A Graph Theory based Energy Efficient Clustering Techniques in Wireless Sensor Networks

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Abstract*— Energy Efficiency is important role of the Wireless Sensor Networks Researchers. The Energy Efficiency is one of the roles where the data is transmitted to the base station. Energy Techniques is used to improve the reliability of a link. When the data is transmitted communicates to the nodes at exact power to the clustering technique algorithm using graph theory approaches. Secure data aggregation is a challenging task in the wireless sensor networks. These issues are needed to overcome using the clustering efficient techniques. We propose a graph theory based secure data aggregation which has a three phases. We assume the transmitted power and sensing power of the nodes. First phase performs the clustering and cluster head election process. Second phase performs the each clusters are calculated the distance, Energy and also dependence. Third phase performs the shortest path calculation was transmitted the data to secured or not. Finally the aggregated data was transmitted from the cluster heads to the base station. Our proposed models are analysis the acknowledgement through the base stations.

Keywords— **Distance, Energy, Graph Theory, Shortest Path, Acknowledgement (Dependence)**

I. INTRODUCTION

Wireless Sensor Networks is a large number of sensor nodes and data send from a sink with the help of radio transmitter [1]. The major issues in wireless sensor networks are limited energy. The applications of wireless sensor networks have increasing every day in life suitable for monitoring and environmental applications like household, industrial, military affairs, traffic management, medical applications, surveillances etc..,[2]. The group of nodes is connected in a single network called cluster. Each cluster is controlled and monitoring by a cluster head [3]. The data is easily communicated through base station with the help of cluster head. So we introduced the energy efficient clustering algorithm to enhancement of the network capacity and also network life time.

II. RELATED WORKS

All the sensor nodes are grouped into one clusters and also data send through base stations. The following assumptions: 1. the base station is inert and also distance calculated from each sensor nodes.[4] 2. The nodes are homogenous, little, no mobility and also energy constrained [5].3. The channel is assuming the symmetric (or) Asymmetric through communicate the network. Base Station is liable for the clusters [6]. The distance and energy are calculated for each node. The LEACH algorithm is used to compare the parameters to increase the network life time [7]. The LEACH algorithm is about 50% more efficient to network life time in wireless sensor networks [8].

III. GRAPH THEORY

Graph Theory was started across the seven Konigsberg bridges with Euler. It is used for finding the communities in the networks and also various branches of Mathematics, Computer Science, Electrical and Electronics Engineering, Electronics and Communication Engineering and Operations research [9]. A Graph is a pair of sets (V,E) where V is the set of vertices and E is the set of edges formed by pair of vertices. Using Graph the nodes are connected to the networks are represented of collection of points, lines are communicate through link [10]. The various application based on graph tree like Binary tree, Reliable communication networks, Assignment of radio frequencies, Latin Square, Membership problem, Mathematical analysis etc [11].

IV. PROPOSED WORK

The Clustering approaches using the Graph Theory to detect the shortest path in Wireless Sensor Networks. The modules of this paper consist of four phases. They are as follow as:

1. Distance Calculation
2. Energy Calculation
3. Shortest Path detection
4. Acknowledgement data

3.1 Distance Calculation

The distance of all other nodes from each clusters is found by E and F coordinates of each node in a cluster network is calculated by using the formula,

$$D = \{\{ E_2-E_1\}^2 + \{ F_2-F_1\}^2\}\}^{1/2} \quad (1)$$

Where D is the distance from (E_2,E_1) and (F_2,F_1) is also called as Euclidean distance

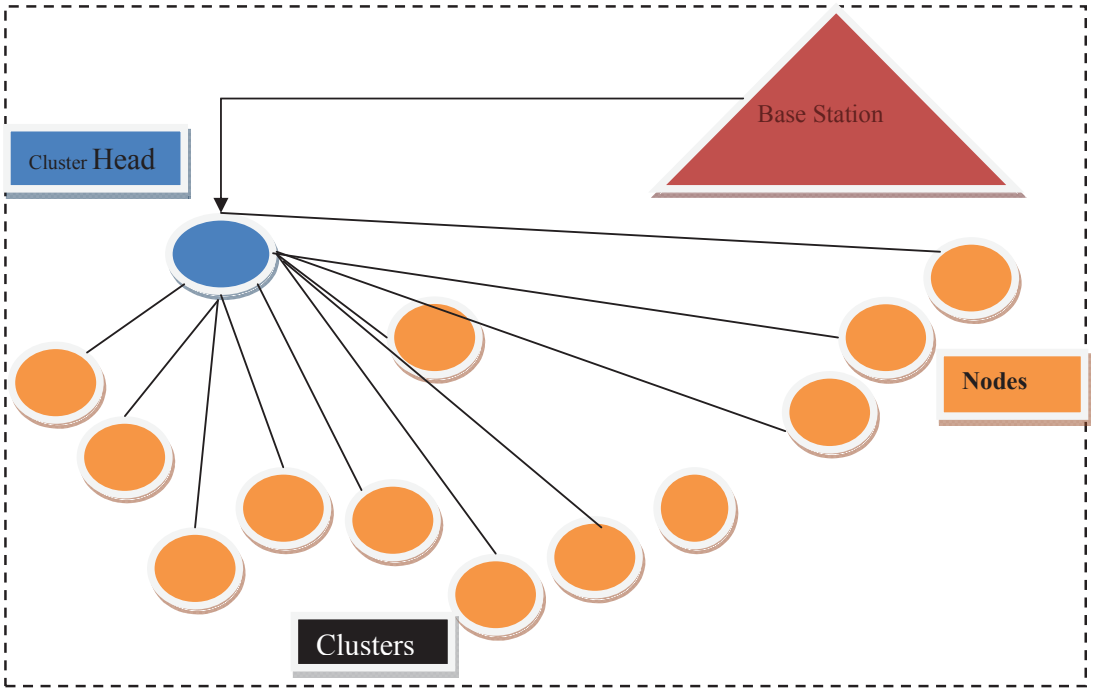


Figure 1: Related Work Network Structure

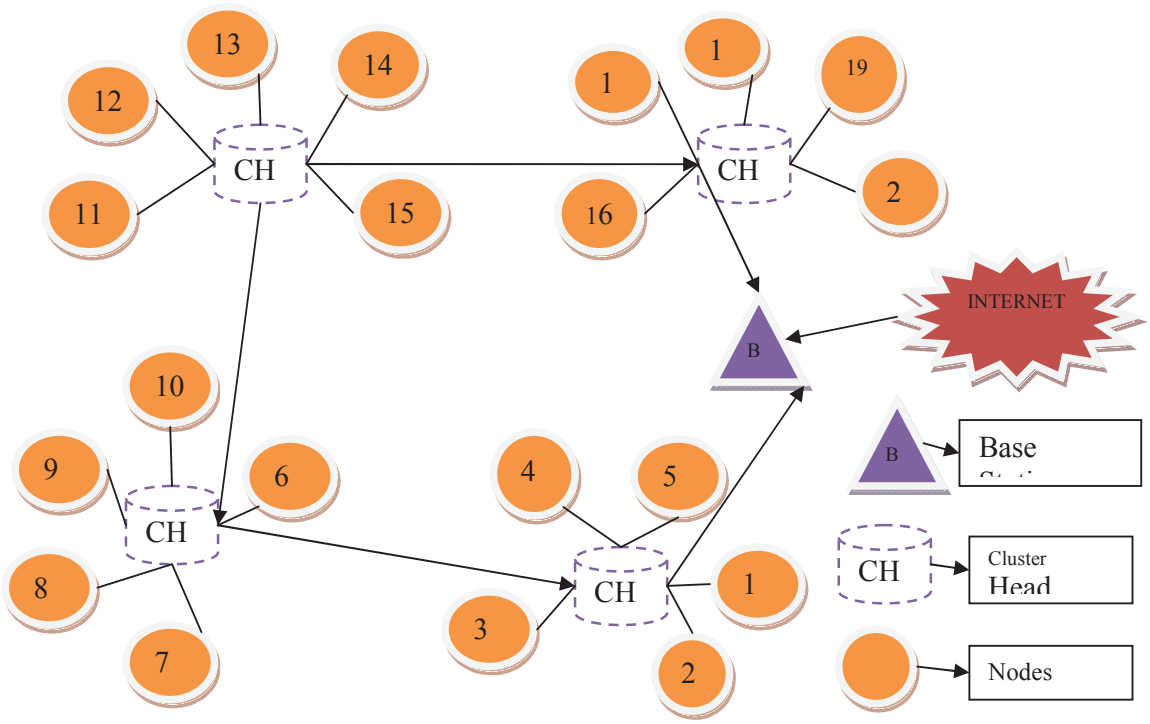


Figure 2: Proposed Work for Network Structure

3.2 Energy Calculation

The Energy can be calculated by using the formula,

$$E = A_{int} - ((B_t * C_{tx}) + (B_r * C_{rx})) \quad (2)$$

Where,

A_{int}- Initial Energy level of each cluster

B_t- Number of Packets transmitted by the node

B_r- Number of packets received by the node

C_{tx}- The Transmission energy to transmit of each Packet

C_{rx}- The total energy consumed while receiving each packet

C. Shortest Path Calculation

The distance calculation and energy calculation based for finding the shortest path to send the data from the clusters head to the base station with prolonging the life time of the network. The shortest path calculation of two vertices using graph representation i and j is denoted as D [i,j]

1. $D[i,j] \geq 0$
2. $D[i,j] \leq 0$
3. $D[i,j] = 0$

D. Acknowledgement

The data send from the source to the destination. The base station Send through the acknowledgement the data is successfully received as indicated as 1.

1- Received data (Best Node)

0- Not Received data (worst Node)

NODES	ACKNOWLEDGEMENT
10	1
20	0
30	0
40	1
50	0
60	1
70	1

Table 1: Decision Making Network Structure

E. Neighbour Identification

Network nodes are represented by the vertices and also direct connectivity between the nodes by the edges. Sensor nodes are maximum flow from one node to the other node to calculate the distance. The Combinatorial Structure are called as network structure. The Number of vertices are connected to the source node in a network is called its neighbour node and the number of edges are its size. Two or more edges of a network joining the same pair of vertices are called multiple edges and corresponding network is known as multipath network.

V. ALGORITHM

1. Start the Program
2. Read the Number of Nodes
3. Read the Number of Edges
4. Read the Number of Neighbour Nodes
5. Label the Start edges as 0.
6. Label of each edge is connected to the edges with its distance.
7. From this edges, consider the distance to each connected edges.
8. If the edges is greater than one of its edges, to calculate the distance and also read the distance
9. If the edges is less than one of its edges to calculate the distance and also read the distance.
10. If there is no distance at the edges, write down the new distance.
11. Calculate the Shortest path Detection.
12. Read the Transmitted Power.
13. If the Edges are less than the distance, write down the transmitted power and then calculate the total transmitted power consumed value.
14. Stop the Program.

The nodes are 10, 40, 60 and 70 data transmitted successfully received with the acknowledgement from the base station is indicated as 1.

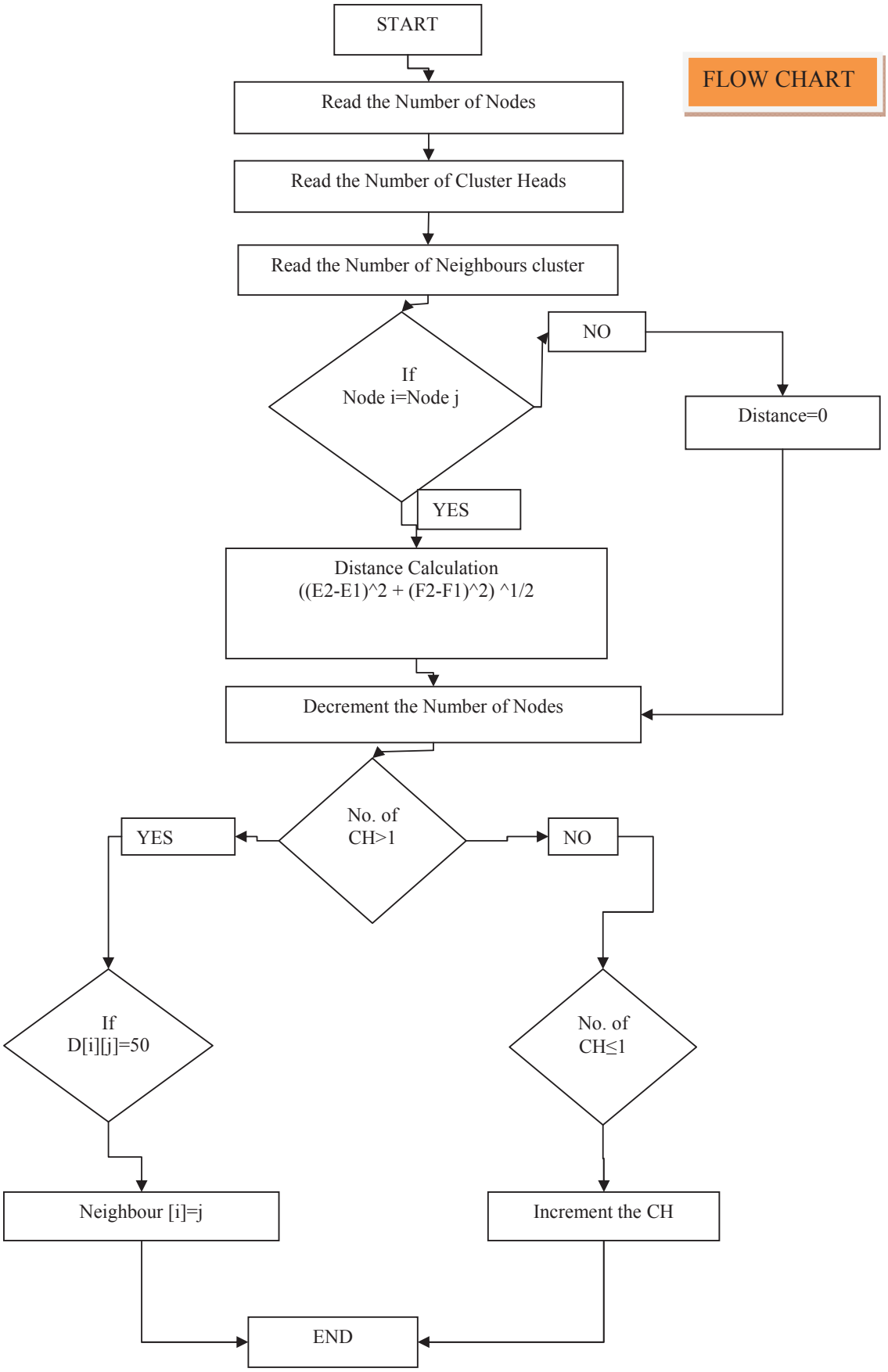
The major role of graph theory in computer applications is the development of graph algorithms. Numerous algorithms are used to solve problems that are modeled in the form of graphs [12]. These algorithms are used to solve the graph theoretical concepts which intern used to solve the corresponding computer science application problems.

Some algorithms are as follows:

- Shortest path algorithm in a network
- Finding a minimum spanning tree
- Finding graph planarity
- Algorithms to find adjacency matrices.
- Algorithms to find the connectedness
- Algorithms to find the cycles in a graph
- Algorithms for searching an element in a data structure

A. *Applications of Graph Theory*

- Binary Tree
- Construction of Reliable Communication Networks
- The Lame Duck Airlines Problem
- Assignment of Radio Frequencies
- Fast Register Allocation for Computer Programming
- Scheduling an Oral Examination
- Latin Square
- Timetabling Problem
- Transportation Problem
- Maritime Traffic
- Membership Problem


START
FLOW CHART
Read the Number of Nodes
Read the Number of Cluster Heads
Read the Number of Neighbours cluster
If
Node i=Node j
NO
Distance=0
YES
Distance Calculation
((E2-E1)^2 + (F2-F1)^2) ^1/2
Decrement the Number of Nodes
No. of
CH>1
YES
NO
If
D[i][j]=50
No. of
CH≤1
Neighbour [i]=j
Increment the CH
END

VI. RESULTS

The Simulated results are done by NS_2 Simulator. Figure 3 shows that the sensed the data from clustering techniques. Figure 4 shows that the throughput of our proposed work.

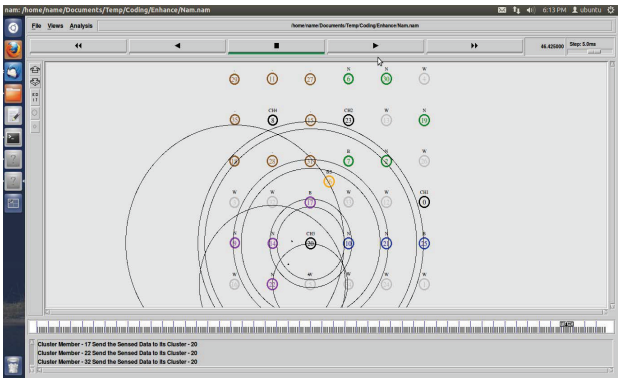


Figure 3: Data sensed the Network

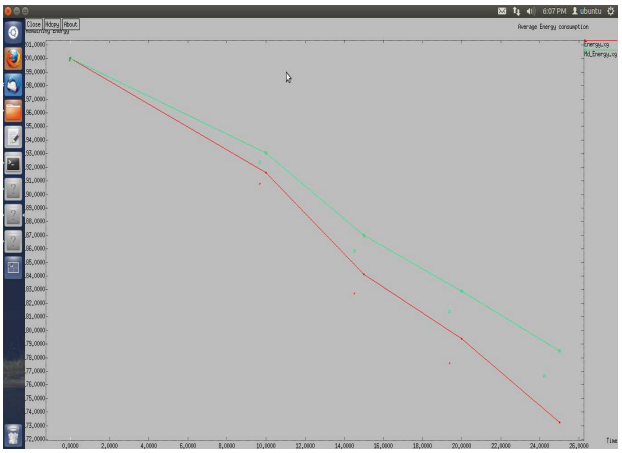


Figure 4: Throughput of the Network

VII. CONCLUSION

This paper introduces a new methodology of clustering of each node and also overall potential of each cluster. The efficiency of the proposed model is analysis using NS-2 and the results showed above. The sensor nodes utilize extremely less power and stay in the networks for a greater period of time. The detect the shortest path in a network is good mobility of each node to transmitted the power from the source node to the destination node. As a future work, the clustering techniques are used to detect the shortest path in a network using Fuzzy Logic.

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