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Research Paper

An efficient energy lifetime enhancement using node balancing approach

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Abstract

Wireless sensor network (WSN) is the cutting edge communication entity, which is adopted by various platform such as IoT and other secure wireless area. There are many advantages while dealing with such system which can provide an efficient communication over remove area. Involvement of multiple node in the communication occurred while sending a packet to destination. An efficiency in packet transfer is required which is in terms of shortest path, managing load on each node and finally finding efficiency in data transfer. Balancing the node and its energy is important aspect which help in preventing complete network and make it energy efficient. Previously given solution find its ability in proper communication but lacking in enhancing overall network lifetime. In this paper a mobile threshold energy route optimization using Matrix formulation approach is presented. The Given proposed solution is implemented on Ubuntu Platform using NS2 Simulator. Observed result find enhancement in PDR, Throughput and Less Overhead.

Keywords: *WSN; Network Analysis; Threshold Energy; Matrix Formulation; Energy Lifetime.*

1. Introduction

WSN (wireless sensor network) is the area of research where a secure data transmission over the network component is needed to transmit [1]. Generally two type of routing techniques called Proactive routing and Reactive routing are used to route packets. Recently used technique is a proactive routing technique which used to deliver packet from source to destination, in that technique a table of the links at each nod in present which contains the information about the other links to the other nodes [2]. But in that technique there are multiple links are provided to connect to the next node, that requires a selection mechanism to select optimized node to deliver message from source to the destination that consumes to select optimized path, that introduce delay in the process. Because of the delay performance of the whole technique is degrades.

The technique which involved in previously used solution is tree based, self-load balancing node using AVL tree and selfish node participating is network related algorithm is performed. A Query based technique which met in finding low usage node is also given in previous background approach [3].

A new technique called MCTE-RMF (Modified cost threshold energy- route matrix formulation) is proposed in this paper, this help in working with the proposed architecture which deals in trust computation, energy consumption factor, cost estimation and shortest path analysis paradigm. A threshold setup help in computing the data analysis using the proposed given solution. The algorithm help in providing the optimal energy efficient path. It help in building and maintaining the balance threshold for all the network which increase the overall network lifetime [7].

2. Related work

In our recent paper the technique ETC algorithm for the initial tree generation is used. Also in order to have tree generation a module of ETC which is FHF is used by them. A tree based approach which is maintaining child node list (CNL) and Alternate parent list (APL) is outperformed along with ETC. A self-balancing node architecture is given to find work efficiency. They have utilized three phases mechanism approach namely 1. ETC Approach 2. AWL Node balancing approach finding average workload on each node, 3. Node degree which help in understanding the number of available data load and connected node with this. The methodology followed by them is on processing with node balancing technique. Sharing and data transmission occurred based on the last usage node activity. The given technique solution is provided a proper usage of estimation approach but it is also limited to the node count, not with the actual scenario over the time.

The approach previously defined is also worked on the first come first serve basis based on the nearest node visibility. The data transmission get performed using the possible given nearest node. Thus the working methodology is not correct when it comes to the random inputs. The dynamic functionality of understanding the input priority and currently handling functionality is not provided by the system [8].

In previous given solution there are some technique such as Thomas Kunz [6] present energy- efficient variations in OLSR. Mobile Ad-Hoc network has commonly battery-powered nodes. So that energy consumption must be a crucial metric to consider in designing routing protocols for such networks. It examines the impact of various protocols. So that it can change the purpose of increasing node lifetime and network performance, and examine them below a variety of various scenarios.

In this paper [9] proposed an energy efficient technique and gives optimal randomized clustering protocol for self-organizing WSNs. This technique determines optimal number of clusters by giving a new approach for setting threshold value, comprising the probability of optimum number of cluster-heads and energy of the nodes.

A new tree based structure help in separating the different usage based node. Working with a tree model and generating usage of node is computed by the provided system.

The LB algorithm depends on the information which is used to balance the load in the WMN. The taxonomy involves three types of algorithms, which can be local information, link aware and routing aware algorithms. Similarly routing metrics are classified depending on the components like link quality, link capacity and channel diversity.

3. Existing algorithm

The existing solution based on the tree construction methodology which keeps the workload associated with each node [5].

Step 1: The node network creation, setup of tree structure. Updating the simulation based on the tree construction algorithm.

Step 2: Node direction, node statistics configuration, simulation time and bit rate. Configuring the level of tree follow.

Step 3: configuring the sending packet size range between 256 KB to 1 MB and setting up the data transmission rate in the simulation.

Step 4: Drafting an initial level of tree using FHF and ETC technique.

Step 5: Finding an average work load on each node connected in a self-balancing manner. Based on the current node load.

Step 6: Finding a parental node till the threshold is observed and finally performing the communication occurred between the nodes.

Step 7: Observing the simulation parameter. Finding the PDR and overall efficiency.

Thus the related work finding its efficiency while maintaining the work towards the efficient node balancing tree model. Working with uniform workload up to the different possible level is performed [10-11].

4. Problem definition

In the base paper and previously done scenario approaches. The limitation are observed because there are different approach level such as finding an optimal load balancing approach for node data transmission. Finding the energy balance structure is being performed but the following limitations were observed.

1) The different level of finding and length of communication information gathering is required with this tree based approach [12].
2) The applicability of tree construction and complex structure need to enhance so that a quick solution and delivery can get performed.
3) A central base station base structure is followed which may create a generic issue in case of central node failure. Thus a secondary node setup and data migration strategy can be adopted [13].

5. Proposed work

To avoid such issues while dealing with the energy efficient routing over the multiple nodes. The following approach based on the matrix, energy efficiency monitoring, secondary node concept based on the backup and information exchange is proposed. The algorithm A new technique called MCTE-RMF (Modified cost threshold energy- route matrix formulation) is proposed in the given solution.

An evaluation of each node after every hope transaction cycle is presented and made available for next communication node transfer. The data analysis between the communications is being analyzed and suitable node which can participate is being analyzed by the simulation matrix data. The proposed algorithm gives an optimal solution of best fit node path finding. The usage of statistics, tree stats and available routing node position finding is detected from the given scenario.

The proposed algorithm depict a enhance feature which includes tree balancing along side providing the best occurrence of highly efficient node while deciding the routing path. In which occur in network layer the depicted more free route engagement. There are different type of overhead, energy depletion and trust factor which help in decision making for data transfer.

A node capacity monitor, node engagement for the data packet transmission. The proposed algorithm steps MTE-RMF (Modified threshold energy- route matrix formulation).

Proposed Methodology

The proposed methodology for the energy based routing is proposed here which can further be used in networking data transmission. The proposed algorithm pseudo code is given below:

Input: Nodes N, Trust Values T 1-n, Matrix values initialization, Node position

Output: Efficient energy saving route, Updated matrix values, a shortest optimized path

```
Start:
Begin [
Initialize Configuration()
{
forEachNode(1-n)
{
setX();
setY();
setTrust();
setMatrixInitialization();
}
matrixInitialization()
{
Node Position ();
Node Initial energy ();
}
Int FindingOptimalPath()
{
computeVertexDistance();
computeMinimumCostOverDistance();
findingPeakEnergy();
findingPeakTrust();
return optimalconditionalfactor();
}
dataTransmission()
{
If(OC>Op threshold)
{
Transmit the data();
matrixUpdate();
returnReroute();
}
}
}
] End;
```

6. Experiment setup and result analysis

An experiment using the NS 2.35 is setup for the simulation. Setting up of 30 number of node with initial trust and energy values along with the node data backup information configuration is performed. The Ubuntu platform with 4 GB of RAM and i5 processor is executed. The parameter such as PDR packet delivery ration and other processing computation is performed. The below table shows the configuration setup.

Table 1: Configuration Simulation Setup

The parameter setup	Value
Dimension	1250 * 1250
Number of Nodes	30
Traffic type	CBR/UDP
Initial node energy	90-105
Size for packet	256 KB-1 MB
Traffic Sources	2

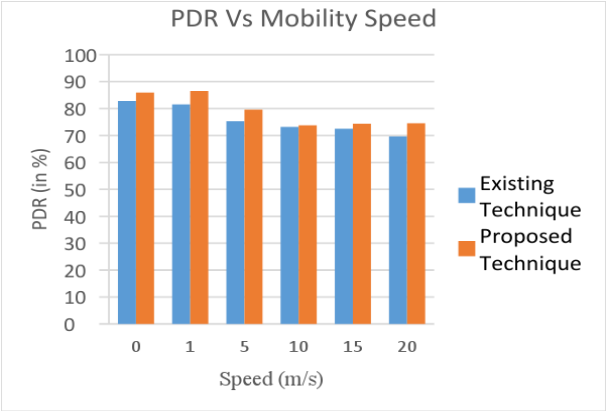
The Observed simulation parameters are Packet delivery ration, normalized route load and the overall packet delay versus the mobility speed is computed. The observed results are observed with the provided simulation setup.

7. Result analysis

As per the discussion and experiment performed on the algorithm. A comparison analysis with previously given approach for energy lifetime over the wireless sensor network is discussed. A comparison analysis is performed in this section to understand the efficiency of our proposed algorithm.
A Packet delivery ration comparison is shown which shows the efficiency of packet delivery.

Table 5.1: Comparison of the Statistics Observed from PDR

Mobility Speed	Tree construction approach	Proposed technique
0	79.10	81.98
1	80.18	82.11
5	84.11	86
10	79.78	81.21
15	83.56	89.20
20	75	79.13

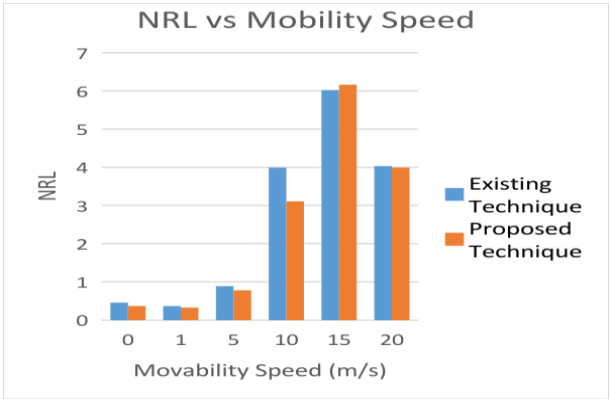


Graph 5.1: Comparison of the PDR over Mobility Speed.

NRL Computation: A comparison analysis of the proposed approach and existing tree construction based scheme is shown with the NRL parameter computation.

Table 5.2: A Comparison Analysis Data Statistics

Speed	NRL (Normalization Route Load)	NRL Proposed approach in %
0	39	36
1	43	39
5	69	67
10	81	77
15	69	62
20	83	81



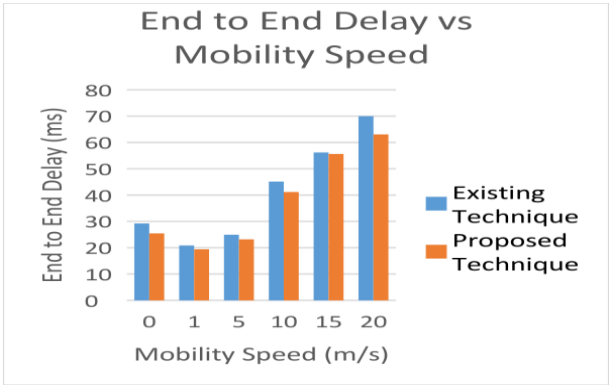
Graph 5.2: Comparison of the Normalization Load vs. Movability Speed.

The graph above shows the graphical analysis of NRL values obtained. Further the table 5.3 below shows the delay versus mobility speed statistics.

Table 5.3: End to End Delay Comparison

Speed	Existing technique	Proposed technique
0	89.11	78.5
1	78.90	67
5	83.8	81.56
10	76.90	69.1
15	75.4	71.88
20	68.90	63

A delay based comparison is being executed versus mobility speed in the figure 5.3. The result obtained are efficient while comparing with traditional approach.

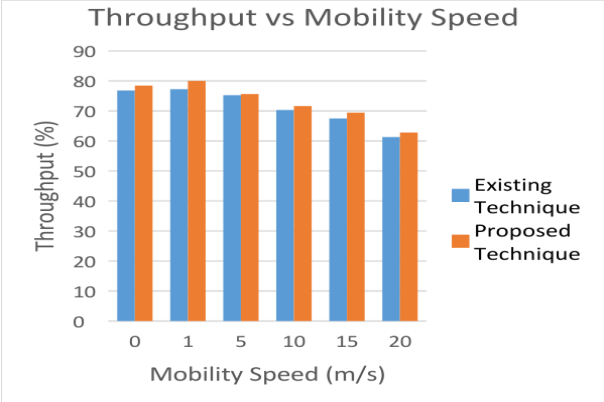


Graph 5.3: Comparison of End-to-End Delay Vs Ni\ Obility Speed.

Throughput Comparison analysis results:
A comparison analysis between the techniques compared in terms of throughput which shows the efficiency of given solution.

Table 5.4: Throughput Data Comparison between the Techniques

Speed	Existing Technique	Proposed Technique
0	86.10	89
1	83	84.2
5	91	89.34
10	92.12	90.32
15	87.56	79
20	79.80	76.43



Graph 5.4: Comparison of Throughput vs. Mobility Speed.

A graphical comparison of the throughput for existing and proposed technique is presented in Graph 5.4. That shows proposed technique generate high throughput as compare to the existing technique.

8. Conclusion

WSN is the recent trending area of research which is capable of transmission for packet in various application area. The requirement of suitable algorithm with shortest path usage and energy efficiency is the important aspect while dealing with it. WSN help in secure communication packet transmission as well as involvement of multiple entity route to make energy balancing is required. There are approaches were proposed for the energy efficient balancing in this field. A proposed technique which make use the concept of dynamic matrix with level info and tree balancing approach is presented. This paper gives an analysis of algorithm and implemented using NS2 simulation platform. The proposed algorithm compared existing tree balancing approach. The proposed implemented approach find its suitability over the existing energy life time node balancing approach. A further work be done working toward short path using some other parameter and an efficiency can be derived over the network.

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