Enhancing Life Span for WSN Nodes using LEACH, Huffman Data Fusion and TSP- NN Algorithm

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***Abstract*- The Sensor nodes are working under the principles of energy. The most important factor is usages for energy. How the energy is efficiently used. If the power is keep on decreasing due to transmission of data the nodes travelling toward dead state. In this paper explained the few basic techniques and algorithms are used to increase the energy. We cannot create energy but we can save the energy in terms of following few life time enhancement methods which mentioned in this research paper.**

***Index Terms* - LEACH, Data Fusion, NN, TSP, Huffman Encoding**

I. Introduction

The sensor nodes are working under the principles of energy or power. If the power goes on reduce, it indicating that the die moving towards die state. The efficient usage of energy efficiency and maximization of energy is the most important role in wireless sensor nodes.

1.1. Data Transmission in WSN:

The WSN nodes are does not have any wired physically communication so that the Data transmission in sensor nodes taken place of the Communication between two unconnected WSN nodes is achieved through intermediate nodes. Every node that falls inside the communication range *r* of a node *u*, is considered reachable.

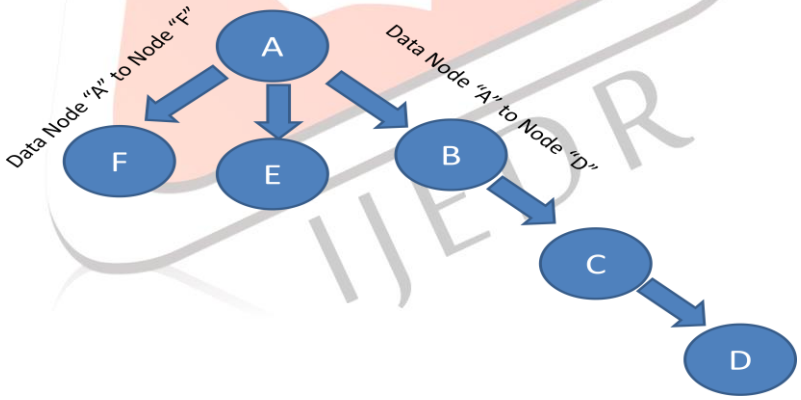

Fig. 1. Data Transmission in WSN Nodes

In the Fig.1 depicts that are six nodes namely A, B, C, D, E, F. These nodes are connected together over a wireless medium. In that above figure indicates that node "A" is sending the data to node "F" similarly to Node "A" is sending a data to node "D". in the case of Node "A" to node "F" there is no intermediate nodes so the data can directly sent to the node "F". In the case Node "A" to node "D" there should be two intermediate nodes are involved during the data transmission so the their should additional data loss of the node "B" and Node "C". To address this issue few techniques are used in this paper they are (a). Clustering with LEACH, (b).Data fusion with Huffman Algorithm, (c). Nearest Node with TSP Algorithm.

1.2. Types of Data Transmission in WSN:

(a). Single Hop without Clustering
(b). Multiple Hop without Clustering
(c). Single Hop with Clustering
(d). Multiple Hop with Clustering

II. Clusters Using LEACH Protocol

Clustering is grouping similar object or nodes. Low-Energy Adaptive Clustering Hierarchy (LEACH) is completely distributed clustering and hierarchical routing protocol for wireless sensor networks, requiring no control information from the base station (BS). The LEACH, use the higher energy nodes to process and send the data and lower energy nodes can be used to perform the sensing. The formation of Clusters are formed and special tasks is assigned to the cluster-heads can greatly contribute to overall system scalability, lifetime, and energy efficiency.

2.1 Process of Cluster Formation Steps:

Table.1 Process of Cluster Formation

S. No	Steps
1	Creation of Clusters
2	Selection of a cluster-head (CH)
3	Broadcasting CH state to the nodes
4	Registration of the nodes with their respective CHs Using carries sense multiple access (CSMA MAC) Protocol.
5	Time slot allocation for the data transfer from node to CH using Time Division Multiple Access (TDMA)
6	Transfer of consolidated data from the CH to the BS (sink)

2.2. LEACH Process Flow:

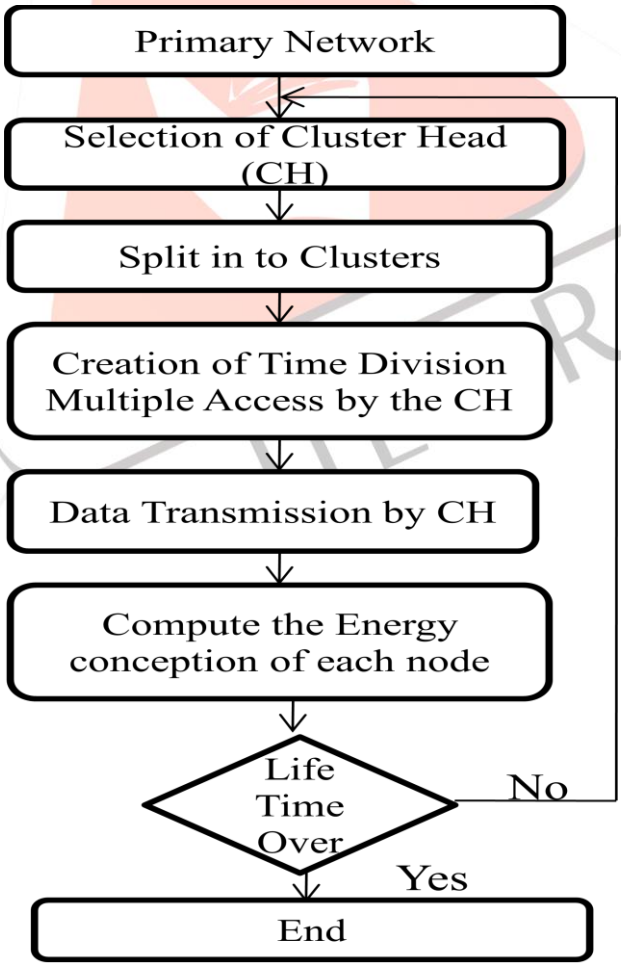

Fig.2. LEACH Process Flow

The LEACH process flow depicts initial structure of the network then the cluster head is selected based on the energy then time slot for transmission is allotted by the cluster head and estimate the energy of the each node. if energy is not up to the threshold level then take to the next level of transmission. If not that's the end of the transmission.

2.2. Cluster Head Selection:

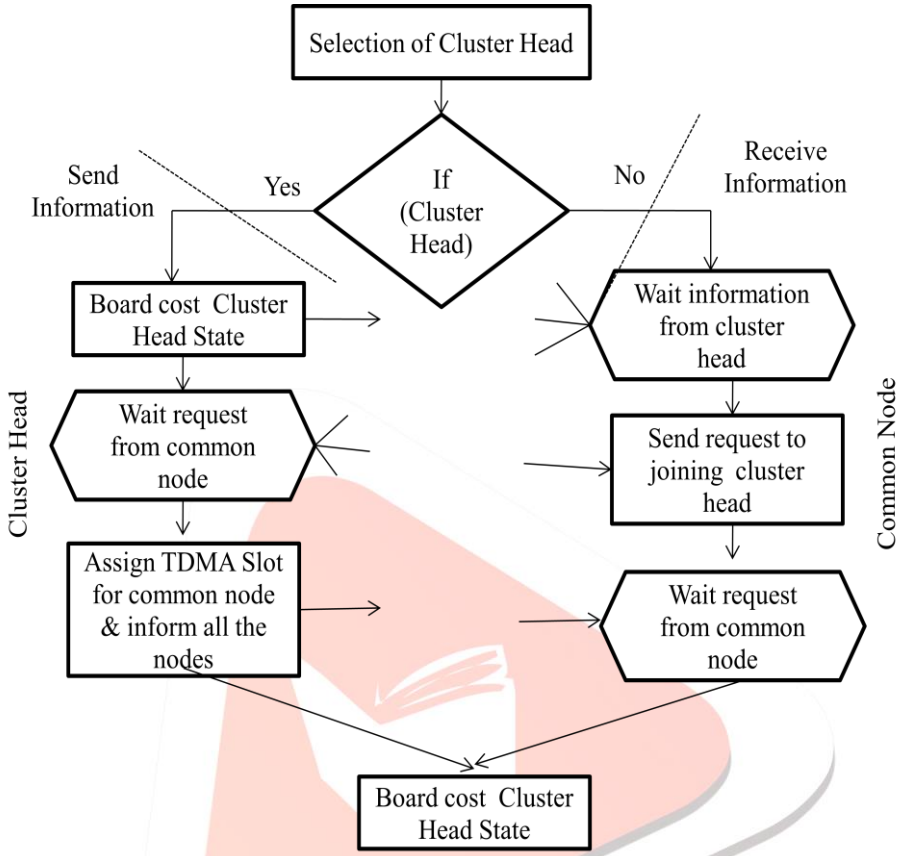

Fig.3.Cluster Head Selection

The cluster head selection must be given the higher level node gets first priority. If the node is cluster node the I will broad cost the cluster head state and the cluster head wait for the request from a common node and assign the TDMA time slot the common node. If its not a cluster head then wait information form the cluster head or send the request to the cluster head or waiting for request from a common node. After completion of the transmission the cluster head broad cost the cluster head state to the common nodes.

III. Data Fusion

The main object of data fusion is reducing the no of data elements so that can maximize the energy. In data fusion the data is encoded in the form of 1 and 0. This means that the data is originally a combination of elements from some alphabet. This combination of elements is called a message. This message is encoded into the binary format. The string of bits, binary digits (0's and 1's), is the encoded data.

3.1. Block Encoding

Plain message	:	he had a cafe
		H e h a d
Encoded message	:	111 100 111 000 011
		a c a f e
		000 010 000 101 100
Total No. of Bits	:	30

3.2. Huffman Encoding:

Plain message	:	he had a cafe H e h a d
Huffman Coding	:	01 111 01 10 011 a c a f e 10 111 10 110 111
Total No. of Bits	:	25

Table.2 Huffman Table

Elements	Frequency	Block Code	Huffman Code
A	3	000	10
C	1	010	000
d	1	011	001
e	2	100	111
f	1	101	110
h	2	111	01

Make ascending order of frequency

Table.3 Frequency Table

Element	Frequency
c	1
d	1
f	1
E	2
h	2
a	3
Total Frequency	10

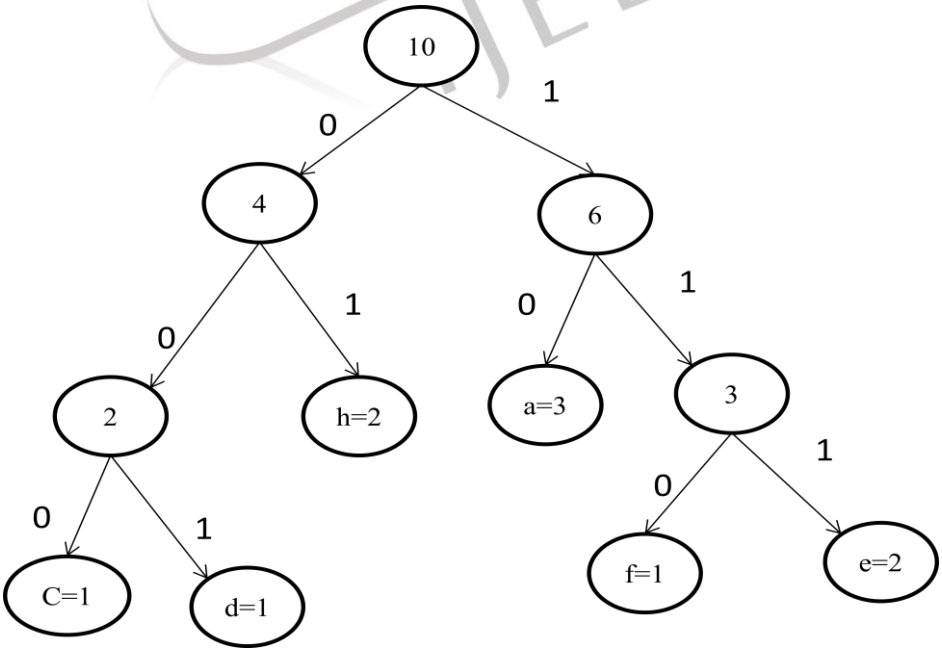

Fig.4.Huffman Tree

Performance Efficiency comparison Between Block doing and Huffman coding

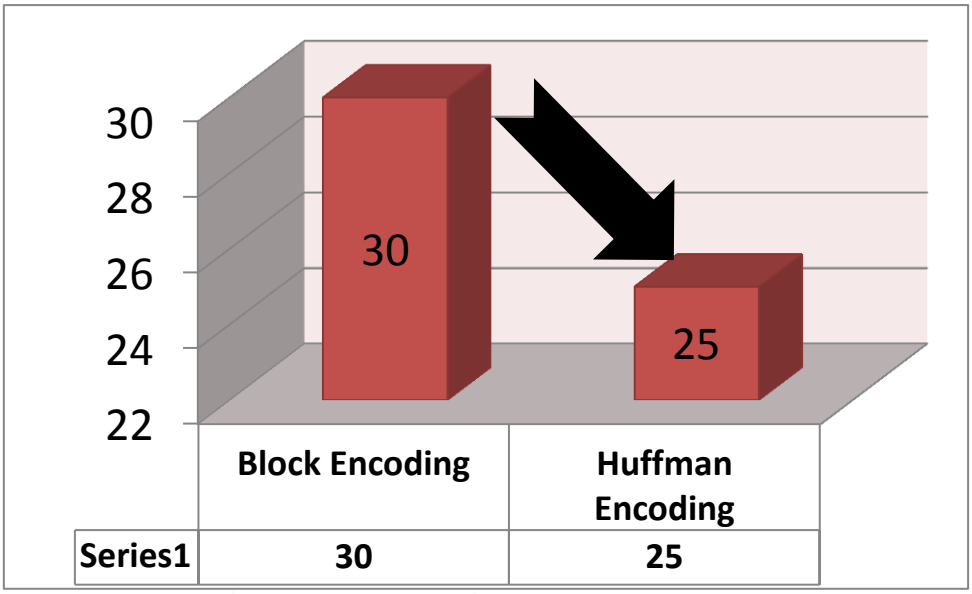

Fig. 5 Performance Comparison

The Huffman coding of the messages is 25 bits long. The block code encoding is 30 bits long. The Huffman encoding saves 5 bits.

IV. Nearest Node Find Using TSP:

Nearest Neighbor Algorithm used transmit the data when a particular node is not available while transmission while the transmission taken place so the cluster head need to send the data once again to the destination to address this issue we keeps the data to the nearest nodes of destination node. The nearest neighbor algorithm was one of the algorithms used to determine a solution to the travelling salesman problem. In it, the salesman starts at a random node and repeatedly visits the nearest node until all have been visited.

Node "G" is Sending Data to Node "B

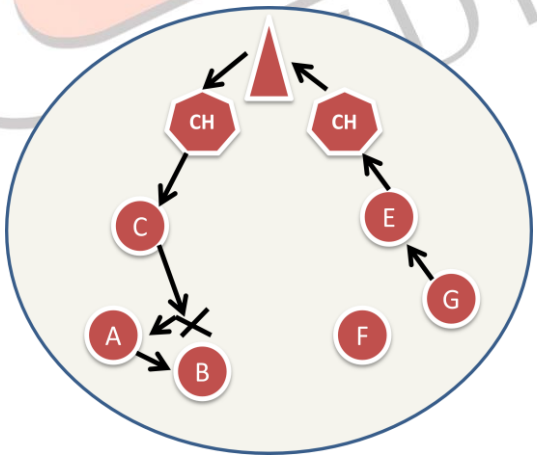

Fig.6. Nearest Neighbor Node

4.1 The Nearest-Neighbor Algorithm (NN)

The Nearest-Neighbor Algorithm (NN) is an estimated algorithm for finding a (possibly) sub-optimal solution to the Travelling Sales men Problem. Below the figure in that 5 nodes and the distance between the nodes are given below

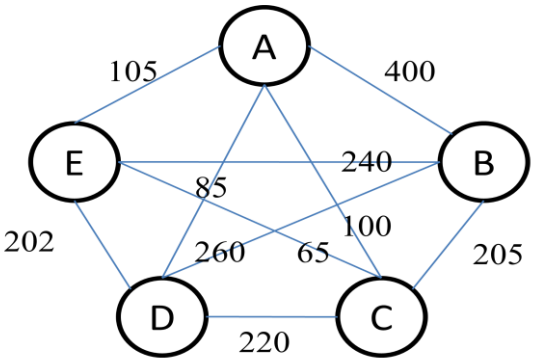

Fig.7. TSP node structure

4.2. TSP Algorithm

Table.4 Frequency Table

1	Start at home or Cluster Head (current vertex.)
2	find out the shortest edge connecting current vertex and an unvisited vertex V.
3	set current vertex to V.
4	Go there mark V as visited.
5	if all the vertices in domain are visited, then terminate.
6	Repeat steps 2 until no more unvisited node
7	Go home

4.3. TSP Transition states:

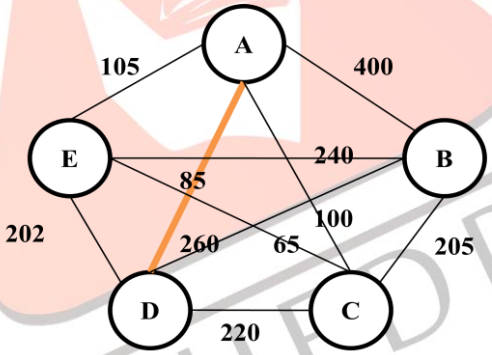

Fig.6. TSP Transition A →D

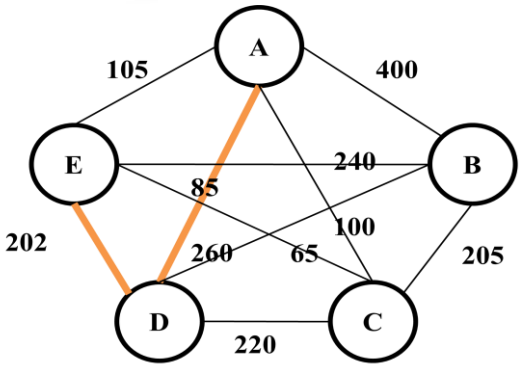

Fig.8. TSP Transition D →E

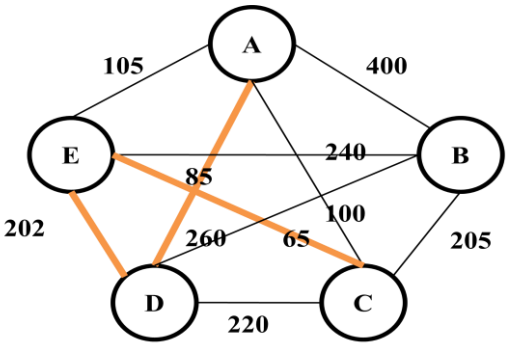

Fig.9. TSP Transition E→C

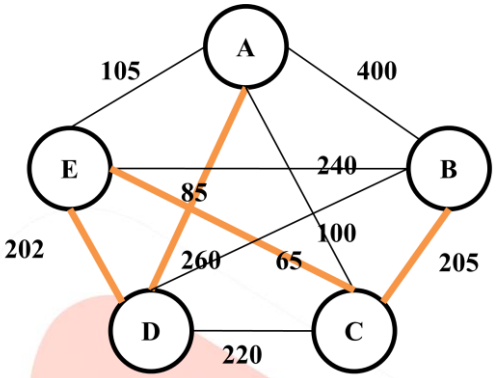

Fig.10. TSP Transition C→B

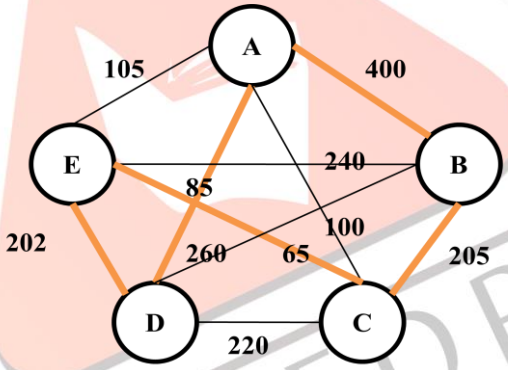

Fig.11. TSP Transition B→A

The figure.5 is indicating the Travelling Sales Person node structure. The figure.6 is indicating that find shortest path from A→D its 85. The figure.7 is indicating that from nodes D taking shortest path from D→E its 202. The figure.8 is indicating that from nodes E taking shortest path from E→C its 65. The figure.9 is indicating that from nodes C taking shortest path from C→B its 205. The figure.10 is indicating that from nodes B taking shortest path from B→A its 404.
So the NN route is: ADECBA.
with weight: 957

V. CONCLUSION

The life time enhancement of wireless sensor nodes being implemented in this paper with aid few techniques. The first techniques clustering techniques this LEACH concept is used to save and maximize the energy. Second one is data compression technique is used to minimize data transmission time. Third one is nearest neighbor node finding using travelling sales person problem with this we can save the energy by selecting a shortest path so that we can the save the energy.

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