Increasing the Route Stability for MANET throughBTSNA-DS Algorithm

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Abstract—Mobile Adhoc Networks (MANETs) are multi hop wireless networks that MANET is functioning within the absence of mounted infrastructure and additionally the packets are sent by organization of nodes. By self-organizing themselves the nodes route the packets of their neighbor nodes over wireless medium by constructing a multi hop networking setting. In order that the nodes of the MANET should act as each a router similarly as transceiver. Since MANET in dynamic is nature, and also the nodes have to be compelled to self organizes to regulate their transmission range to remain connected to every alternative, the property between the nodes may be a huge challenge. This network largely used for emergency network like military preparation and for disaster management etc. Within the recent year there has been lot of scientist analysis in the neighbour coverage protocol field, as a result of each node executes supported the restricted resource constrain like, power and storage. Thus each node broadcasts its own data to the network, so it's received by a node inside the transmission range. The receiver senses its neighbours and updates its neighbour table from time to time.In this paper, proposed a new routing algorithm named Binary Tree Structured based Network Approach using Depth Search (BTSNA-DS) for increasing link stability path between sender and receiver. Finally, proposed BTSNA-DS algorithms provide a better performance compare to existing Energy Efficient Neighbor Coverage Protocol (EENCP), Restrictedflooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG) and also increase the throughput, packet delivery ratio, and remaining residual energy with number of nodes, transmission range, and mobility is increased.

Keywords: Broadcasting, Packet Delivery Ratio, Neighbour Coverage, Throughput, Remaining Residual Energy, Flooding, Mobility.

I. INTRODUCTION

The origin of Mobile Adhoc Networks (MANETs) may be derived back to DARPA packet radio network project within the year of 1972. initial generation of MANETs were used for various military situations for aiding combat operations around 1970 and packet radio networks was the primary adhoc network. Second generation from 1980 to mid-1990, named as survivable adaptive radio networks, developments were targeted on future advancement of MANETs developed throughout their initial generation. Third generation of MANETs, notebook computers supported radio waves idea of economic MANET were fabricated. The network is redistributed, wherever all network activity together with discovering the topology and delivering messages should be executed by the nodes themselves (i.e. routing practicality are going to be incorporated into mobile nodes). Node mobility in associate

MANET causes frequent changes of the network topology. Theinsecurity of the wireless links, energy constraints (power), comparatively poor physical protection of nodes in an exceedingly hostile atmosphere, and therefore the vulnerability of statically organized security schemes are known because the major challenges. MANETs operate in extremely dynamic atmosphere and as a result of that their topology cannot be continuously outlined and limitation poses a problem of security of the network and there's perpetually a necessity for optimized and secured routing protocol. Till now, variety of routing protocols are developed for MANETs the set of applications for MANETs is numerous, starting from little, static networks that area unit affected by power sources, to large-scale, mobile, extremely dynamic networks. In ad hoc networks, nodes don't have a priori information of topology of network around them, they need to discover it.

MANETs represent a replacement type of communication consisting of mobile wireless terminals wherever it's associate infrastructure less IP based mostly network of mobile and wireless machine nodes connected with radio. In recent years, MANET has gained quality and much of research is being done on completely different aspects of MANET. It's associate infrastructure less network having no mounted base stations. MANET is characterized by dynamic topology low information measure and low power consumption. All the nodes within the network area unit moving i.e. topology of the network is dynamic that the nodes will act each as host yet as router to route info redundant for its use. Nodes of a MANET don't have a centralized administration mechanism. It's celebrated for its routable network properties wherever every node act as a router to forward the traffic to alternative specific node within the network. MANET may be a wireless multihop network with none mounted infrastructure, in distinction to today's wireless communications that relies on mounted, pre-established infrastructure. All networking functions, like determinative the network topology, multiple accesses, and routing of knowledge over the foremost applicable methods, should be performed in an exceedingly distributed approach. These tasks area unit significantly difficult, as a result of the restricted communication information measure accessible within the wireless channel.

MANET Issues: Mobile adhoc networks are collection of mobile nodes with no pre-establishedconfiguration or infrastructure. Any two devices can communicate with each other by the use ofshort range wireless communication capabilities like Wi-Fi or Bluetooth interfaces, when theyare in wireless range of one another. MANETs are multi-hop networks where the wireless nodes communicate beyond their communicationrange by the use of intermediate nodes.Since every node of a mobile ad hoc network is mobile and possibly very volatile theyare having highly dynamic topology. These constant topological variations will eventually leadto a continuous state of network instability, which in turn can deteriorate the performance ofservices and applications on these networks. Another important issue is that typically devicesparticipating in mobile ad hoc networks, have limited resources as far as storage and processingcapabilities are concerned. By adding the energy constraints in the set of limitations on MANETs, one can easily understand that the road to fully grasping the potentials of MANET is not going to be an easy one. As the advancement in the wireless devices and the craze of using handhelds leadsto the penetration of mobile ad hoc networks in the domains where all the handhelds, wirelesscommunication and infrastructure free networks can be applied. However the

highly dynamicnature of the topology, unpredictable conditions on the network connections, heterogeneousnature of the devices involved, constraints of the resources are the main hurdles to be removedfor the wide spread application. Most of the researcher works are mainly focusing on the lower layers of the mobile ad hoc networkswhereas the concentrations on application layer issues are comparatively very less.

II. RELATED WORKS

Survey of Broadcast Expenses Controlling Techniques in Mobile Adhoc Networks have been studied and discussed fromNaeem Ahmad, et.al (2015).Performance Analysis of Broadcast Based Energy Efficient Routing Protocol for MANET Using BTSNA-DS Algorithmhave been proposed by Saraswathi, R. et. al (2018). Performance Analysis of Location Aided Routing (LAR) and Limited Hop Broadcasting Algorithm (LHBA) for MANET were discussed and analyzed from Saraswathi, R. et. al (2018). Energy Efficient Neighbor Coverage Protocol for Reducing Rebroadcast in MANET were discussed and analyzed from RagulRavi.Ra, et. al (2015). Enhance Internet Access Ability for Ad Hoc Network with On-Demand Gateway Broadcast Strategy were studied and discussed from HuaqiangXu, Lei Ju, and ZhipingJia, (2015). An efficient broadcast-based information transfer method based on location data over MANET were discussed from Yosuke Totani, et. al (2016). Network resource efficient routing in mobile ad hoc wireless Networks have been discussed from Ahyoung Lee, and Ilkyeun Ra, (2015). Performance analysis of an extended grid based broadcast algorithm in mobile ad-hoc networks have been discussed and analyzed from AbderezakTouzene, et al (2015). Location Based Dynamic Probabilistic Broadcasting for MANETshave been discussed from Imran Ali Khan et al (2011). Performance comparisons of routing protocol in MANET were discussed from Prabu, K., et.al, (2012).Energy efficient routing in MANET through edge node selection using ESPR algorithm were discussed and analyzed from Prabu, K., et.al, (2014).Cluster based controlling of route exploring packets in ad-hoc networks were investigated byHussain, S.Z., and Ahmad, N., (2014).Minimizing Broadcast Expenses in Clustered based Mobile Adhoc Networks were studied by Hussain, S.Z., and Ahmad, N (2016).Analytical studies of energy–time efficiency of blocking expanding ring search were analyzed by Pu, I.M., and Shen, Y., (2010).Energy evaluations of AID protocol in Mobile Ad Hoc Networks were studied by M. Bakhouya, J. (2015).Approaches for Engineering Adaptive Systems in Ubiquitous and Pervasive Environments were studied and discussed by M. Bakhouya and J. Gaber (2015).

III. PROPOSED CONCEPT

Depth Search (D-Search): The exploration of a new node cannot begin until the node currently being explored is fully explored. D-search like state space search is called LIFO (Last In First Out) search which uses stack data structure. To illustrate the D-search let us consider the following tree (fig.1):

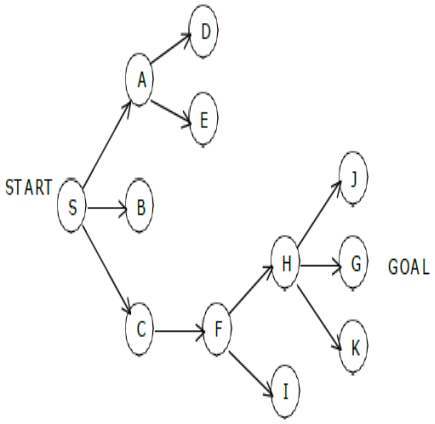

Figure 1.Tree Structure.

The search order for goal node (G) is as follows: S, A, B, C, F, H, I, J, G. The result tree is (fig.2):

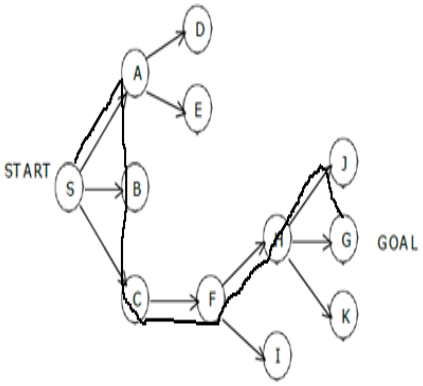

Figure 2.Path Using D-Search.

The given network, the broadcasting signal is flooded the neighbor nodes in the ad-hoc networks. The communication signal forward to next range of nodes which are presented surrounding the source node, its forward flow of direction from source to destination. Each signal forward towards the destination so it consider the directed graph (fig.3).

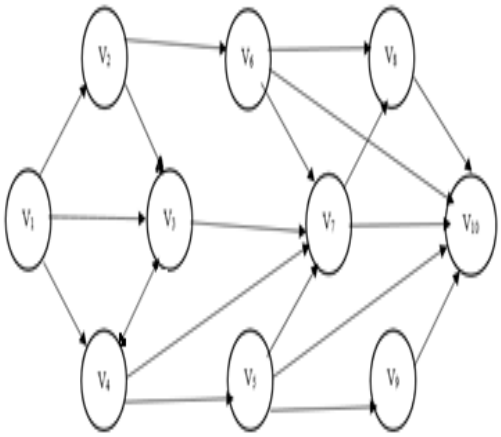

Figure 3.Directed Graph.

In the above graph the node V3 three times received the broadcasting signal from node V1, in via V1,V2 and V3, then V1 toV3 finally V1,V4, and V3. In this case the node V3 received the duplicate signal from various node, this situation rise the network complexity, So Instead of this the node V3 receive the signal only one time it reduce the complexity and also it helps to quick forwarded message to next nodes for that case this research introduce the new algorithm to construct the Binary Tree Structured based Network Approach using Depth Search (BTSNA-DS).

Algorithm for BTSNA-DS

i) Calculate the in-degree and out-degree for each node.

ii) Assign source node (in-degree=0).

iii) Find the destination node (out-degree=0).

// other node have out-degree =0 that node 0 is called terminated node.

iv) Construct the tree structure for given node.

Id: In--degree

Od: Out-degree

Ei: In-degree Edge $\in$ E

Eo: Out-degree Edge $\in$ E

//construct the tree, the node have no child (Rchild, Lchild) first add Lchild then Rchild.

// whenever added the new node to existing tree to find the minimum distance from root node to that node.

// which edges have to create the minimum path length, that edges will be selected, other edges simply rejected.

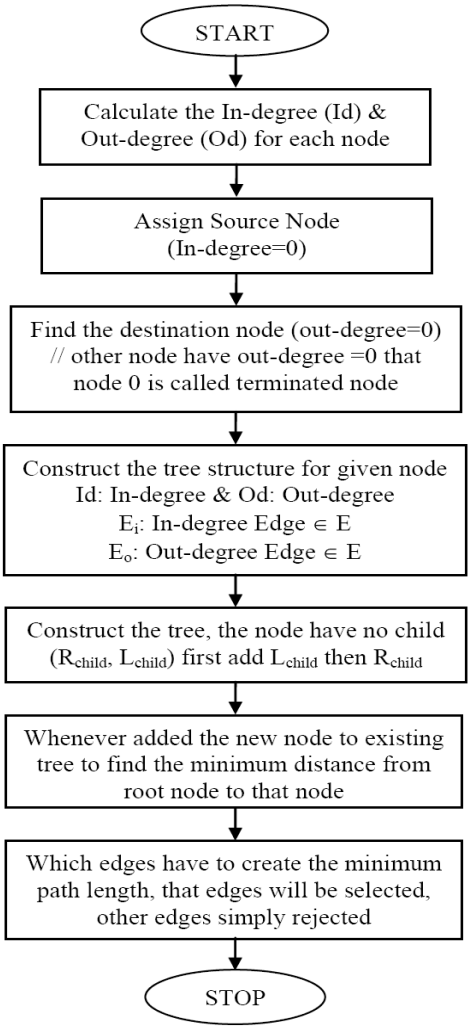

Figure 4.Flow diagram for BTSNA-DS.

In the above diagram (fig.4), Binary tree search based network approach using depth search, executes based on the in-degree and out-degree. Initially in-degree node is zero and out-degree node is zero (other outdegree node (zero) is intermediate node) given node. Next construct the tree, the node have no child then add first left child node and add right child node. Whenever added the new node to existing tree to find the minimum distance from root node to that node.

Pseudo code for BTSNA-DS

Algorithm BTSNA-DS (Graph G)

// G is a graph (Network structure)

// T ←0 is empty tree before constructing the binary tree structure networks

// Input is an Ad-hoc network structure

// Output is Binary tree structured networks

// the given graph is consider as a directed graph because the broadcasting signal send

// toward to destination node

//Idi in-degree, Odi out-degree of that node

//Ei in-degree edge and Eo out-degree edge of that node

Find in-degree (Id) and Out-degree (Od) of every vertices:

For i = 1 to N // N number of node present in the networks.
{
Vi (Idi , Odi)
Idi = {Ei}∈E // i = 0 to Idi
Odi = {Eo} ∈ E, // i = 0 to Odi
}

Root Node Construction

(i.e Here root node is source node that node does not have in-degree)
for i = 1 to N
{
If (Vi (Idi) == 0)
then that node have successor
Vi is root node
else
Vi is terminated node (that nodes does not have successor i.e., dead end node)
End if
}

Binary Tree Structure Network Construction

Select next Vertex(Node)
Root node V1
// the selected vertex have only one in-degree edge
for i = 2 to N
{
if (Vi(Idi) == 1)
then
select edge Vi(Ei)
// select in-degree edge of that node

if root node Vi does not have Lchild or Rchild
then
Add V1 (Lchild (Vi(Ei))
else
Add V1 (Rchild (Vi(Ei))
End if
else
Call D-search(Vi) // node have more than one in-degree edges
End if
}

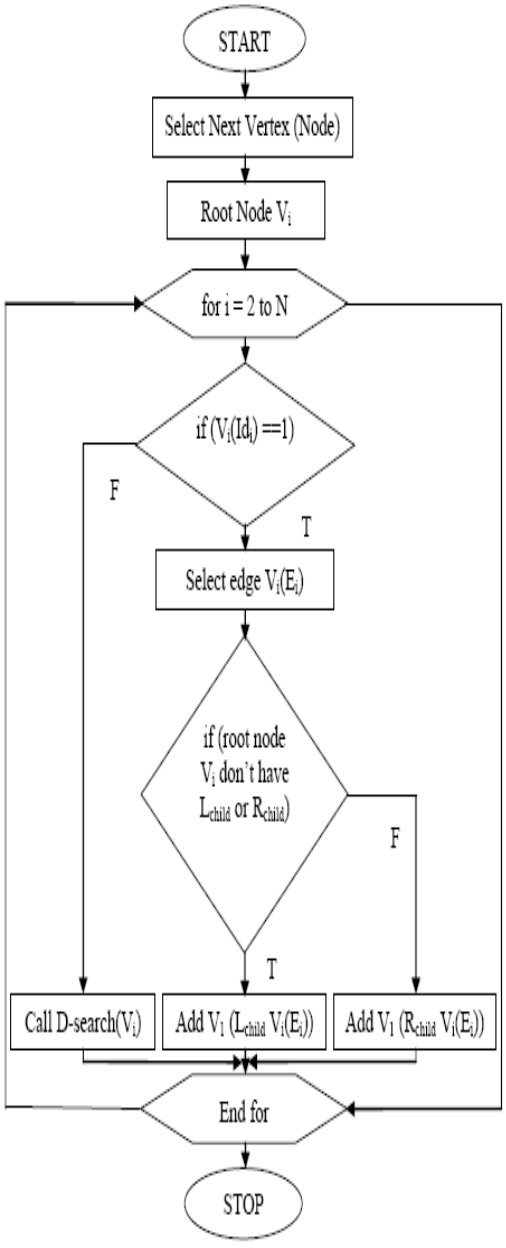

Figure 5.Flow Diagram for BTSNA.

In the above diagram (fig.5) executes based on the select the next vertex (node) from the root node V_i. Selected node do not have left child (or) right child, first add left child and next add right child. Otherwise call depth search.

Algorithm D-search (Vi)

Select next Vertex
Root node V1
// the selected vertex have more than one in-degree edge
For i = 2 to N
{
if (Vi(Idi) > 1)
then
fori=0 to Idi
{
select edge Vi(Ei)
if root node V1 does not have Lchild or Rchild
then
Add V1 (Lchild (Vi(Ei))
else
Add V1 (Rchild (Vi(Ei))
End if
//if root node V1 have both child
// Then check the next level nodes left child or right child edges
//then
//search the next level nodes using Depth search(D Search)
if (L == 0) // root node
all nodes have both child in the level L
then
level L will be increased by 1
L=L+1
for i=1 to LN // number of node present in the same level L
{
If(Vi(Lchild(Vi(Ei))) does not have Lchild
then
Add Vi (Lchild (Vi(Ei))
else
Add Vi (Rchild (Vi(Ei))
End if
If(V1(Rchild(Vi(Ei)))does not have Lchild
then
Add Vi (Lchild (Vi(Ei))

else
Add Vi (Rchild (Vi(Ei))
End if
}
End if
}

A vertex contain more than one in-degree edges, at that same time more than one nodes does not have left child or right child, in this case we choose the level as a main constrains, We select which edge have minimum level (length of the path) that edge connected to their parent. The remaining edges simply discarded.

Backward Binary Tree Structure Based Broadcasting algorithm (BBTSBA): Existing algorithm the broadcasting signal sends from source to destination to find the destination. The proposed approach the broadcasting signal send from destination node to source node to find the appropriate path from source to destination using backward approach and avoids the unnecessary transfer the packet through the all link present in the given networks.The given binary tree structure based networks is:

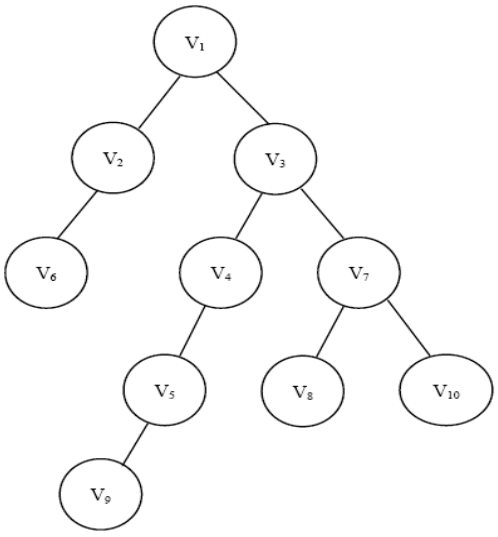

Figure 6.Binary Tree Structure based Networks.

In the above tree (fig.6) we consider the destination node is $V_9$and source node is V_1. Suppose the beacon signal pass from node V_1 that signal pass through the all nodes then finally reach the V_9 nodes because the node V_9 is present the final level and also last leaf node in the tree structure. To avoid this unnecessary delay and broadcasting overhead we start the broadcasting from destination node in the above structure the signal only pass V_5, V4, V3 and V_1.

IV. RESULTS AND DISCUSSION

The performance of the proposed scheme is evaluated using Network Simulator version 2 (NS2). The simulator parameters are listed in Table 1. The network area is confined within 1000× 1000 m^2. Each mobile node has a position and a velocity and moves about over a rectangular flat space. Each node in the network has a transmission range of 250m. A two-ray ground reflection model is used as the radio propagation model. The MAC layer scheme follows the IEEE 802.11 MAC specification. The broadcast mode with no RTS/CTS/ACK mechanisms is used for all message transmissions, including HELLO, DATA, and ACK messages. The movement pattern of each node follows the random way-point model. Each node moves to a randomly selected destination with a constant speed between 0 and the maximum speed 25m. Then, some randomly selected nodes start to send broadcast packets. This procedure lasts for 1000 seconds. The number node for testing scenario is 20 to 100, number of packet sender is 40, constant bit rate is 2 packets per seconds, packet size is 512 bytes, Initial node energy of per node is 100 joules and antenna module is omnidirectional. Transmission range of the nodes is varied from 50 to 250 meters. The normal cluster heads simulations done for the duration of 1,000 seconds that the proposed scheme has lesser number of cluster head changes. Simulations are done for number of node is 20-100 nodes by

varying the transmission ranges between 50 and 250 meter.

Table 1.Simulation Parameters.

Parameters	Values
Simulation	NS-2
MAC Layer Protocol	IEEE 802.11
Mobility Model	Random Waypoint
Terrain Range	1,000 X 1,000 m2
Transmission Range	250 Meters
Examined routing protocol	BTSNA-DS
Channel Bandwidth	2 Mbps
Speed	10-20 m/s
Application Traffic	CBR
Simulation Time	1000 s
Propagation mode	Free space
Data Packet size	512 bytes
Packet rate	2 packets/s
Number of mobile nodes	20–100

The following performance metrics to evaluate through networks simulation (NS2):

1. Throughput: Throughput is the number of bytes or bits per seconds arriving at the time interval t. It is generally measured by kilo bits per second (kbps) or mega bits per second (mbps).

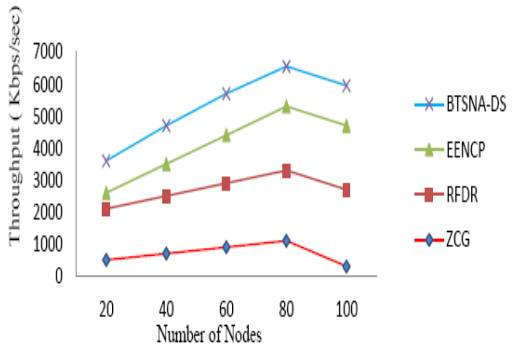

Figure 7.Throughput (kbps) Vs. Number of Nodes.

In this part performance analysis of proposed BTSNA-DS algorithm with existing Energy Efficient Neighbour Coverage Protocol (EENCP), Restricted flooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG). In Fig. 7 the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also increased throughput with number of node is increased.

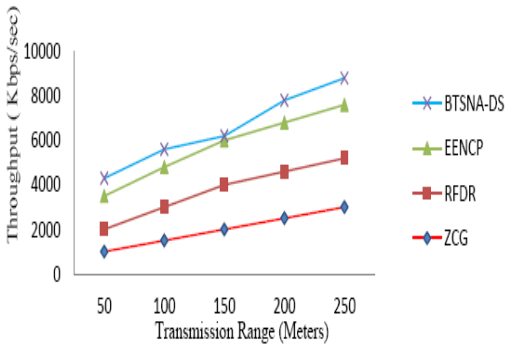

Figure 8.Throughput (kbps) Vs. Transmission Range (Meters).

In this part performance analysis of proposed BTSNA-DS algorithm with existing Energy Efficient Neighbour Coverage Protocol (EENCP), Restricted flooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG). In Fig. 8 the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also increased throughput with transmission range is increased.

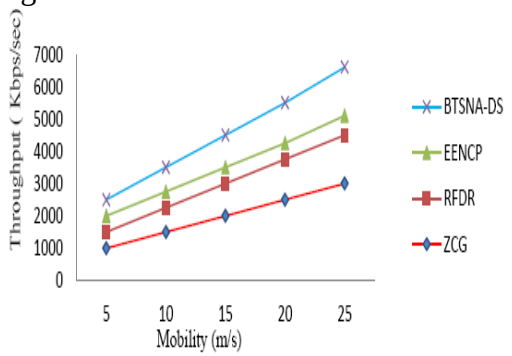

Figure 9.Throughput (kbps) Vs. Mobility.

In this part performance analysis of proposed BTSNA-DS algorithm with existing Energy Efficient Neighbour Coverage Protocol (EENCP), Restricted flooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG). In Fig. 9 the proposed BTSNA-DS

algorithm provides better performance compare to existing algorithm and also increased throughput with mobility is increased.

2. Remaining Residual Energy: Remaining energy will be calculates at the time interval t.

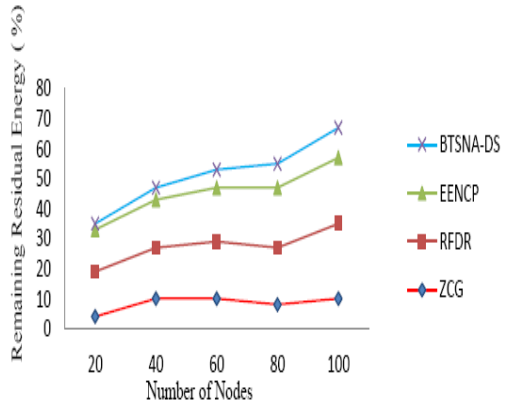

Figure 10. Remaining Residual Energy Vs. Number of Nodes.

In this part performance analysis of proposed BTSNA-DS algorithm with existing Energy Efficient Neighbour Coverage Protocol (EENCP), Restricted flooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG). In Fig. 10 the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also increased remaining residual energy with number of node is increased.

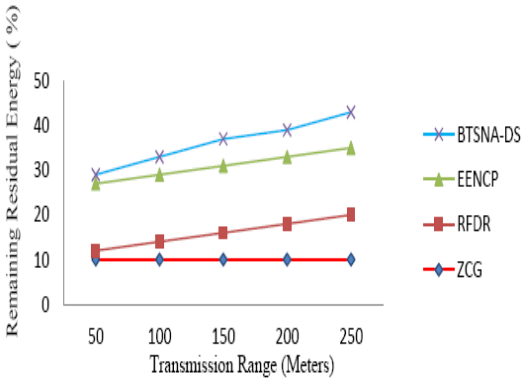

Figure 11. Remaining Residual Energy Vs. Transmission Range (Meters).

In this part performance analysis of proposed BTSNA-DS algorithm with existing Energy Efficient Neighbour Coverage Protocol (EENCP), Restricted flooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG). In Fig. 11 the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also increased remaining residual energy with transmission range is increased.

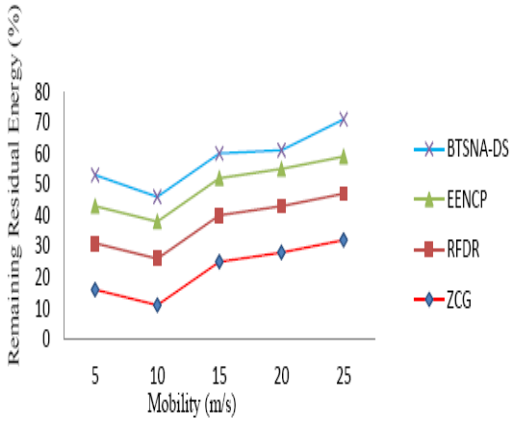

Figure 12. Remaining Residual Energy Vs. Mobility.

In this part performance analysis of proposed BTSNA-DS algorithm with existing Energy Efficient Neighbour Coverage Protocol (EENCP), Restricted flooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG). In Fig. 12 the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also increased remaining residual energy with mobility is increased.

3. Packet Delivery Ratio (PDR): The ratio of the number of delivered data packets to the destination. This illustrates the level of delivered data to the destination. (∑ Number of packets delivered / ∑ Number of packets transferred).

$$\text{PDR} = \frac{\text{TotalNoofPacketsDelivered}}{\text{TotalNoofPacketsTransferred}} \text{X } 100$$

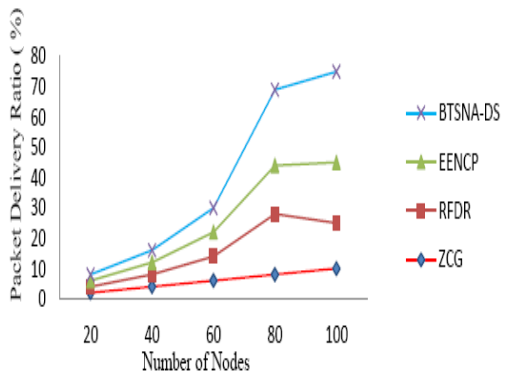

Figure 13. Packet Delivery Ratio Vs. Number of Nodes.

In this part performance analysis of proposed BTSNA-DS algorithm with existing Energy Efficient Neighbour Coverage Protocol (EENCP), Restricted flooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG). In Fig. 13 the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also increased packet deliver ratio with number of node is increased.

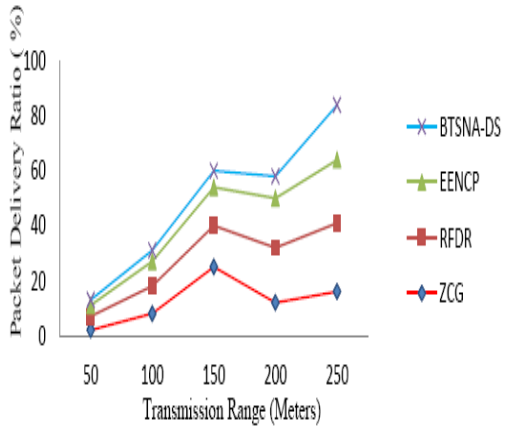

Figure 14. Packet Delivery Ratio Vs. Transmission Range (Meters).

In this part performance analysis of proposed BTSNA-DS algorithm with existing Energy Efficient Neighbour Coverage Protocol (EENCP), Restricted flooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG). In Fig. 14 the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also increased packet deliver ratio with transmission range is increased.

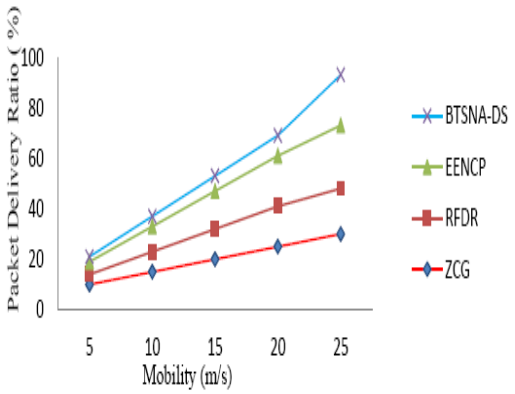

Figure 15. Packet Delivery Ratio Vs. Mobility.

In this part performance analysis of proposed BTSNA-DS algorithm with existing Energy Efficient Neighbour Coverage Protocol (EENCP), Restricted flooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG). In Fig. 15 the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also increased packet deliver ratio with mobility is increased.

V. CONCLUSION

Mobile Adhoc Networks (MANETs) are considered as the most emerging research areas inthe recent trends in communication networking. MANETs are thewireless infrastructure in which the nodes in the mobile adhoc networks do not haveany fixed infrastructure and communication happens in the adhoc manner.In the recent year, there has been lot of researcher research in neighbour coverage protocol field for the emerging situation, because every node executes based on the limited resource constrain (power and storage). So every node broadcasts its own information to the network, so that it is received by a node within the transmission range. The receivedbeacons its neighbours and updates its neighbour table from every

seconds.In this paper, proposed a new routing algorithm named Binary Tree Structured based Network Approach using Depth Search (BTSNA-DS) for increasing link stability path between sender and receiver. Finally, proposed BTSNA-DS algorithms provide a better performance compare to existing Energy Efficient Neighbor Coverage Protocol (EENCP), Restricted flooding and directional routing (RFDR), and Zone based Routing with Parallel Collision Guided Broadcasting Protocol (ZCG) and also increase the throughput, packet delivery ratio, and remaining residual energy with number of nodes, transmission range, and mobility is increased.

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