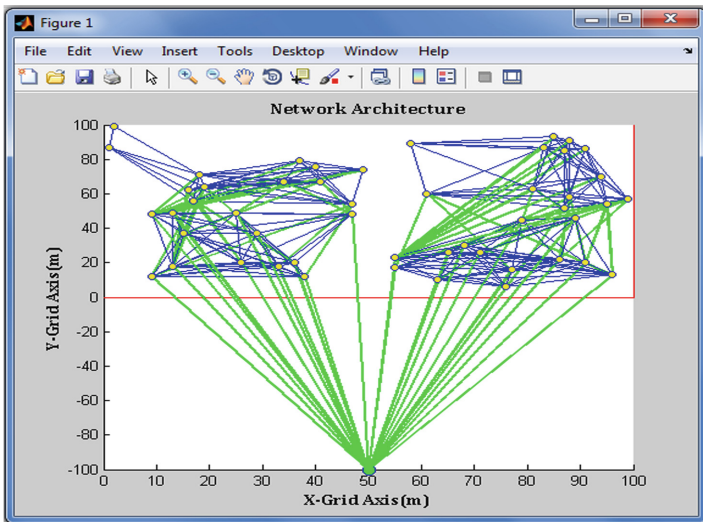
Fig. 5. Data communication among node

Packet Sent

Gross packets sent to the BS are evaluated to show that the proposed scheme is comparatively better than the base scheme (Fig. 6).
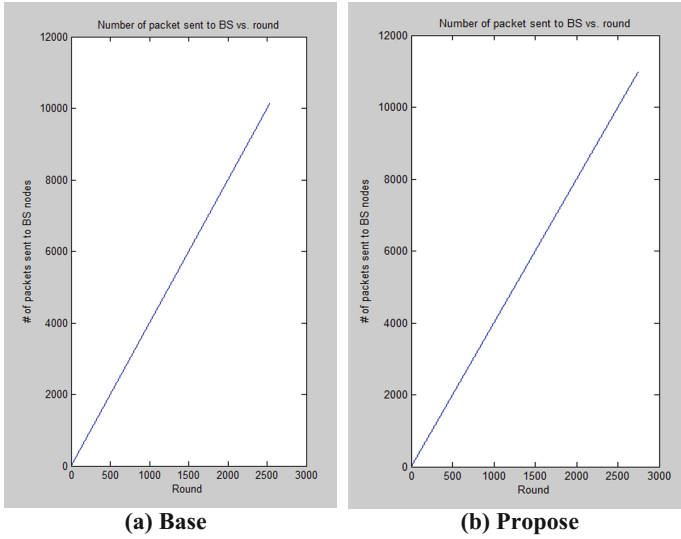
(a) Base   **(b) Propose**

Fig. 6. Number of packet sent to BS for base and proposed technique

Dead Nodes

Dead nodes in the WSN suggest the passive in nature which demonstrates its status in the network. dead nodes are shown inside the graph below which depicts that the proposed scheme is comparatively better (Fig. 7).
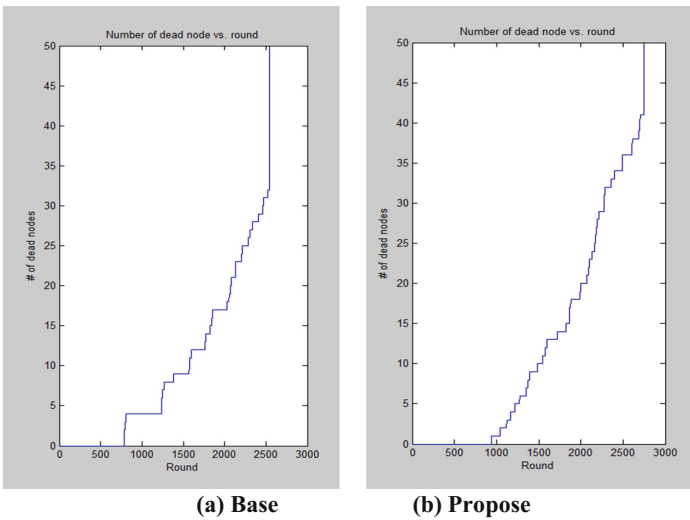

(a) Base   **(b) Propose**

Fig. 7. Number of dead nodes for base and proposed technique

Energy of Nodes

Energy of the nodes is taken on the x-axis and cycles on the y-axis within the graph indicating that the strength of nodes is comparatively better in our work (Fig. 8 and Table 2).
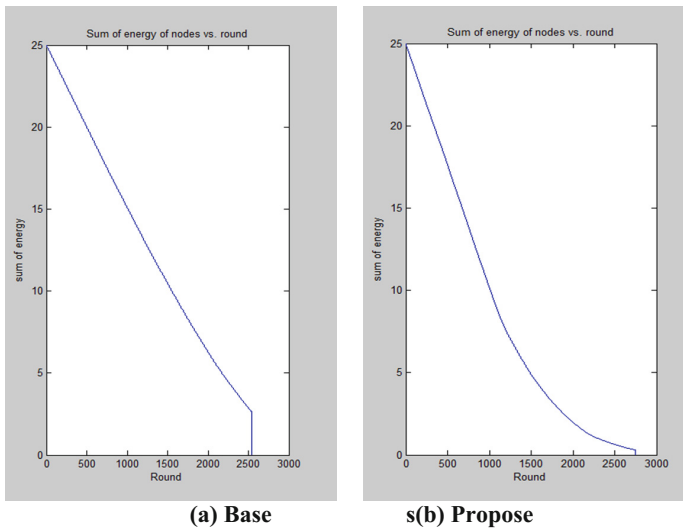

(a) Base   s(b) Propose

Fig. 8. Sum of energy of nodes for base and proposed technique

Table 2. Comparison between base and proposed approaches

Protocol	Metric			
	First node dead	Half node dead	Last node dead	Total packet sent
Base approach	786	2213	2540	10160
Proposed approach	900	2030	2751	11004

7   Conclusion and Future Scope

WS Node are normally fuelled through confined restrict batteries which substitution is delicate in renounced condition in which masses of nodes are capriciously passed on. Routing algorithm is of fundamental monstrosity in optimizing energy utilization in WSN. In this paper, we proposed a multi-hop cluster based completely routing system to decorate LEACH protocol through lessening the quality utilization and broadening the sensor arrange lifetime. The executed method is develop absolutely in light of a total of LEACH and MTE protocol. Wireless sensor nodes are ordinarily controlled

through limited limit batteries whose substitution is frangible in diverse situation wherein loads of junctions are indiscriminately deployed. Routing algorithm is of essential result in optimizing power utilization in WSN. To decide this energy constraint, proposed technique which utilized multi-hop inter-nodes conversation using MTE algorithm in which source nodes ahead its information to the CHs. all of the manner through halfway nodes internal every group. Each supply junction inside the groups sends its message to the neighboring junction on the methods to the CH. which will decrease the transmission energy. By this, the energy utilization reduced to get better the performance of the network. In the future work, we can apply some cryptographic techniques to improve the security of the data and enhance the performance of the network. Security is very essential component as the data is reached to each Cluster Head until it reach the Base Station. Encryption and Decryption on data can be performed for increasing the security of the data.

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