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Empirical Model for Improving the Capacity of Wireless Adhoc Network

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Abstract

In Mobile Adhoc network, mobile devices are connected to the network through wireless medium. In such networks, devices have specific IP address which helps in identifying the nodes for routing. However, when the node location changes, routing with the same IP address will be a challenging issue. In such scenarios, the IP address of each node must be updated, and complex protocols are required to handle these changes. Also host specific routing must be propagated through the network which requires significant changes in the routing table but does not scale well. In multipath communication systems, packets may need to traverse through multiple links to reach destination where mobility causes change in route. This require intelligent model to optimize energy consumption and enhance the lifetime of a node. Therefore, in our work, we built a wireless adhoc network where packets have been distributed using different probabilistic approaches.

The performance of the proposed network is tested in terms of packet delivery, residual energy, throughput and delay. It is observed that the proposed model using Pareto distribution exhibits superior performance over some of the existing models. Furthermore, these models are also tested using advance neural network.

Keywords: Routing Protocol,Adhoc Network, ANN,Pareto, Residual Energy

I INTRODUCTION

The Wireless sensor networks or Ad-hoc networks are structural deployment of several devices equipped with sensors that perform a collaborative measurement process. Sensors are in the form of nodes which are sprayed over the globe in random fashion. Every wireless sensor network has some different characteristics as compared to the wired ones. They mainly consist of Sensor devices(usually hardware)**,** Wireless communication modules and Open Source (API).In addition to the wireless communication modules different protocols are followed in different systems depending on the behavior of the clustering nodes and processing base station.

A node structure consist three main sections of microcontrollers for data processing, battery for power requirements and storage for containing information in regards to future processing. Different communication modules can be used according to the requirements like IEEE 802.15.4, Zigbee, DigiMesh, Bluetooth, GPRS, 3G support, Wifi etc. For storing all sort of processing information and calculative measurements EEPROM's (Electronically erased program read only memory) are widely used. Nowadays SD cards are available to store upto 2 Giga Bytes of data.

RELATED WORK

Energy Efficiency of Clustering Algorithms:-

Energy efficiency depends on the number of factors and parameters governing the actions performed in or by the WSN architecture.

Paradigm of wireless senor networks:-

(1) Energy efficient- It means the consumption power of the nodes are reduced by removing the waste residual energy demands.

(2) Scalability- The requirement of nodes as per the performance based on large scale implementation, medium scale implementation and small scale implementation can be categorized according to the needs. Because all three implementations requires nodes ranging from tens to hundreds of thousands.

(3) Self-arranging capabilities- The nodes are deployed in random fashion which does not have systematic architecture and does not follow uniformity. They can adopt any protocols according to their convenience temporarily.

(4) Reliability- Every cluster consisting of nodes needs to be in operational condition throughout the process. The special attention is to be given to the dead nodes which are not functioning generally because of lack of energy. If the cluster head is itself dead than the whole network gets effected causing the whole system to be collapsed and special monitoring should be provided to it.

(5) Adaptability- The nodes should move or leave any cluster in which it is currently operating and capable enough to adapt the environment of any new clusters formed with its new

topology and routing algorithms. And system should automatically update its routing table and new topologies followed by that particular node.

(6) Self-care- The nodes have the tendency to recover themselves from the faults occurred during the harsh environmental conditions and operating climate location. The nodes must have self-testing, self-collaborating, self-repairing and self-recovering abilities.

(7) QOS- Quality of service of every cluster represents the way the work and how quick they are from sensing data, routing it though algorithms, mathematical and calculative processing of data and storing as well as providing and monitoring information in the output form [1].

EXISTING ROUTING PROTOCOL

HEED- In this, the clustering algorithm uses hybrid method to define the probabilistic value for distribution of the CH(Cluster Head) evenly in the network. It takes care of all the networks by providing each network with only one cluster head.

It consist of three different phases mainly are [a] Initialization phase (a value is provided by the initiator for defining the node to be the cluster head) [b] Repetition phase (the process is repeated to find the cluster head until the probability becomes 1) [c] Finalization phase (final decision is taken to whether the node will become cluster head or join another cluster low cost node).

(2) LEACH-This clustering algorithm uses cluster head to be rotated in the entire network so as to distribute the load and make the nodes free of access data inflow and causes nodes to consume less energy.[2]

It consists of two phase mainly are [a] Setup Phase (initially every node is provided with probability value ranging from 0 to 1 and nodes is declared as cluster head if its value is smaller than the threshold value and remaining nodes fails to have their value less than the threshold value) [b] In Steady State Phase, finally the cluster head is decided and remains in steady state for some period of time.

(3) PEGASIS - It is the chain-based cluster algorithm which is an advanced form of LEACH. It creates chain on active notes from the farthest node to the nearest node and to base station. Nodes will transmits data to its neighboring node till it reaches the base station and thus cluster head are not required to perform function which indirectly saves the energy of the network. The major drawback of the network is that if a node dies in between the whole network gets affected.

(4) TEEN – It is a time-concerned clustering algorithm which is efficient when a data has some importance regarding its timely delivery. It occurs usually when an event is defined.

It is based on two types mainly [a] Soft Threshold (In this it switches to the transmitter without informing the cluster head) [b] Hard Threshold (In this it switches to the transmitter and forwarding its copy of information to the cluster head).[3]

1. ANT COLONY OPTIMIZATION

ACO has swarm intelligence which deals with the artificial and natural systems composed of individuals and controlled by the coordination and self-governing ability. SI systems like popular colony of ants and termites pounds full of fish and insects. Like ACO there are many methods which exists today are Particle Swam Optimization (PSW), Swam-based network management and cooperative behavior in swarm of robots. Ants follows shortest path from source to destination in search of foods and guides other ants to follow the same path using a chemical excretion known as pheromones.

The main reason behind applying ACO is that like ants all the nodes operate on their own without consulting its supervisor. In ant colony all ants does not perform whole task instead different ants are provided with different tasks in which they conduct work in specialized manner. This saves energy, time and the task can be completed in the quickly. The agents are proactive and reactive entities and are capable enough to adapt, cooperate and move intelligently from one source to destination inside the network. CEETP-ACPO) algorithm is based energy-efficient transmission algorithm for wireless sensor networks. Here cluster heads are selected using distributed cluster computing routing scheme DCCERS and the sensor node clustering is done using nodes which are reachable [4]

RELATED WORK

1 Multihop Networks and Residual Node Energy:

Multipath routing are popular methods in mobile ad hoc networks .If we compare this with single-path routing, there are many advantages in terms of higher energy efficiency , higher throughput and lower end-to-end delay. In case of battery operated nodes, Energy efficiency is the main requirement. EAOMDV protocol proven to be the best & selects path based on its route cost function. Residual battery power & traffic is the main parameter to compute cost function [5]

2. Improving Bandwidth Utilization using MAC protocol

Network capacity will be increased by using Multichannel media access control (MAC) protocols .In Multichannel MAC protocol; each device will carry an additional antenna which may have costed more price for hardware. Time for each channel can be divided in a best way & which leads to low bandwidth.

An efficient staggered multichannel protocol for ad hoc networks is effective in improvising bandwidth of network where single antenna is useful & proposes SMC-MAC will form a channel model for utilizing bandwidth. [6]

3 . Clustering Algorithm in Sensor Networks

In LEACH, residual energy of the nodes and distance node will be the parameter for $T(n)$ adjustment. Data fusion need to be adjusted which allows the cluster-heads to fuse data before

transmitting to the base station. The free-space model and model for multipath fading will be effective to avoid the excessive consumption of energy caused by the nodes. Improved algorithm is proposed based on weighted energy and distance ratio [7]

4 . Modelling and Analysis of Data Flow in MAC Layer

Mobile phones have important role in developing ubiquitous network. Recent wireless devices are having powerful computing capacity, storage facility which improves the scalability, energy efficiency & reduces packet delay. The performance measures such as channel capacity, coverage can be increased by using mobile sink node over static sink in wireless sensor network. Analytical model is proposed to study the performance metric over data flow from sensor node to mobile [8]

5 .Enhancing Performance of wireless ad-hoc Networks with Network Coding

There are many approaches which enhances capacity of wireless adhoc network. One such approach is network coding where broadcast of encoded packets are done to improve the security of network. Routing algorithm can strengthen the wireless ad-hoc network with better reliability.[9]

6 .Cross Layer Design in MANET

To improve the life of battery in MANET, energy aware cross layer design is important .Conservation of energy is a critical issue while designing a routing protocol in adhoc network. In addition to energy saving issues, the AODV protocol calculates the best path for routing data packets. Most of the energy is consumed in transmitting data packets. Cross layer model is built between MAC layer and Network layer for low power consumption **[10]**

7. Clustering Methodology to Prolong Lifetime

WSN has many applications in military, civilian, visual sense models and many others as being a low power network.

Network lifetime should be enhanced by using these sensor nodes. These nodes will be clustered in to non overlapping clusters to provide energy efficiency..Energy Efficient Hierarchical Clustering (EEHC) algorithm is efficient algorithm in WSNs where cluster heads collects information about individual clusters and forward it to the base station. Clustering process is explained in [11]

8. Mathematical Model for Wireless Signal Path Loss

Mobile communications have emerged as the fast growing communication technology. There is demand to enhance to high quality and high capacity in wireless networks. Many researchers have proposed models to detect path loss . An adaptive path loss model is proposed for predicting signal received power values inside the buildings [12]

9. Quality of service using QOD enabled AOMDV Protocol:-

A quality of service for wireless communication & its analysis for real time transmission is done using QOD enabled AOMDV Protocol. Whenever link failure and route break occurs, multipath distance vector protocol is most efficient in dynamic networks. It will maintain routes for destination while in active communication mode and will be using sequence numbers for the determination of the latest routing information to prevent routing loop. This protocol has a timer which helps mobile nodes to find the breakage in links & modify topology accordingly. In this, QOS parameter of the network is analyzed for signal drop, link failure and interference. QOD enabled AOMDV is effective protocol in incorporating into sensor network applications where is a major concern. In terms of evaluating the performance, PDR, throughput and is improved rather than AOMDV routing protocol. This will be used in military application where quality of service is a major concern. Also when we use sensors, energy constraints will be utilized to enhance the sensor lifetime [13].

10. Meta heuristics approaches for minimizing energy consumption.

This review exhibits work demonstrate for vitality in light of Geographic Adaptive Fidelity (GAF), best known topology strategy for saving energy of a node . Simulated Annealing and Genetic Algorithm Meta heuristics are processed for limiting the utilization of energy in remote specially appointed system displayed by rectangular GAF.GA and SA are productive enhancement methods towards limiting utilization of energy in Adhoc networks.

GAF:

The GAF calculation saves energy by portioning the node into virtual grids in a Network .In this model, adhoc network which has a zone of length L and breadth b is isolated into networks with the goal that information can be accommodated in grid structure. Energy consumption in a grid (Ei) structure will be the summation of energy generated by the node for reception, transmission, listening and sleeping

$$E_i = e_1 T_r + e_r T_r + e_1 T_1 + e_s T_s \quad (1)$$

Where e_i will be the power generated for transmission.

e_r will be the power generated for reception.,

e_1 will be the generated power of the node in listening node,

e_s will be the generated power of the node in sleeping node respectively.

$$e_i = a + cR_n \quad (2)$$

$$i = a + b$$

$$e$$

$$e_i = a$$

$$e_s = d$$

Where the estimated constants are a=0.083(J/S),

b=0.017(J/S),

c=0.00002(J/S)

and d =0.013 J/S/m2.

The n means the energy of record for communication path loss and its esteem is 3.

R will speak to the ostensible territory that will guarantee that any two nodes that are in nearby networks and may straightforwardly convey.

The parameter ei & es are proportional since it has demonstrated that d has a little esteem and closes to zero.

Energy consumption in a matrix (Ei) is the sum of powers in accepting (er), transmitting (ei) and sleeping (es) states increased by time length (Ti & Tr).

Energy consumed in a grid area is modeled as

$$Ei = a + b + cRnTt \quad (3)$$

Where the duration for receiving & transmitting traffic data respectively is given by

$$Tt = Dt/u \quad (4)$$

The parameter (u) is the received or transmitted data rate in bits per second with a given values of 250kbps. [14]

11 . Mathematical Model

The node moves from one position to next position with uniform speed & direction which is termed as epoch .The time between two direction changes is the sum of epoch time & pause time

$$T'=T+Pt \quad (5)$$

The frequency of change in one direction is

F'=1/T'

The speed of mobile node directly affects the mobility metric direction change of the node

Relative mobility between any two nodes can be defined as

$$TRMij = \sqrt{(Vi) + (Vj) - [2vivjcos(\theta i - \theta j)} \quad (6)$$

While they move at a point, they move away from transmission range which results in link breakage

.The maximum time tlh for which the nodes are in transmission range is

$$tlth = \frac{dlth}{RM(i,j)} \quad (7)$$

Link brakage condition is

$$tl > tlth \quad (8)$$

Energy Consumption due to mobility:-

Additional energy will be consumed by a node to reestablish the link with other node. This additional energy El consumption over a period can be given by

$$El = \{ nlb \times \alpha + nprocess \times \beta \} \quad (9)$$

Where α is the energy for transmitting hello packets

Energy for processing hello packets is β

No of link breakage is nlb

Nprocess is the number of acknowledgement received.

Total energy consumption by a node in mobility during transmission mode

TM=1 for Active

=0 Idle

Where

TM=1

$$ETA = Etp + Erp + Erlep + El \quad (10)$$

Where ETA is the total energy consumption for a mobile node in a active node & $Erlep$ is the energy consumption for relaying packet

When TM==0,

$$ETI = Eidle \times (nidle + Pt) \quad (11)$$

Where Eidle is the energy consumption when the node is idle

Pt is the pause time &$nidle$ is the number of seconds when the node is idle. [15]

12. Performance Analysis of Multicast routing protocol.

Bandwidth enhancement & mobility turned out to be characterizing factors in global telecommunication development. If user wants to send information using assigned bandwidth with better reliability then quality of service becomes the important factor. Several issues related to MANET have been addresses here. Multicasting and routing is done & its performance analysis using AODV, MAODV using NS3 have been discussed. In low mobility, performance of AODV is better in terms of PDR but it does not perform well in terms of E2E delay & average routing overhead. In case of high dense network and mobility, MAODV is better protocol for packet delivery and average E2E delay [16]

13. Packet level Analysis:-

Survey on NS-2 for packet level simulation is important to judge the efficiency of wireless adhoc network. It explores the advantages and the limitations of NS-2 in terms of packet loss, interval period, and packet & traffic type. Simulated results show that there is high correlation in theoretical & practical aspects. We can change different scenarios, parameters, network setting, traffic agents while creating wireless adhoc network which leads to judge the network efficiency. [17]

14 .Energy Efficient Hierarchical Routing Algorithm in MANETs

Mobile Adhoc Network is a network of mobile nodes which are self-configured. It does not need existing architecture .It has a dynamic topology. Memory & energy issues requires effective routing algorithm. HEEMCORP routing algorithm is proposed which is energy efficient & on demand routing. Proposed hierarchical routing algorithm provides good packet delivery ratio (in Kbits) and will consume less power than DSR and MTPR for higher number of nodes. HEEMCORP is a hierarchical energy efficient demand routing Protocol. It has group leaders and territory leaders which makes the effective routing and reduces latency in routing the packets [18].

15. Performance measures of Receiver Directed Transmission Protocol with a Single transceiver

Multiple channels is proven to enhance the capacity of wireless ad hoc network. RDTP provides multichannel access by using a single radio interface. It does not depend on control channel as well as time synchronization. This will help to mitigate the hidden terminal problems inside a network. In idle mode, each node will listens its base channel. Number of nodes listening to the same channel would be computed if the total number of nodes in the network is divided by the channels available.

In another words, if we consider 50 nodes network and if there are 3 available channels, then there would be about 16 nodes listening to the same home channel, which may affect the connectivity and network performance. [19]

16. Performance Analysis of Mobility Models using Routing Protocols

MANETs establishes a network where nodes communicate with each other by network systems. Routing protocols for MANET are characterized into two type's i.e. Table-driven & on-request or demand. Node will perform function of routers which discovers and maintain the path to other node. In Adhoc networks, nodes synchronize with their neighbor's node while they move. The link failures mostly occur frequently in this network due to its mobile nature where nodes can be added or leave the network at any time. Parameters which affect efficiency related considerations are Jitter, PDR, Throughput and End to End delay. In case if number of nodes increases i.e. size of a MANET grows; its performance will degrade due to large throughput come up in repairing route breaks. Reactive protocols i.e.AODV, DSDV & AOMDV works fine if the network has more than 30 mobile nodes. Throughput of AOMDV is superior than AODV and DSDV at more than 30 nodes. AODV has good performs for CMM for more than 50 nodes but DSDV does not perform well but it will perform better up to 25 nodes.[20]

17 .Energy Efficient Multipath Routing Scheme in Sensor Networks

In case of remote wireless sensor networks, sensor nodes are mainly restricted by communication range & battery life. Single path routing mechanisms is the main cause in WSNs which leads to drastic power utilization and path failure. A multipath routing scheme is efficient scheme to enhance performance of a network. Multipath routes are recognized based on the availability of energy. This scheme enhances the performance in terms of multipath identification delay, PDR, end-to-end delay and network life time etc.The multipath routing scheme will minimize the route identification time, end to end delay and decreases the control overhead. Results have been tested to enhance the performance for wireless senor networks. This scheme is energy aware with reliable routes and load is balanced equally in network environment to maximize the network life time [21].

18. Role of Dynamic Weight Adjustment for enhancing Network Lifetime

MANET has a support for mobility, scalability and extendibility of the network over the air. Connectivity in wireless medium has costed a lot for communication. In such network, life of connections, routing of packets, and delay in information, security over the air and trusted source and receivers needs extra care in communication. Flat topology does not support scalability of the mobile nodes in the wireless network. Clustering is one of the hierarchy topology which overcomes the scalability problem. One of the hierarchy topology can be consider as clustering. Clustering of mobile nodes will be utilized to solve three problems (a) expanding the network (b) communication stays within the cluster (c) rote maintenance become much easier. Clustering includes two processes which are (a) cluster formation and (b) cluster maintenance. Weighted clustering is one of the important clustering schemes & constraints on weights which are fixed and not varying with the dynamics [Degree Difference v, Sum of Distances Dv, Mobility (Mv) and Power (Pv) of the nodes] of the mobile node in the network. Weight plays major role for the selection of best stable cluster head as it defines and support the dynamics of the mobile nodes.

Cluster head selection is important task of the clustering which Does cluster formation and also in maintenance phase as well. In this work, dynamic weight adjustments is done by using soft computing technique. Neural Network & Fuzzy Systems are Soft computing approaches. Clustering algorithm which are based on weight adjustment is just like Advanced Neural Network. Since less computation with fast clustering is the target of any clustering based algorithm, so best cluster head is selected by choosing the appropriate weights for mobile nodes with less computation overhead [22]

19. Energy Efficient Advanced Neural Network

Processing capacity, storage, and communication range & energy demand of sensor network has been increased nowadays in spite of various constraints of wireless sensor network. The main aspect is delay and energy consumption in routing data to receiver node. While deploying a big network,

artificial neural network based on energy efficiency will be useful. Huge data set is required to train network using ELDC technique to make network better & adaptive to environ mental changes. In such scenarios group based methodology is best to enhance the life span of the network. ANN provides an effective threshold value in selecting cluster heads chief node & cluster head using back propagation algorithm. It allows efficient, intelligent & robust group organization .This technique is highly appreciated to enhance the lifetime of network. [23].

20. Throughput Improvement of 802.11 MAC

Building energy efficient network is essential as most of the wireless devices are operated on battery. 802.11 is the protocol for MAC. It is being used to minimize the energy consumption of sensor nodes. To analyse the impact of energy consumption and throughput, model based on 802.11 protocol is build.

We would save much energy for high throughput network. Simple linear equations are specified to fit the throughput data. For throughput, Single variable models and MTU will be designed for different distances. Throughput is depended on the distance & MTU. If we increase the MTU or distance, throughput goes on decreasing. Empirical models are build using curve fitting which also shows significant impact of MTU on throughput. For maximum throughput, Models are built to with optimal MTU. By varying the MTU, maximum throughput can be obtained which leads to enhance the lifetime of a node and energy efficiency [24].

21 .Performance Evaluation of Routing Protocols using Different Models in MANET

In mobile adhoc networks, mobile stations are associated with wireless link. This system will be modeled as uninformed graph in Adhoc networks data packets are routed from source to destination effective using intermediate nodes (which serve as router). While setting MANET, it can be setup anytime, anywhere as it does not have infrastructural requirement. If DSR, LAR1 and AODV routing protocols are compared with reference to pause time, speed and number of nodes, , LAR1 has better throughput with respect to AODV and DSR routing protocols. LAR1 seems to have better PDR in comparison to DSR and AODV. [25]

22 .Impact of Different Mobility model on network with IEEE 802.15.4 for WSNs

Wireless Sensor Network has the set of heterogeneous & homogeneous sensor nodes which senses the data from different sensing region of the network. Many protocols are utilized to find the best route for transmitting the data from source to destination. Routing protocols performance is always affected by packets size, signal type, node movement, rate of data transmission, power consumption model and topologies. The battery power consumption becomes the major factor in deciding the performance of routing protocols in the network, in term of lifetime and PDR. Initially, network designed with different routing protocols and topologies becomes important for the analysis of wireless adhoc network. Mobility model will affect the performance of routing protocols to a certain level and network lifetime as node movement consumes more energy than stationary nodes.[26]

RESULTS

Wireless adhoc networks are created up to 30 mobile nodes in NS2.These networks are built using various routing protocols with probabilistic distributions. Topography dimensions are 767x 663 .Important results are discussed using DSR protocol and models are also formulated for residual energy to evaluate the performance.

Table 1: Simulation Parameters:

Number of nodes	5/10/15/20/25/30
Routing Protocol	DSR
X	767
Y	663
Initial Energy(J)	5
Idle Power	0.0
Rx Power	0.8
Tx Power	0.9
Sense Power	0.0175
Packet Size(bytes)	1500

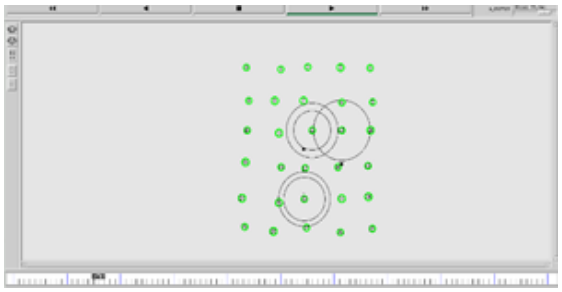

Figure 1: Nam file 30 mobile nodes

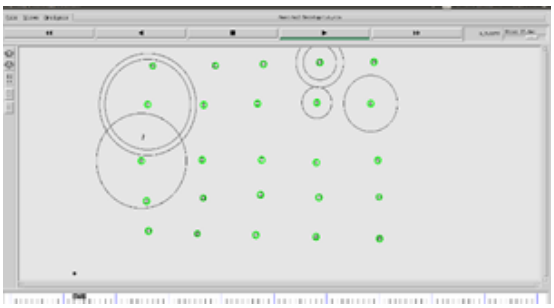

Figure 2: Nam file for 25 mobile nodes

Figure 1 and figure 2 shows NAM of 30 and 25 nodes simulated in NS2.Packets are distributed in a random fashion for the configuration as mentioned in Table 1 and performance

parameters i.e. E2E delay, PDR,Throughput ,Average residual energy & average energy consumption is computed. Response of average residual energy is plotted in figure 3 and fitted line plot is plotted in figure 4.

From Table 2 & Table 3, In case of 10 node mobile scenario , packet delivery is improved from 81.99 to 82.47 .Throughput have been increased from 2050.12 to 2069.79 as well as average residual energy is improved from 4.508 to 4.74 .

Table 2: Packet Delivery Ratio, Average Throughput, Residual Energy of Wireless nodes 5-30 mobile nodes without any distribution.

NN	PKT SIZE	PDR	E2EDELAY (ms)	THR (kbps)	AVG ER	AVG CON ENER
5	1500	94.44	96.69	2032.38	4.14	0.85
10	1500	81.99	228.241	2050.12	4.508	0.49
15	1500	87.34	297.58	1892.65	3.72	17.85
20	1500	77.85	42.93	600.84	4.35	0.6415
25	1500	80.48	388.08	2918	3.448	1.55
30	1500	86.21	361.825	4612.01	3.44	1.54

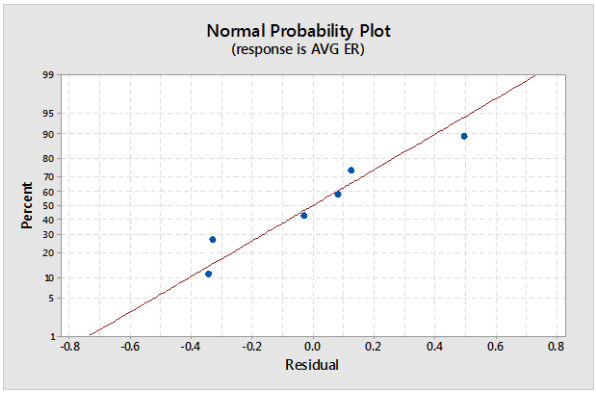

Figure 3: Normal probability plot for Table 2

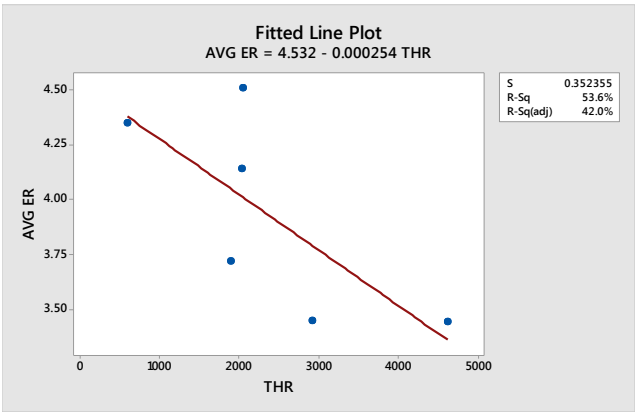

Figure 4: Fitted line plot for Table 2

Table 3: Packet Delivery Ration ,Average Throughput, Residual Energy of Wireless nodes 5-25 mobile nodes with Pareto distribution .

NN	PKT SIZE	PDR	E2EDELAY (ms)	THR	AVG ER	AVG CON ENER
5	1500	94.59	91.83	2015.75	4.10	0.8923
10	1500	82.47	233.454	2069.79	4.74	0.249
15	1500	75.09	326.821	1703.45	4.01	0.988
20	1500	83.62	46.21	612.28	4.65	0.33
25	1500	73.56	431.559	1082.72	3.80	1.19

Networks created have been tested using Advance Neural Network where first five parameters of the table i.e. Packet Size ,Packet delivery ,End to End delay ,throughput are considered as input variables & Average residual energy is considered as target variables. Neural Network have been tested using following parameters & results are improved one.

Table 4: Performance parameters for designed Advanced Neural Network

Parameters	Measured values/algorithm
Training & learning algorithm	TRAINLM
Performance function	MSE
No of layers	2
Number of Neurons	05
Transfer function	TANSIG

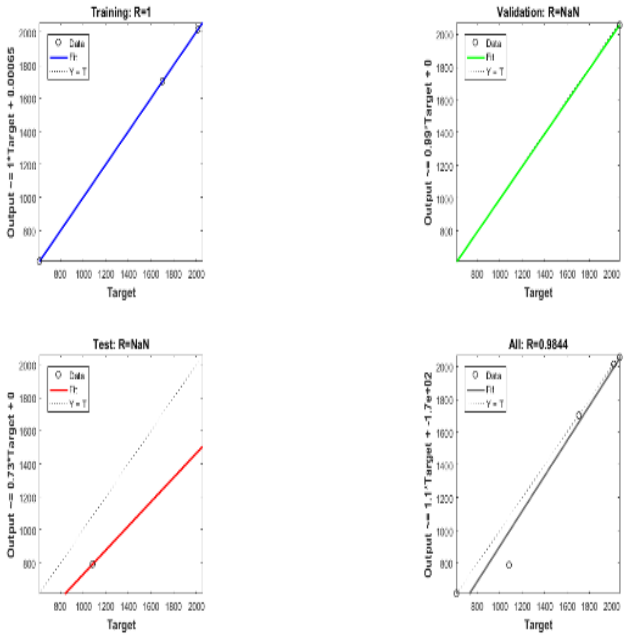

Figure 5: Performance of Neural Network Tested for Table 3

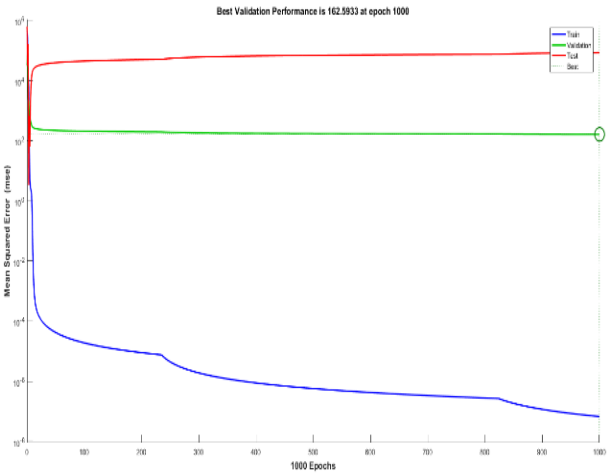

Figure 6: Performance of Neural Network Tested for Table 3

From the above graphs, it is clear that value of R is near to 1 so there is exact correlation between output &targets. In proposed networks, Packet transmission is done through Pareto distribution where parameters are kept as

Avg-10

Shape factor -1.2

New network using pareto distributed packets are designed & computed various performance measures as mentioned in Table 3. We wanted to build the model for residual energy of a network with improved packet delivery and throughput so these parameters are tested in Minitab & formulated model as specified in equation (12)

The regression equation of residual energy using Pareto distributed packets in wireless adhoc network

$$Er = -3.090 + 0.3965NN - 0.02776PDR - 0.01357E2EDelay + 0.004504THR \quad (12)$$

This equation specifies that number of nodes & throughput directly affect the residual energy of a node in wireless adhoc network.

CONCLUSION

In wireless Adhoc Network, there are many challenges in traditional routing. Periodic updates during route updates will consume lot of energy without actually contributing to transmission of packets. There is a vast scope to develop method for packet transmission in order to improvise energy efficiency of a network. Probabilistic approaches seems to be effective in distributing packets while routing information and optimizing energy of a wireless network**..** These networks will be tested using advanced neural networks using specified algorithms where performance can be judged. For improvising the performance of neural network, TRAINLM function has been effective to set the error to zero value. To obtain the lowest error performance ratio, number of epochs should be increased.

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