International Journal of Scientific Research & Engineering Trends
Volume 2, Issue 6, Nov.-2016, ISSN (Online): 2395-566X

Linear-Regression Based Node Relocation Scheme for Energy Efficient Wireless Sensor Network

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***Abstract* – Transferring data from source node to destination is the most important as well as tuff task in the wireless sensor network. The Major drawback for the any wireless sensor networks is the availability of the energy in nodes because of the small size of the batteries they use as source of power. Balancing the route of the data transfer is one of the techniques that can be used to minimized sensor nodes energy consumption during operation. In this Dissertation gives a bird eye over routing protocol of sensor network that concentrate over energy efficient routing in other to longer survival of sensor network.**

***Keywords* – Sensor Network, Protocols.**

I. INTRODUCTION

In recent years development in communication technology has allowed to the development of lightweight, intelligent, low cost sensor nodes that efficiently transfer data from one place to another place [1]. The sensor nodes of communication network have the ability to transfer data between other nodes and responsible to establish contact with the base station. A sensor node consists of sensing, processing, communication, transceiver and power units [2]. These sensors are used to collect messaging data, process, and communicate to other sensors in the wireless networks mainly, through radio frequency channel [3]. In many different applications wireless sensors networks (Wireless network) have been used such as monitoring movement of wild animals in the forest, battlefield surveillance, home security, earth movement detection, and healthcare applications [4]. Mobile sensor nodes can also be used in sensing ambient conditions such as light, sound, and temperature. Depending on the area of applications, sensor networks can be randomly distributed, for instance in military applications, sensor nodes can be randomly dropped from war-plane into the battlefield to monitor enemies' movement or manually placed.

A wireless infrastructure less network having static or dynamic topology is called the sensor network. The basic entity used here is called the sensor. This type of network meets Combine different types of nodes and gateways. Due to the mobility of the nodes in the network supports the dynamic feature. The sensor network can temporal establish instantly. The figure shown below is an example of the sensor network. In this scenario there is a source and destination node is available for communication

II. PROBLEM STATEMENT

It is seen that most of the previous approaches for chose alternate path directly when any node shout down that dropped performance and have relative higher complexity. As the mobile nodes operate on the limited power of battery therefore it becomes very necessary to develop techniques which can successfully maintaining lesser complexity. The objective of this dissertation is to develop a new approach which can successfully maintain the rout with lesser battery power in order to long survival of Sensor network.

A large number of business must find another way when it is exempt from a node in the network. Because of this attack on the overall performance of the network will also reduce in relation to the complexity of the routing protocol. The purpose of this letter is to develop a methodology to improve the network to survive for as long as possible.

III. PROPOSED ROUTING PROCEDURE

The proposed solution is going to provide supplement support the high junction lower energy node with lower junction high energy node. Proposed method used liner regression for deciding which high energy node provides supplement support to high junction node without break its own connectivity. In proposed methodology as show in figure 1 uses to select node from low traffic area having middle resident energy limit to provide supplement support low energy node at high traffic zone.

The proposed solution will work for all the nodes exist in the network. Here traffic of network will check at the time duration. For the M sensor node algorithm has been trying to find the lower energy node. Here we get the high energy node. Now the linear regression approach has been apply in order to swap the nodes. The swapping has been take place between lower energy node and higher energy node.

The proposed algorithm initially assumes power limit knot low-energy environment and a resident residing knot. If a node in the network degrades the minimum energy for low power node, and residents knot broadcast replace its own package. If a node neighbors have more energy than the average resident and reduce reside in low traffic area traffic select to provide additional support.

International Journal of Scientific Research & Engineering Trends
Volume 2, Issue 6, Nov.-2016, ISSN (Online): 2395-566X

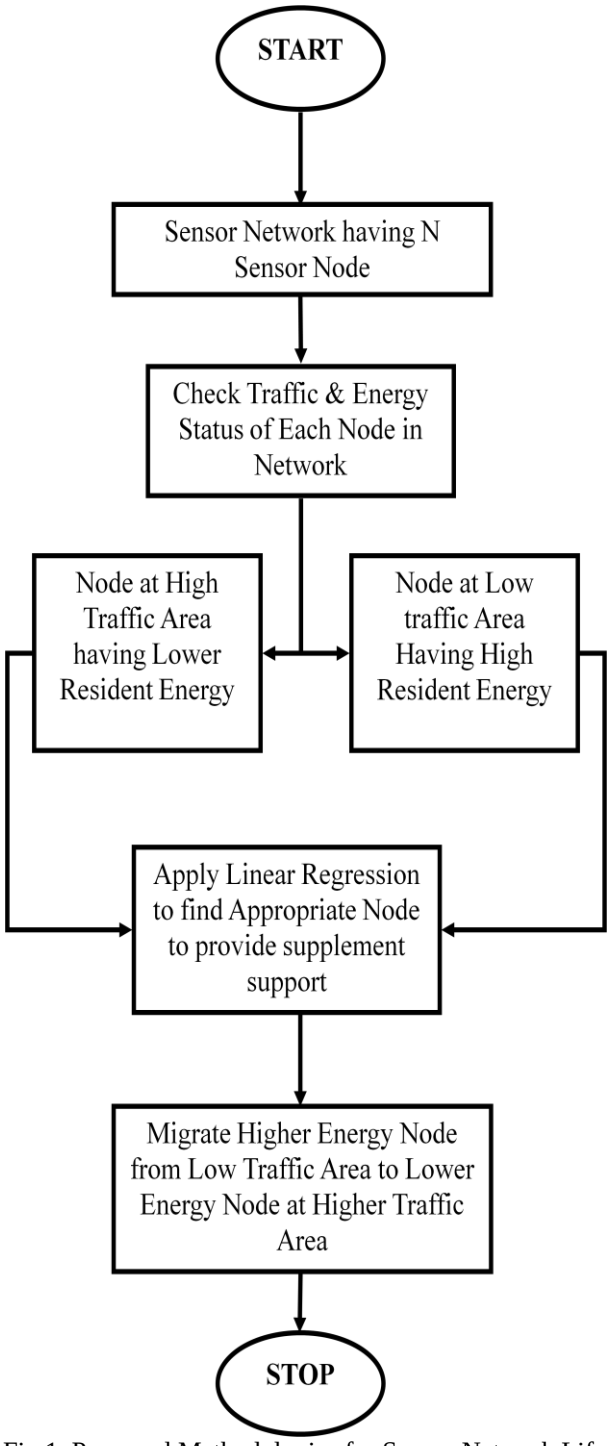

Fig.1. Proposed Methodologies for Sensor Network Life Saving Routing Protocol

IV. Proposed Algorithm for Routing Protocol

The proposed solution is going to provide supplement support the high junction lower energy node with lower junction high energy node. Proposed method used the method of bi-partite graph & swam intelligence for deciding which high energy node provide supplement support to high junction node without break its own connectivity. In proposed methodology as show in figure 5.1 uses to select node from low traffic area having middle resident energy limit to provide supplement support low energy node at high traffic zone.

Assumption

N^i_{MANIT}
$= Mobile\ adhoc\ network\ having\ i\ \ mobile\ node$
List[node, id] = list contain node and their id maintain by each node of network
M
$= \{X_i | X_i \text{ is } i^{th} \text{ mobile node } \epsilon\ N^i_{MANIT}\}, Set\ of\ Mobile\ node$
$NN^{Xi} =$
$\{Y_i |\ Y_i \text{ is } i^{th} \text{ neighbour node of } X_{ith} \text{ mobile node } \epsilon\ N^i_{MANIT}\ \}$

Algorithms

{

Step 1:- Source node ($\mathbf{X_S}$) call AODV and broadcast RRP to all there $\mathbf{NN^{Xs}}$ path towards their desired destination ($\mathbf{X_D}$)

Step 2:- Every $\mathbf{NN^{Xs}}$ uni-cast Route reply packet (RRP) to X_S with their energy level. Where each node attached their node ID

"$Ri^{Xd}_{Xs} = X_s, Y_1^{id}, Y^{id}_{1+1}, Y^{id}_{1+1+1}, , , , X_d$"

Step 3:- for every route Ri^{Xd}_{Xs}

$Ri^{Xd}_{Xs} = X_s, Y_1^{id}, Y^{id}_{1+1}, Y^{id}_{1+1+1}, , , , X_d$

Step 4:- Xs verify each node id and drop the route having lower resident energy node by using List [Node, id]

Step 4:- Lower resident energy node (N^{LE})search their neighbor node having energy above middle resident energy node as N^{ME} by using List [Node, id]

Step 5:- Lower resident energy node (N^{LE}) use N^{ME} as supplement support by coordinating their coordinating their GPS position to neighbor.

Step 5:- Xs select route and send data packet.

Initially proposed algorithm assume limit of low resident energy node and middle resident energy node. If any node in network degrades their energy limit below low resident energy node then its broadcast node replacement packet. If any neighbors node having energy above middle resident limit and reside in lower traffic region select for providing supplement support.

V. Simulation Environment

Simulation is the running of a model of system according to time that provides info a couple of system being investigated. Events occur at distinct points of your time. Once the quantity of such events is finite, we have a tendency to decision it distinct event. A distinct event machine consists of a bunch of events & a central machine object that executes these events so as.

The following items square measure most useful and/or necessary to related simulation:

- An abstract events framework
- A arrangement to manage events
- Functions to get random variables
- Facilities to permit objects to move

International Journal of Scientific Research & Engineering Trends
Volume 2, Issue 6, Nov.-2016, ISSN (Online): 2395-566X

In this section, we have a tendency to gift the simulation studies for the projected formula and therefore the IEEE 802.11e Mac protocol. Simulation is performed exploitation Network machine (NS) version two.32.

In different words, to use NS, programming in OTcl script language is needed. For setting up and execute a network of simulation, a user ought to write associate degree OTcl script that initiates a happening hardware, sets up the configuration exploitation the network objects and therefore the plumbing functions within the library, and tells traffic sources once to start out and stop sending packets through the event hardware. The term "plumbing" is employed for a network setup; as a result of fixing a network is plumbing attainable information ways in objects of network by adding the "neighbor" locator of associate degree object to the address of associate degree applicable object. Once a user desires to create a brand new network object, he or she will simply build associate degree object either by writing a brand new object or by creating a compound object from the article library, and plumb the information path through the article. This could sound like difficult job, however the plumbing OTcl modules truly build the duty terribly straightforward. the facility of NS comes from this plumbing [10].

VI. Simulation Model

In heterogeneous ad hoc networks, each node normally has different capabilities since some nodes are portable devices with limited capacity and battery life, while the others may be stationary or equipped with vehicle. These nodes are not power-constrained and usually have higher capacity than the former one. In this research work, there are two types of nodes which are High-capacity nodes (H-nodes) and General capacity nodes (G-nodes). These two types of nodes have different capacity which are bandwidth and transmission range.

Simulation scenarios are constructed by varying number of nodes. In each scenario, a few nodes approximately 5-20% are included as malicious nodes. For example, if there are totally 50 nodes in the heterogeneous networks, 5 nodes of them are the malicious nodes while other nodes are correct nodes performing good communication practices.

Table 1: Simulation Parameters

Parameters	**Values**	
Number of Nodes	Vary from 50 to 250	
Area	50	600*300
	100	600*300
	150-250	1000*800
Traffic	CBR	
Simulation Duration	100 Mili Seconds	
Packet Transmission Rate	1024 kbps	
Carrier sense threshold Used In Normal Nodes	200 ter	

VII. Performance Evaluation Metrics

The performance metrics which are used to analyze the performances of routing protocols in heterogeneous ad hoc networks are discussed in the following:

Performance Parameter

Packet Delivery Ratio: Packet delivery ratio of total number of packets successfully delivered during data transmission to total number of packet send. For any ideal routing protocol it is required that it has higher Packet delivery ratio, whereas existing approach by using PF-MHR(Potential Field based mini-mum hops routing) Based On Potential Field have lower packet delivery ratio as compare to proposed methodology by using LR(Linear regression)- Based On Potential Field.

$$\textbf{Packet delivery ratio} = \frac{\textbf{No of data packet delivered to distination}}{\textbf{number of packet generated}}$$

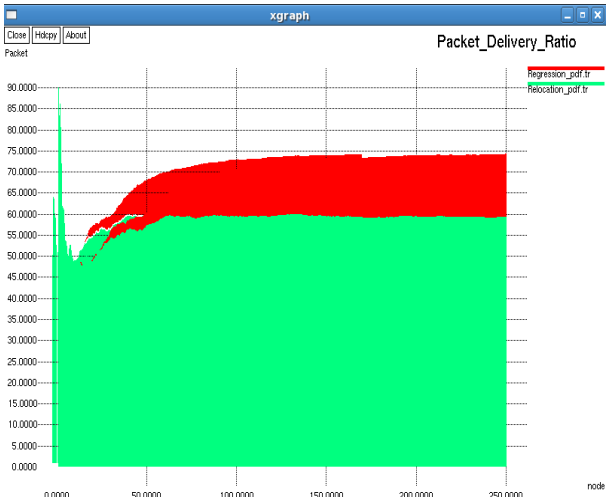

Fig.2. Comparative Analyses of packet delivery ratio

Routing Load: - Routing load is the overhead required to search route from source to destination and establish an end to end connection from source to destination. For any ideal routing protocol it is required that it has lower routing load, whereas existing approach by using PF-MHR Based On Potential Field have required higher control packet as compare to proposed methodology by using LR-Based On Potential Field.

$$\textbf{Routing Load} = \frac{\textbf{No. of Control Packet Send during Comm.}}{\textbf{number of packet generated}}$$

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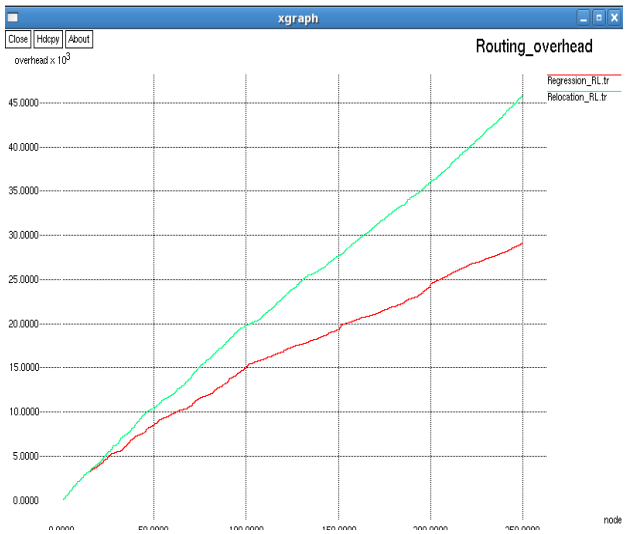

Fig.3. Comparative Analysis of Routing Load

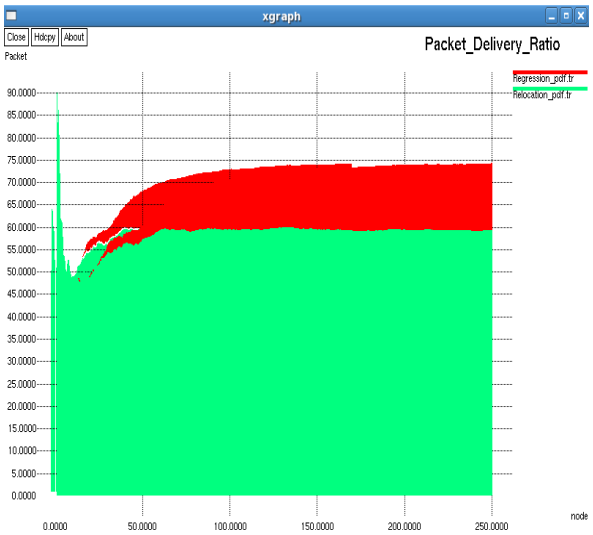

Fig.5. Comparative Analysis of throughput

Energy Consumption by Node: Energy consumption means battery power used by any node for successful transmission. Higher energy consumption degrades the survival of network. And lower energy consumption maintains longer survival of network. For any ideal conduction network need longer survival. Using this protocol the retransmission will be reduced where existing methods are only able to minimized redundant path. Existing approach by using PF-MHR Based On Potential Field have required higher battery power consumption as compare to proposed methodology by using LR- Based On Potential Field .

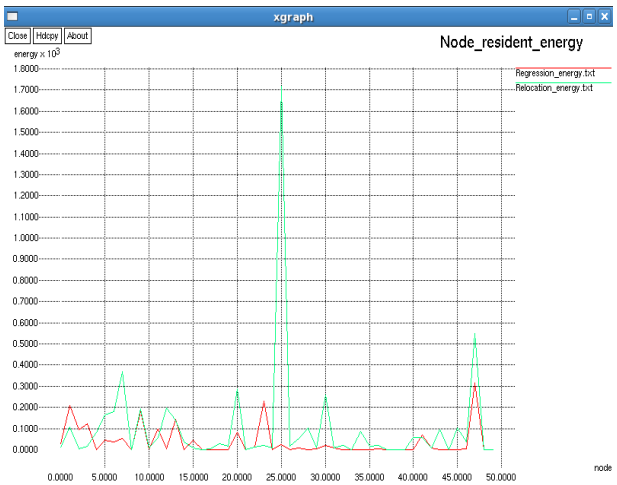

Fig.4. Comparative Analysis of Node Energy Consumption

Throughput: -The fraction of the channel capacity for effective transmission (packets successfully delivered to the destination data) is given and is defined as the total number of packets received by the destination. It is in effect a measure of the efficiency of a routing protocol. In any sensor network it is required to have higher throughput ie need to increase rate of successful packet transmission.

VIII. CONCLUSION

In the previous study, multiple disjoint paths are discovered among source and destination. Among the discovered routes, the optimal paths are selected based on bandwidth constraints, delay constraints and path stability. When any flow request is received, it is initially categorized as real time and non-real time flows where real time flows are given higher priority.

This paper a novel secure location added data transfer protocol for multipath energy efficient routing over sensor network is presented. This method encapsulate advantage of two different predefine method in order to overcome their limitation. First swam intelligence and second one is bi partite graph. Proposed protocol tries to provide supplement support to lower energy node at heavy traffic by higher energy node from lower traffic of network.

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