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To Enhance the Network Lifetime Based On EDIT Algorithm in Wireless Sensor Networks

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ABSTRACT: The main objective of this project is to provide a technique for increasing the life time of the wireless sensor network. Increase the network lifetime and efficient data transmissions are one of the most important issues for WSNs (Wireless Sensor Networks). To keep the network alive as long as possible, communication between the WSN nodes must be done with cluster load balancing. There is a need to design a scheme which enhances the network lifetime and provides information to the sink. To propose a scheme for energy consumption and data collection in wireless sensor networks by sleep/awake method. This framework is fully based on clustering. The Energy Delay Index for Trade-off (EDIT) algorithm is used to build the energy efficient cluster. Clustering is used to decrease energy consumption and collision. A cluster head represents all sensor nodes within the region and collects data values from them and finally sent it to the base station.

KEYWORDS: Cluster, lifetime, Wireless Sensor Network, Sleep/awake scheduling, Energy consumption.

I. INTRODUCTION

A Wireless Sensor Network (WSN) is a network system comprised of spatially distributed devices using wireless sensor nodes to monitor physical or environmental conditions such as sound, temperature, and motion. The individual nodes are capable of sensing their environments, processing the information data locally, and sending data to one or more collection points in a WSN. Efficient data transmission is one of the important issues for WSNs. Meanwhile, many WSNs are deployed in harsh, neglected and often adversarial physical environments for certain applications, such as military domains and sensing tasks with trust less surroundings.

Wireless sensor networks play a key role in sensing, collecting and disseminating information about environmental phenomena. Sensing applications represent a new paradigm for network operation, one that has different goals from more traditional wireless networks [1]. In this paper, we have focused on cluster formation process by considering energy-delay trade-off. Cluster formation is a part of hierarchical routing protocols. This protocol are energy efficient and provides scalability [2].

A survey on various routing techniques and protocols can be found in [2]-[4]. Each cluster consists of member nodes and a cluster head (CH). CH is responsible for collecting and aggregating data from the member nodes and sending it to other CH or BS. A survey on different attributes clustering of WSN is given in [5]. As mentioned previously, energy is the most scare resource of WSN. Hence, the objective of the CH election is to provide energy efficiency so as to enhance the lifetime of the WSN. Data aggregation is one of the ways which can provide energy efficiency [1]. Routing between the clusters can be direct or multi-hop.

A cluster head represents all sensor nodes within the region and collects data values from them [16]. This framework is general enough to incorporate many advanced features and we show how sleep/awake scheduling can be applied, which takes our framework approach to designing a practical dynamic algorithm for data aggregation, it avoids the need for rampant node-to-node propagation of aggregates, but rather it uses faster and more efficient cluster-to-cluster propagation.

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To propose an Energy Delay Index for Trade-off (EDIT) and Sleep/Awake Scheduling Algorithm for increasing the network lifetime. This EDIT algorithm is used to build the energy efficient cluster and Sleep/Awake Scheduling Algorithm is used to list out the sleep/awake nodes for better data transmission.

The remainder of this paper is organized as follows. Section 2, discuss about the methodologies. Then, the performance analysis of the proposed algorithms is presented in Section 3. Finally, conclusions are given in the last section of the paper.

II. METHODOLOGIES

In WSN, The numbers of nodes is selected randomly and place the nodes in region vice like Region 1 cluster, Region 2 cluster, Region 3 cluster and Region 4 cluster. Each and every region have the more number of sensor nodes. This project has only one base station. The base station broadcast the message to all sensor nodes. After receiving the broadcasting message, each and every sensor node calculates the weight. Then the highest weight will become the cluster head. Then apply the Sleep/Awake scheduling algorithm. Based on this algorithm the data is sent to the cluster member to cluster head and finally sent it to base station.

A. *Network Region*

In this paper the number of nodes N=0,….36 are used. The maximum number of nodes used in this project is 37. Then the nodes are positioned in random manner. That means the X and Y positions of the nodes are selected randomly and place the nodes. Assign the Initial energy of each node is 1000. The network area is fixed at 250 x 250m.

B. *Splitting Network Region*

In this module the whole network is splitted into region vice like Region 1 Cluster, Region 2 Cluster, etc. Then the splitted network region is grouped. Among these groups contains the many number of sensor nodes. These sensor nodes are considered as the cluster member.

C. *Selection of Cluster Head*

Algorithm begins with neighbour discovery phase which is initiated by the sink by sending a hello packet. Hello packet consists of sender Id, Hop-count and distance to reach the sink and location of the sender. Hop-count and node distance both are used to measure distance from the sink. Then calculate the weight of the node,

$$W(u) = \left(\frac{\text{Total Neighbors}}{\text{Total Nodes}}\right)^{\alpha} + \left(\frac{1}{\text{Average distance fom sink}}\right)^{\beta} + \frac{Re(u)}{E(u)}$$

Re (u) =Remaining Energy
E (u) =Initial Energy

α and β is a parameters which is lie in the range of [0,1] and $\alpha+\beta = 0$

Then the highest weight will become the cluster head and other nodes are called as a sensor node or cluster member.

D. *Sleep/Awake Method*

The cluster member is awake means the confident level should be higher than threshold value. when the confident level is lower than threshold value means then the sensor node is in sleep condition

E. *Data Transmission*

The awake sensor node send the data to the cluster head and cluster head send the data to the base station.

III. PROPOSED ALGORITHM

A. *Energy Delay Index for Trade-off (EDIT) Algorithm:*

This method is to built an energy efficient cluster

Step 1: The numbers of nodes are arranged in random manner.

Step 2: Then the whole network is splitted into sub-network. This sub-network is considered as the region vice cluster.
Step 3: Algorithm begins with neighbor discovery phase which is initiated by the sink by sending a Hello packet. Hello packet consists of Sender Id, Hop-count and distance to reach the sink and location of the sender. Hop-count and node distance both are used to measure distance from the sink.

Step 4: Then calculate the weight of the node

$$W(u) = \left(\frac{\text{Total Neighbors}}{\text{Total Nodes}}\right)^{\alpha} + \left(\frac{1}{\text{Average distance fom sink}}\right)^{\beta} + \frac{Re(u)}{E(u)}$$

Re (u) =Remaining Energy
E (u) =Initial Energy
α and β is a parameters which is lie in the range of [0,1] and $\alpha+\beta = 0$

Then the highest weight will become the cluster head and other nodes are called as a sensor node or cluster member.

Step 5: The highest weight will become the cluster head

Step 6: Then the cluster members are send the data to cluster head.

Step 7: Finally cluster head send the information to the Sink.

B. *Sleep/Awake Scheduling Algorithm:*
Sleep/Awake scheduling for cluster member

Step 1: while member I is awake

Step 2: if the confidence level is higher than threshold value

Step 3: if condition (2) holds

Step 4: let member i power off for Δ seconds

Step 5: while member i is sleeping

Step 6: if timeout after Δ seconds

Step 7: awake member i

IV. EXPERIMENTAL RESULT

To analyze the performance of the proposed system, lots of simulation experiments are conducted. The proposed system is implemented in Network Simulator (NS2). Network Simulator (NS2) is a discrete event driven simulator developed at UC Berkeley. The goal of NS2 is to support networking research and education. It is suitable for designing new protocols, comparing different protocols and traffic evaluations. NS2 is developed as a collaborative environment. It is distributed freely and open source. NS is written in C++, with an OTcl interpreter as a command and configuration interface. The C++ part, which is fast to run but slower to change, is used for detailed protocol implementation. The OTcl part, on the other hand, which runs much slower but can be changed very fast quickly, is used for simulation configuration. One of the advantages of this split-language program approach is that it allows for fast generation of large scenarios. To simply use the simulator, it is sufficient to know OTcl. In the simulation experiments, WSNs nodes are

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randomly distributed in the 250 m × 250 m area. The target area is set as [0, 250] × [0, 250], and the base station is in the interval [250, 1000]. This is shown in the below table.

TABLE I. SIMULATION SETUP

Number of Nodes	***37***
Target Area	***250 x 250m***
Initial Energy	***1000 joules***
Simulation Second	***1500 sec***

To analysis the performance of the proposed method, several performance metrics are used. These are Average Delay and Network Lifetime

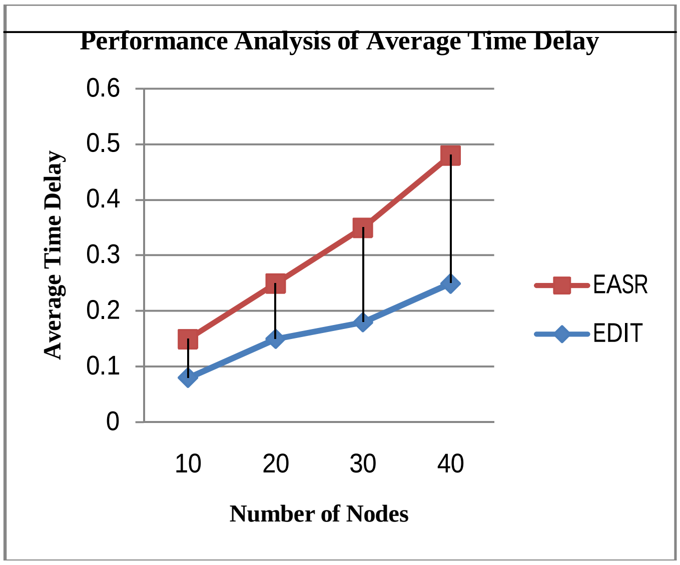
A. *Average Delay*

Average delay is calculated taking average time each packet spends in the buffer.

TABLE II. AVERAGE TIME DELAY

Number of Nodes	**EASR**	**EDIT**
10	0.08	0.07
20	0.15	0.1
30	0.18	0.17
40	0.25	0.23

FIG.2. PERFORMANCE ANALYSIS OF AVERAGE DELAY



This project needs a trade-off between the delay and the energy keeping the track of packet loss. From the above table and graph it is shown that the proposed method Energy Delay Index for Trade-off (EDIT) works better than the existing method.

B. *Network Lifetime*

Network Lifetime is represented by the number of rounds where each round begins with a set up phase when the clusters are organized, followed by a steady state phase when the data transfers to the base station. When contrasting algorithms in the same round, the algorithm with lower ratio of dead nodes is deemed better. In this project, the life cycle ends when 80% nodes are dead in our experiments. The performance of the proposed system in network lifetime is compared with the existing system. This is shown in below table.

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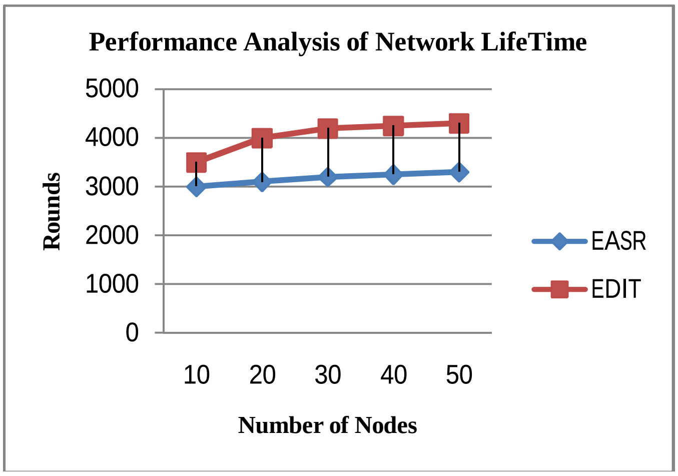
TABLE III. network lifetime

Number Of Nodes	EASR	EDIT
10	3000	3500
20	3100	4000
30	3200	4200
40	3250	4250
50	3300	4300

Fig.3. Performance Analysis of Network Lifetime



From the above table and graph it is shown that the proposed method Energy Delay Index for Trade-off (EDIT) works better than the existing method. Because in the proposed system the dead node arrives in more than 3500 rounds. It is higher than the other existing system.

V. Conclusion and Future Work

Thus the proposed Energy Delay Index for Trade-off Algorithm and Sleep/Awake scheduling Algorithm in WSNs are used to enhance the network lifetime. We have proposed, examined and derived *EDIT* protocol to analyse energy-delay trade-off by doing extensive simulation. Compared with traditional clustering algorithms, the proposed algorithm can form more stable and reasonable cluster structure, and also improve the network life cycle significantly. The simulation result shows that the algorithm is feasible and has superior performance. In addition, the scenario should be a scalable and works for different network sizes. In future, the cluster head will be reelected for creating the energy efficient cluster based wireless sensor networks.

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