# Modified Distance Vector Routing for Longer Life Time of WSN using Cluster Logic

Gayatri Kushwaha[1], Dr. Sanjeev Sharma[2]

[1]M. Tech. Scholar, [2]Guide

Department of Computer Science and Engineering, SOIT, UIT RGPV, Bhopal

***Abstract - Wireless sensor networks are the very advanced information network which facilitates various applications. The challenges faced by the network designers are the energy consumption optimization. In some ways battery technologies can help to overcome this problem, but it not the only solution because battery has a limitation of energy means finite energy source. The work dedicated to finding out the ways to reduce the consumption of energies by some intelligently working routing algorithms. Previously different algorithms are proposed and got better network lifetime of the network. Network lifetime is nothing but the optimum utilization of battery power, means lower consumption of energy will last network for longer period of time. In this work (Cluster Based Destination Sequenced Distance Vector (CB-DSDV) has been proposed which is the improved version of destination sequenced distance vector algorithm with clustering. The simulation outcomes shows how the energy saving and lifetime of the network is optimum with proposed routing schemes.***

***Keywords - CBDSDV, Energy Efficiency, WSN, Clustering.***

## I. INTRODUCTION

Wireless sensor network (WSN) is an important supplement of the modern wireless communication networks. It can be viewed as a network consisting of hundreds or thousands of wireless sensor nodes which collect the information from their surrounding environment and send their sensed data to remote control center which is called Base Station (BS) or sink node in a self- organized manner. WSNs can be viewed as a huge database which stores information about the environment to be monitored. Each sensor node will perform sensing, processing and communication functions inside the network.

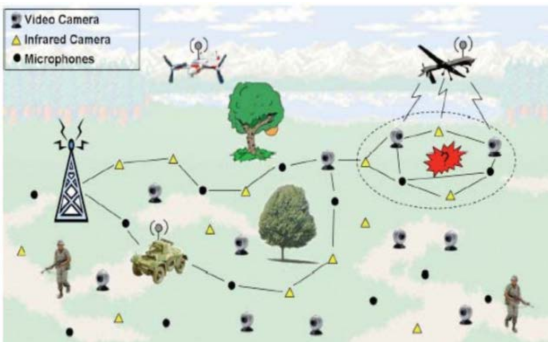


Figure 1.1 Typical sensor network examples.

Fig. 1.1 shows a typical sensor network example. Sensor nodes are randomly deployed (e.g. dropped from airplane) in an environment and they will take a "snapshot" of their surrounding environment like temperature, humidity, sound or motion information. This information can be further aggregated and then sent to a remote BS through direct transmission or multi-hop transmission. Finally, the BS will analyze the collected information from sensors and make reasonable deduction or prediction about the event which has happened or to happen in the sensor network.

In the highly dynamic and energy constraint network, it is a challenging task to develop a routing protocol. The design of the routing protocol can be affected by many characteristics possessed by the WSN. A few issues and challenges for routing in WSN are discussed below:

*a. Energy constraint*

The sensor nodes are battery-powered devices, hence have limited energy. A large amount of energy is consumed during data transmission. Furthermore, a significant amount of energy is consumed during the route discovery and its maintenance phase. The lifetime of the network directly depends on the total energy consumption by each node.

*b. Bandwidth constraint:*

Generally, WSN consists of a large number of sensor nodes, which makes the bandwidth allocation for each link very challenging. Moreover, in the process of route discovery and maintenance, an enormous amount of control packets has to be broadcasted among the sensor nodes.

*c. Limited hardware constraint:*

Sensor nodes are tiny embedded devices having limited processing and storage capacity. Therefore, the researchers have to design a light-weight routing protocol that does not have complicated computing procedures and functions. Hence, the sensor nodes can process and store the data efficiently.

*d. Crowded center effect:*

The data communication from source nodes to a sink in WSN is the many-to-one relationship. In the multi-hop environment, each sensor node forwards the data to the sink through intermediate sensor nodes. The sensor nodes near the sink always relay a large number of data.

*e. Node deployment:*

The sensor node deployment entirely depends upon the applications. In some applications, structured deployment is required whereas, in some scenarios, random deployment is needed. In the random deployment, the node location is not predefined and generally, thrown from an aircraft in the hostile or unattended area.

*f. Scalability:*

A large number of sensors are deployed in the interested area. Further, during the operation, the network size may increase. The protocol has to be designed in such a way that the node scalability does not affect the performance

## II. SYSTEM MODEL

Many routing protocols along with efficient routing approaches have been developed for wireless networks. Approaches, such as multi-hop routing and clustering, can enhance the performance of protocols in terms of energy efficiency and network organisation.

In a wireless network, the distance between a transmitting node and a receiving node may be long. Thus, choosing multi-hop routing to minimise the energy dissipation of long- distance data transmission is sensible. In the multi-hop routing, one or more intermediate nodes are used as sequential hops if and only if the total energy dissipation can be reduced

- MTE

Minimum transmission energy (MTE) routing is an energy-aware multi-hop routing approach for wireless networks. In MTE, intermediate nodes are chosen to relay data packets from the source node to a given destination so as to minimise the total transmission energy. Assuming a d2 (d is the distance between the transmitting node and the receiving node) power loss implemented to estimate the energy dissipation during the transmission, for the configuration shown in Figure 2.1.

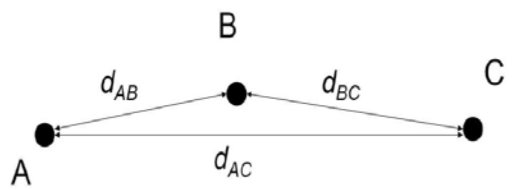


Figure 2.1 Minimum transmission energy (MTE) routing.

- GeRaF

Geographic Random Forwarding (GeRaF) is a distributed geographic protocol. At each hop, the node currently holding the packet to be relayed towards the destination has the objective of minimizing the residual distance the packet will have to travel toward the destination. In other words, call s the current sender, and let D be the vector containing the coordinates of the destination. Call Xs the set of neighbours of node s, and let x 2 Xs be the vector of coordinates of a neighbour of s. The objective of the current sender is to send the packet to the neighbor x such that. The procedure to actually search and find the optimum relay entails a number of queries to the set of neighbors of the current packet holder, which in turn require a number of exchanges of signalling messages [16].

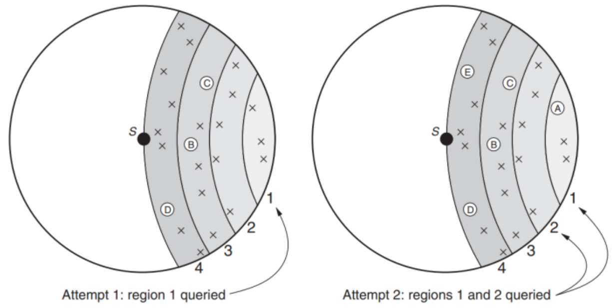


Figure 2.2 Geographical random forwarding propriety regions wakeup process example.

The different regions are shaded using increasingly darker tones of gray in figure 2.2 (region 1 has the lightest color). Crosses represent sleeping nodes whereas awake nodes are identified by a letter. At the first attempt, only region 1 is queried and no node is found awake. At the second attempt, both regions 1 and 2 are queried, and awaking nodes in both regions can participate. In this case, node A, which just woke up in region 1, can take part in the relay selection, whereas node E cannot because it has awakened in region 4, which is not being queried [16].

- END_OR

ENS_OR (Energy saving via opportunistic routing) adopts a new concept called energy equivalent node (EEN), which selecting relay nodes based on opportunistic routing theory, to virtually derive the optimal transmission distance for energy saving and maximizing the lifetime of whole network. Since sensor nodes are usually static, each sensor's unique information, such as the distance of the sensor node to the sink and the residual energy of each node, are crucial to determine the optimal transmission distance; thus, it is necessary to consider these factors together for opportunistic routing decision. ENS_OR selects a forwarder set and prioritizes nodes in it, according to their virtual optimal transmission distance and residual energy level. Nodes in this forwarder set that are closer to EENs and have more residual energy than the sender can be selected as forwarder candidates. Our scheme is targeted for relatively dense 1-D queue networks, and can improve the energy efficiency and prolong the lifetime of the network [1].

## III. PROPOSED METHODOLOGY

The concept of routing in wired networks by abstracting the wireless links as wired links, and find the shortest, least cost, or highest throughput path(s) between a source and destination. Since most routing protocols rely on the consistent and stable behavior of individual links, the intermittent behavior of wireless links can result in poor performance such as low packet delivery ratio and high control overhead. One the other hand, this abstraction ignores the unique broadcast nature and spacial diversity of the wireless medium.

Routing is the way of choosing the least and best path among different available options. The major factors to be considered during the process of choosing best path are energy, distance, bandwidth along with data security. The proposed algorithm has been designed to consider all above parameters discussed is a modified distance vector routing for longer life time of WSN using cluster logic. The flow chart of proposed algorithm has been shown in figure 3.1. The good performance of these efficient methods lead us to develop a centralised clustering, energy-efficient (CCEE) routing protocol for wireless sensor networks. The implementation of proposed work has done on Matlab and Simulation of proposed work has done in Matlb Simulink. The Steps of Implementation of proposed work has given as follows.

1. Start

2. Initialize Network Parameters

3. Create Clusters with defined Rule

4. Define Data to be transmitted

5. Analyze Data Reception Pattern

6. Calculate Data Loss in Network

7. Route Data (Transmission) with CB DSDV Routing

8. Estimate Losses and Time for Overall Transmission

9. Display Results

10. End

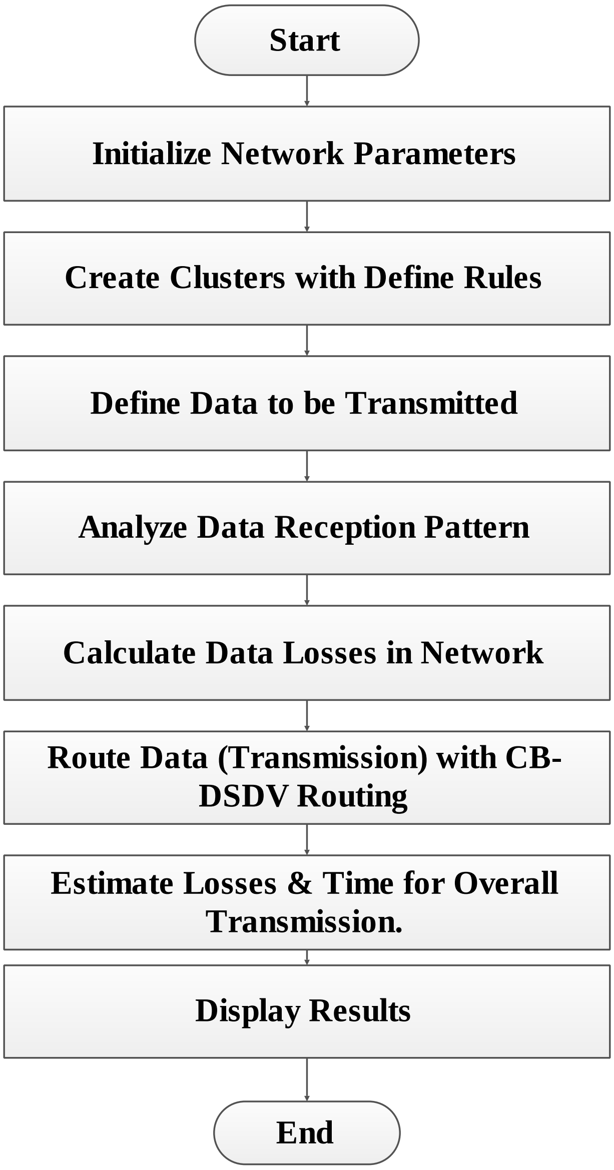


Figure 3.1 Process Flow of Proposed algorithm.

## IV. SIMULATION OUTCOMES

The simulated network has 100 node stationary nodes randomly uniformly distributed on a line with length L or in a W x Wm2 square region. The simulation experiment has conducted on MATLAB Simulink. Each node has the same frequency 1 Mbit/s, and firmware character. The performance comparison of proposed work with existing work has given in Table 1.

Table 1: Performance Comparison of the Proposed Methodology with Previous Techniques

| Parameters | Algorithms | | | |
|---|---|---|---|---|
| | MTE | GeRaF | END_OR | CBDSDV |
| *First Dead Node* | 85 hours | 140 hours | 175 hours | 195 hours |
| *Network Life Time* | 145 hours | 245 hours | 300 hours | 450 hours |

There are mainly two parameters First Dead Node and Network Life Time are considered for evaluation of performance of proposed work with existing work as shown in table 1.

The graphical representation of comparison table has given in figure 4.1 graphical performance comparison network life time and first node dead. The illustration has given by two different shades for first dead node and network lifetime.

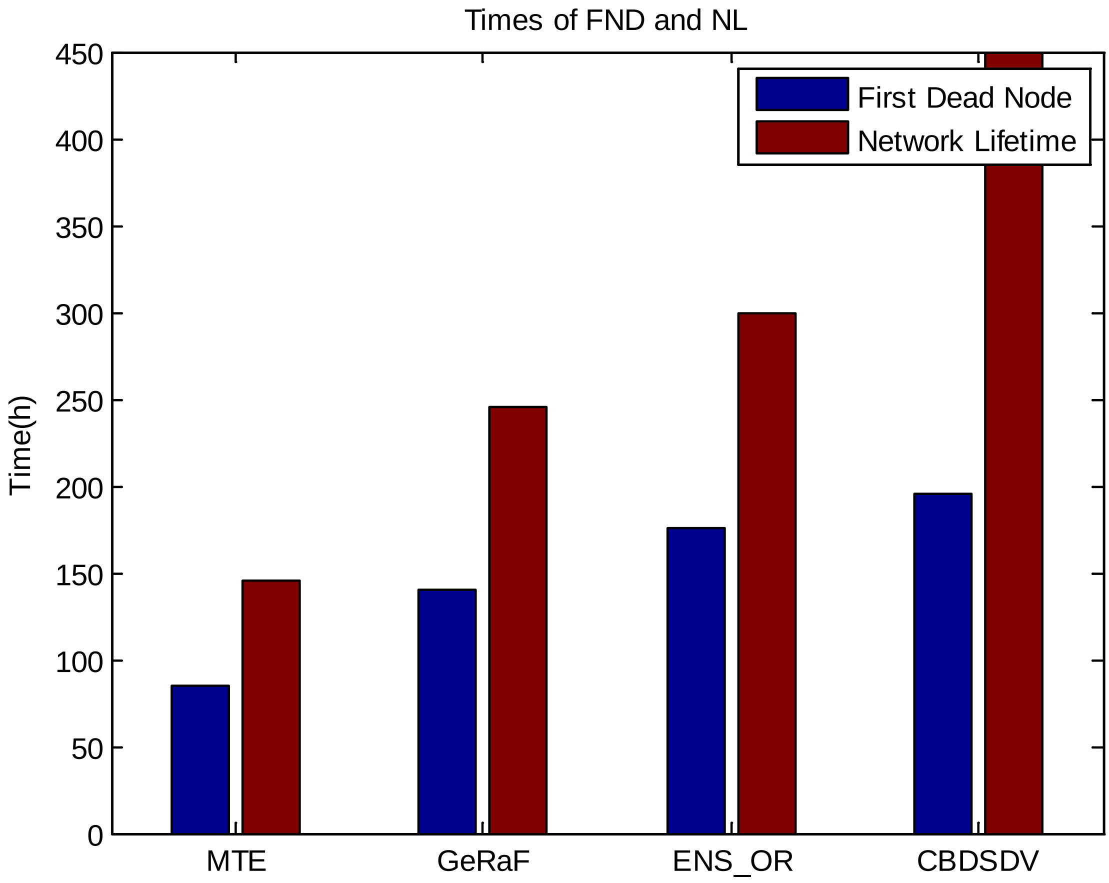


Figure 4.1 Graphical Performance Comparison Network Life Time and First Node Dead.

## V. CONCLUSION AND FUTURE SCOPE

In this research exploration, a Modified Distance Vector Routing for Longer Life Time of WSN using Cluster Logic has been proposed. The objective is to prolong network lifetime of WSNs by reducing and balancing energy consumption during routing process.

Because of the fact that the factor plays an important role on many network metrics such as energy consumption, hop number, latency, interference, routing overhead etc. and hop-based routing for WSNs is not well addressed. This work studies the consumption of energy performance under one dimensional sensor network. The life time of Network has been increased and rate of fist dead node has decreased.

Finally, compare the performance between proposed work and other four existing algorithms MTE , GeRaF, END_OR, CBDSDV; it is found that proposed work has a better performance than the others in terms of energy consumption, and network lifetime.

In future there is a scope to more work on the proposed algorithm to the following aspects such as the factor of residual energy for each node during the selection of next hop node. Design a Clustering mechanism with data fusion. Use different distances for individual nodes so that each node consumes same amount of energy.

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