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Exposing Active Node in Association Set Using Distance Method

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Abstract

The main aim of Wireless Sensor Network is to maximize the network lifetime without data loss.Numerous research work has been done on WSN in order to develop energy efficient protocols. The best method to increase the network lifetime is to keep some sensor nodes in alive mode and remaining in sleep mode. The proposed approach consists of two methodologies : (i)Competitive Heuristic method and (ii)Ad-hoc on Demand Vector topology. Competitive Heuristic method is used for identifying the alive node with higher number of neighbor nodes using Euclidean distance, the fast iterative heuristics method is used to refine the number of active node. The Ad-hoc on Demand Vector topology is used for finding the shortest path with minimum cost. Also, it helps in reducing data loss during transmission, irrespective of failure data can be transmitted in alternative path. By these techniques, network lifetime and performance can be increased and also data loss during transmission can be avoided.

Index Terms— Competitive heuristic method, Adhoc on demand vector routing, Euclidean distance, Fast iterative heuristic method

I. INTRODUCTION

Wireless sensor network (WSN) is a collection of sensor nodes which are distributed with restricted power. Sensor nodes collects the information from the environment like its humidity, temperature, sound, motion, pressure. It applies in many WSN applications like health care, habitat monitoring, surveillance, anti-theft services. Each sensor node consists of a processing unit, transceiver and sensor for information collection and monitoring. Multihop wireless network is formed using these

components and send the collected data to gathering node. For this process, energy consumed by the sensor nodes increases drastically resulting in reduced lifetime. To increase the network lifetime, various measures like clustering of nodes, data fusion, in-data processing and network coding are used. Most of the existing proposals used these methods to save energy but failed to prevent data loss.Hence the efficient method is proposed to extend the network lifetime without data loss.

To increase the network lifetime, there should be proper usage of energy by each node. In a large sensor network with enormous amount of active nodes requires more energy for processing. In order to reduce the energy consumption, the number of active nodes should be minimized. Most of the large networks use data correlation method to reduce the enery usage. The data correlations between the nodes highly depends on node's position and its deployment region. Using data correlation between the nodes is suitable for transmitting the data in the minimum hop count. It is usually in static manner because of its dependency on location.

Data correlation among the sensors contain two –tuples. First tuple consists of set of nodes which are in active mode. Second tuple consists of set of inactive nodes. Usually in wireless network, each node knows the information about each other. It is difficult to decide the active nodes in the network. If the number of active nodes is discovered, then the process of finding the inactive nodes will be easier. In such situations, the process of sensing and transmitting the data should be done by active nodes. The inactive node will be twisted off for prolonging the network lifetime. Proposed work need to concentrate on this to achieve the efficiency.

In sensor network, there are two different types of nodes they are sensing node and gathering node. Sensing nodes are the nodes which collects the information from all the nodes and transmit to the gathering nodes. Usually active nodes act as sensing nodes. Gathering nodes are used for receiving the collected data and it can be either in active or sleep mode. But it should be turned on to active mode while receiving the data.This paper aims to decrease the energy consumption. Initially it identifies the active node by calculating its number of neighbor node. Generally the number of neighbor node should be more for a active node. We model the fast active node determination [1] problem as an illustration of connection dominating set of association [2]. In existing proposals, L-hop heuristic method is used for minimizing the energy consumption. The main aim of L-hop heuristic is to construct the dominating set with maximum number of sleep node. L-hop heuristic identifies the vital node with the help of benefit function, and the node with higher benefit function becomes an alive node. A constant threshold value is calculated for each alive node from the benefit value and when this benefit values is lesser than the threshold then the node becomes a sleep mode.

- Competitive heuristic method, it is effective and run time efficiency to identify the vital node.
- The AODV topology used for transmitting data with the minimum cost.

The Fast greedy constructive heuristic constructs the associated high neighbor set with the large relation set as an input. The Fast greedy constructive heuristic method executes before the fast repetition heuristic method. It helps to select the

active node quickly as much as possible. During the active sensor node selection the residual energy is important.

The fast iterative improvement heuristic merges the elected sensor node to the present association set of unselected sensor nodes. The main purpose of the swap operation is to select the maximum residual energy node from the selected and unselected sensor node. It helps in improving the sensor node selection method. A formula is used to find the best unselected sensor node for the shaping process. So, the fast iterative heuristic method identifies the high residual energy node from the unselected sensor node using 0-hop centralized heuristic method [1]

Zero-hop centralized heuristic method consumes time when the large association dominating set is given as input, but it provides the best result to identify the active sensor node. The greedy constructive heuristic method is also performing the same, but it is done in the small scale.

The Competitive heuristic constructs the association dominating result, but it is not used for transmitting data. The Adhoc-on demand distance vector routing is used to efficiently identifies the shortest distance between the active sensor nodes [3]. The aim of Adhoc-on demand distance vector routing is to add the less number of additional nodes to the active state and constructs the connected wireless network. It builds the connected association dominating set with minimum cost by the competitive heuristic.

II. RELATED WORKS

Data correlation between the sensor nodes in wireless sensor network performs the following functions. To extend the network life period, the total number of bit transmission has to be reduced. There are various methods used in the data correlation environment to prolong the network life time they are clustering of nodes for data aggregation then constructing data aggregation tree, networking code etc. On the other hand [7] clustering algorithm is performed by the partially correlated data.

A random geometry methodology [8] is used for measuring the energy consumption and also for transmitting the data. Rate distortion theory [9] is formed by combining the partial clustering and random geometry methodologies. Rate distortion methodologies are used in analyzing the mathematical framework for the energy consumption and network lifetime. The analyzed result is used to calculate the residual energy of the sensor node with the help of a framework to balance the network lifetime.

Cluster aggregation (CAG) [10] is used for decreasing transmissions count in the network. It uses spatial data associations among the sensor nodes to provide the approximate result for the aggregation queries. It choose a set of cluster head, corresponding to the association-dominating set and it also uses the simple localizing scheme during the query propagation. The major drawback of CAG is the usage of simple notion for association.

GRASS [11], involves the heuristic method for finding the routing of data with minimum number of aggregation points. It helps to enlarge the network existence. In a GRASS overlapping method, the representation of relation among the

sensor nodes is done. Aggregation selection and routing problems are solved using GRASS at data gathering node and throws the result to gathering sensor node.

Constructing data aggregation trees [12-15] is one of the systems for reducing the amount of information transmitted by the sensor node. In this method the data is aggregated at the intermediate nodes. The proposed method [12] for effective information collection tree is established at the gathering node, likewise they proposed a randomized tree development method [13] to achieve a constant factor approximation of the gird topology. In previous method, the association is efficient to compress the data. Here the data value is defining in size to compress the multi data value. Minimum fusion Steiner tree [14], considers the transmission cost as well as the information combination cost.

Network coding is used for determining the interference during the transmission. It also contains the scheduler for minimizing these interference. Eigen-coding and self-coding [16] are used for developing the less number of bit transmission, finest and near-finest data gathering tree. The main drawback is that it does not fit for star topology. Baltasar et al[17] proposed two step approach, first is to advance the transmission structure and another is rated allotment determination at the sensor node. In first approach, routing and coding are performed separately. In which node utilizes the joint associated data without unambiguous communication. The best possible solution is obtained using the hard data coding including network knowledge. Their second approach is used in receiving the explicit side information from the other node to exploit the data association.

The probabilistic WSN model is another approach used for the correlated data gathering method.[18] learning algorithm is used to develop the data association models for WSN based on the initial sensor reading. According to the proposed method we can easily predict possible cost of data accessing.

Polynomial time heuristic is the best method to choose the association of the data environment with minimum cost. This method is used for easy identification and also for anticipating the data association in the sensor node. Proposed work selects the active node effectively and efficiently among the defined association data. It is mainly for increasing the network lifetime. Considering association data environment as input to select the active node by using fast greedy heuristic method and fast active sensor node determination.

The proposed L-hop unified heuristic method [2]aims to identify the association high neighbours set with less number of nodes. It contains two parts, first part construct the association high neighbours set and in the second part, the Steiner tree approximation algorithm [3] is used to connect the associate on high neighbor set. The L-hop centralized heuristic complexity is O (nm^2g^L), where n is the number of sensor node, m is the number of correlation, g is the maximum degree of sensor node in the intersection graph, L is a hop count.

There are two main pitfalls in the L-hop centralized heuristic algorithm. (i) High computational complexity The execution time is too high in the dense environment. (ii) Restricted energy consciousness. This method tries to enlarge the network life span to identify the least number of the sensor nodes in the associated environment.

III. ARCHITECTURE DIAGRAM

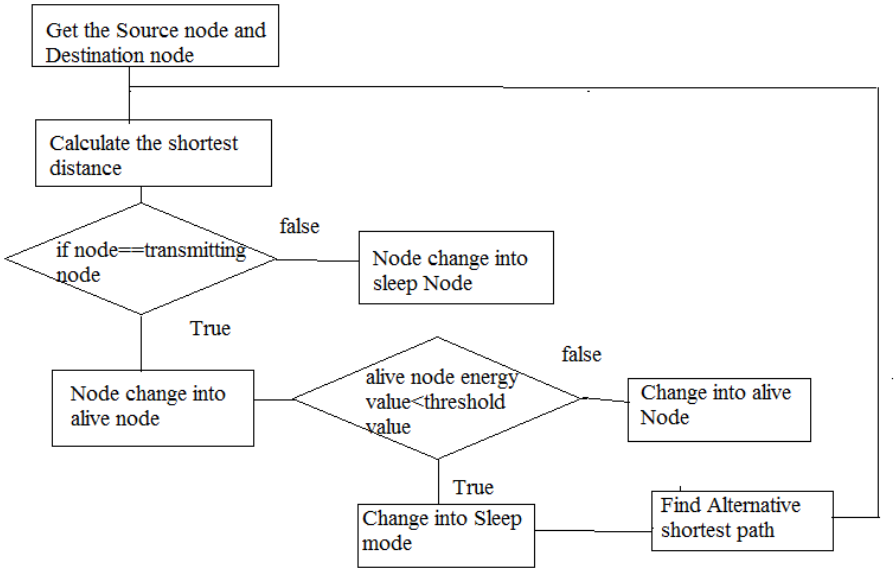

Fig 1. Workflow Diagram for Proposed Approach

IV. PROPOSED SYSTEM

The proposed method contains following methods.

- Clustering
- Energy model
- Neighbor identification
- Eliminate Redundant node
- Adhoc –on demand method

A. Clustering

Clustering divides large sets of data into smaller sets. The partial clustering method will directly decompose the data set using Euclidean method that is used to identify the clustering and neighbor information.An Euclidean distance formula which is used for calculating the distance between the two nodes. Using the distance value, decomposition of the cluster can be done. Based on the threshold value, nodes can be formed into clusters and the node with high number of neighbors act as a cluster head. After certain iterations, energy value of the cluster head is checked. If the energy value is less than the threshold value, then the node with high residual energy node will act as a cluster head.

In Euclidean plane if x(x1, x2) y(y1, y2) then distance between two point is

$$d(x,y) = \sqrt{(x1-y1)^2} - (x2-y2)^2$$

Clustering Algorithm

Step 1: Calculate the distance between each and every node.
Step 2: Identify the node which has high neighbor nodes.
Step 3: Determine as cluster head.
Step 4: Compare the cluster head residual value with the threshold value.
Step 5: If residual value is less than the threshold value, then
Step 6: Identify another node with high neighbor nodes.
Step 7: Determine the node act as a cluster head.

B. Energy Model

Every node will update its energy value, initially all nodes have same energy level. In energy updation method the energy value for transmitting, receiving, and sleep mode should be mentioned explicitly.

C. Neighbor Information

The neighbor information is essential for transmitting the data. During the transmission time, the transmitting node has to know about its neighbor nodes in order to avoid data loss and congestion control. The neighbor information is calculated by an association dominating set. The association domination set tells about the physical relationship between the two nodes. If the distance between two nodes is low then one node will be in active mode and another node in sleep mode. Both the nodes will be in active state if the distance between two nodes is high.

Update the Neighbor Information:

Step 1: Each and every node is update its energy value.
Step 2: For sending the data, the energy value is reduced to 0.678.
Step 3: For receiving data, the energy value is set to 0.548.
Step 4: Sleep node energy value is set to 0.0.
Step 5: Calculate the association domination set of nodes.
6: Each and every node updates its neighbor node information using association dominating method.
Step 7: if the association domination value is strong, that nodes are set at 1.
Step 8: if the association domination value is weak, that nodes are set at 0.

Identify the Neighbor

```
If (association value== strong)
{
Association dominating set=1
}
Else
{
Association dominating set=0
}
```

D.Eradicate Redundant Node

It is used for identifying and removing the redundant node in the network.It is the refinement process in the network. The number of active sensor node is very important in the wireless sensor network. The Minimum number of active nodes which is used for reducing the energy consumption.. Data association method is used to remove the redundant node in the network and also identify the active sensor node. Network traffic is avoided by eliminating the redundant nodes.

Refinement method:

Step 1: Cluster head should know about its member nodes.
Step 2: Both clusters compare their member nodes to eliminate the redundant nodes.
Step 3: If both clusters have same member nodes.
Step 4: Calculate the distance between the member nodes and cluster head.
Step 5: Identify the less distance.
Step 6: Cluster head control all its member nodes.

Table.1 Shows the Comparison of cluster head members to eliminate the redundant node by using distance method:

S.No	Cluster Head	Cluster head Member before iteration	Redundant node	Calculate the distance between C.H and Redundant node	Cluster head Member after iteration
1	C.H1	1,2,3,4,5,6,7,8,9,10,11,12,13,15,16,17, 18,19,20,21,22,23,24,25,26	23,25	C. H1-23=threshold value so 23 under C.H1. C.H1 -25 not equal to threshold value it eliminates	1,2,3,4,5,6,7,8,9,10,11,12,13,15, 16,17,18,19,20,21,22, 23,24,26
2	C.H2	23,25,27,28,29,30,31,32,34,35,36 37,38,40,41,42	23,25	C.H2-25 = threshold value so 25 under C.H2. C.H2-23 not equal to the threshold value so it eliminates	25,27,28,29,30,31,32,34 ,35,36,37 38,40,41,42

D. Adhoc-On Demand Routing Method

The AODV method provides the reliable transmission. The network remains laid off before establishing the connection. Whenever node needs the connection, it broadcasts the message to all nodes, the remaining nodes forward the message to all other nodes.Nodes creates the temporary route for needy node and backward message to the needy node.The needy node identifies the route with minimum number of hop count and transmits the data on that path.During the transmission time, if error occurs in any node then an acknowledgement is send to the transmitting node to avoid the data loss.In this method, temporary route nodes in the active state makes the other nodes in sleep state to the network lifetime.

The information transmitting route is set to be active for certain threshold value.Then the second shortest path has to be selected for transmitting the data. If the same path is used endlessly for transmitting data, the energy of the transmitting node is reduced.In some cases the transmitting nodes undergoes failure. So the alternative path is discovered for transmitting the data.For each and every eight hop, the data is transmitted to the alternative path.

In the existing methods, the minimum Steiner tree topology is used for transmitting the data. It finds the minimum cost for transmitting the data.To avoid the node failure caused by frequent usage of single path, Adhoc-on demand routing is used.

Adhoc-On Demand Routing Method

Step 1: Get the starting node and ending node.
Step 2: Find the shortest path using Euclidean method.
Step 3: Calculate the minimum values and store it in the temporary buffer k.
Step 4: Arrange the Energy values using quick sort.
Step 5: Pick the first path for transmitting the data.
Step 6: Compare the Residual value with the threshold value.
Step 7: If the node's Residual value is equal to the threshold value.
Step 8: Pick the second path for transmitting the data.

Table 2. Shows the energy value of the nodes before and after transmitting and its average energy value

S.no	Source Node	Destination Node	Path To Transmitting Data	Average Energy value before transmitting (ev)	Average Energy value After Transmitting (ev)	Difference Between before and after energy value	Avg Energy Value Of all node
1.	2	45	1st path 2-11-31-38-45 2nd path 2-12-32-34-45 3rd path 2-6-39-36-45	4.991 joules	4.784 joules	0.207	4.657
2	4	56	1st path 4-6-56 2nd path 4-11-40-56 3rd path 4-7-13-56	4.984 joules	4.766 joules	0.218	

Let us take the 60 sensor nodes for calculating energy. The initial energy of all nodes is 5.000 J. During the transmission, transmitting node in active state makes the other nodes in sleep mode. In above tabulation. 2 shows the energy value and its transmitting path.The table shows the two transmissions. It specifies, the source, destination and transmitting path. It calculates the energy value of the nodes and shows the difference between before transmission and after transmission.Then calculate the energy value of all other nodes for increasing the network life time

.

V. SIMULATION RESULT

A. Energy aware

The energy aware simulation graph shows the initial energy value of all nodes. During transmission the energy value is reduced, but at the end of the transmission all nodes have same average energy value with the help of the proposed method. It is used to avoid the node failure and data loss. Fig 5.1 The graph compares the energy value calculated by existing and proposed methods. From the comparison graph, it is proved that the proposed method is efficient

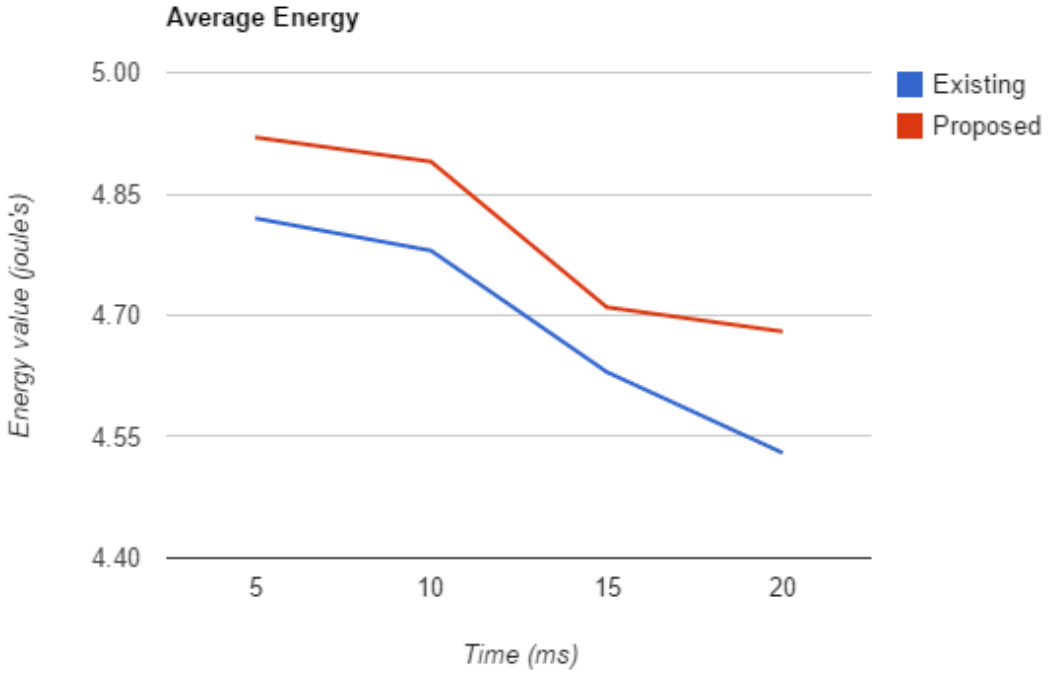

Fig.2 Average Energy

VI. CONCLUSION

In wireless sensor network applications, all the sensor nodes which are in active state gathers information from different area with the help of the association dominating set. The aim of increasing the network lifetime, performance, throughput, data loss avoidance during the transmission is achieved. The main problem of active node determination in the association dominating set is resolved.The Competitive heuristic method to identify the active node in the association environment is proposed. The initial solution to recognize the active sensor node in the associated data environment is achieved.

The Fast improvement heuristic method is used for improving the selection of active node and also swap its operation. The elimination redundant method is used for to identify the redundant node and remove it. The swap operation is also a refinement process, it swaps the selected and unselected node and find the best node from them.The ad-hoc on demand vector routing topology is used for transmitting the data

efficiently even in case of node failure. By using AODV method, unevitably surplus utilization in bandwidth occurs due to the episodic beaconing.This should be overcome in the future works.

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