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An Enhance Energy optimised Path Selections and Efficient Routing Approach

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***Abstract*—The networking node help in participation and transferring the data packets between the source & destination node. Mobile adhoc network help in secure and fast processing of data packets. Efficient routing and energy efficient path selection is always required in any of the communication area. Many algorithms are performed for optimizing the communication. In this paper, an optimized energy efficient path selection algorithm is proposed. This algorithm helps in finding an optimal route with the short node selection with maximizing the energy routing. This algorithm help in achieving high data packet delivery ratio and less packet drop. Thus the implementation is performed using NS2 and result observed are efficient while comparing with traditional OLSR approach.**

Keywords—**Network routing, Data transmission, Path selection, Optimal energy efficient routing, OLSR, MANET.**

I. INTRODUCTION

A phrase MANET is nearly new for locomotive specified net that is an independent process of locomotive nodes attached by Wi-Fi links in a standalone network. In a group of node services single/multiple nodes uses different topology and technique with aim to provide time efficient, energy efficient, less delay in network , in its parameter and thus a maximize efficient routing can be proven. Wireless network uses in different application area like DTN (delay tolerant network), VANET (vehicular Ad hoc network) and multiple hardware devices such as Bluetooth, Wi-Fi, and many other wireless technology used in micro hand handled devices.

ROUTING [14-15]: Routing is a process of deciding the best route within the network. Previously, the phrase routing again stated forwarding web railing enclosed by net. Nevertheless, which contemporary perform is healthier nominate forwarding. Routing is performed for most kinds of net, using the call up net (route switching), automated instruction nets (which since the internet), and transportation networks.

The different problems which can raise in packet delivering such as ordering of packet transfer and ordering of packet receiving in MANET. Maintaining the ordering of packet is hard to keep in real network multicast routing. Another issue such as loss of packet while delivering multiple numbers of heavy packets in one attempt or in heavy congestion network, such things additionally causes network packet delay.

Properties of MANET

A MANET is composed of locomotive node—which are big to blend promptly. A MANET is definitely an infrastructure less process of locomotive nodes. Nodes are supplied with Wi-Fi transmitters and customers the use of antennas that are omnidirectional (advertise), highly-directional (case-to-case), maybe steerable, or any consolidation of authority. At obsessed moment in era, primarily based consequent to the nodes positions and feedback from the user's side, mechanically transmitted stages and have obstruct storm, Wi-Fi joined from internally the complete book for multi-hop virtual presentation or ad-hoc internet of the node. It shows the topography can move up to the nodes that can go or re-mold their mechanical transmitted inputs.

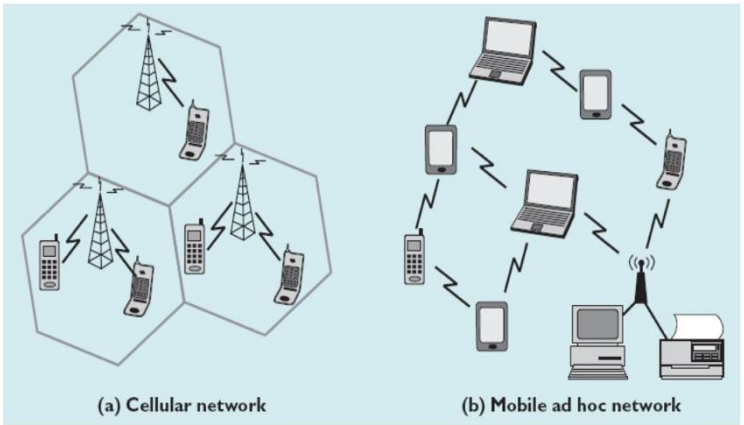


Figure 1.1: Mobile Ad-Hoc Network and Cellular Network.

In the above figure 1.1 the difference between the cellular networks and the mobile ad hoc networks has been shown.

MANETs characteristics:

1) Dynamic topography-: Nodes could be big to flow casually; so, the net topography transforms constantly.

2) Bandwidth-: Wi-Fi combines feeling perform having extensively cut back capacity than their hardwired counterparts. The discover throughput of Wi-Fi telecommunications afterwards thinking about for the result of a couple of thanks to get entry to, paling , buzz, and obstruction circumstances, and a lot of option, is under a radio's such a lot communication evaluate. One final result of somewhat minor to approachconsider the unite capacities is the bottleneck that is generally the pattern rather than the anomaly, which is accumulate petition call for will maybe program or outpace net power on a regular basis. Because the locomotive net is simply an expansion of one's definitive net framework, locomotive specified customers will demand corresponding products and services. These demands will retain to growth as computing and shared networking appeal rise.

3) Energy-: Some or all of one's nodes within a MANET can you will depend upon batteries or more inadequate process for their potential. For those nodes, the maximum vital system design standards for optimization can be energy conservation.

4) Internetworking-: Similarly to the conversation within an ad-hoc network, internetworking among MANET and fixed networks (especially IP based totally) is frequently expected in lots of cases. The coexistence of routing protocols in this sort of mobile device is a task for the harmonious mobility control.

5) Energy consumption-: For most of the light-weight mobile terminals, the conversation-related capabilities must be optimized for lean energy consumption. Conservation of energy and energy-conscious routing have to be taken into consideration. Because the electricity saved is equivalent to energy produced.

II. RELATED WORK

Sudhir T. Bagade and Vijay T. Raisinghani [2] present a multi-metric energy efficient routing mechanism. The main challenge is the energy depletion. It integrates the multi-metric routing scheme into OLSR, a trendy MANET proactive routing protocol.

The proactive nature of OLSR shows that nodes want to periodically receive other nodes weights, in order to compute the path charges and update their routing tables. as a result, it's important to find a way to propagate nodes weights to the network without growing network overhead. A powerful way is to embed this information to the TC packets which might be periodically generated via every node. This does not introduce significant overhead, in contrast to new packets being generated to promote it the weights, and is effortlessly implementable in routing protocols.

OLSR is based on minimum hop routing to proactively decide the next-hop for a specific destination node. The replace of routing tables must be primarily based on the course expenses computed from the nodes weights and no longer at the number of hops. Similarly, routing tables have to include path costs to the sink address instead of the number of hops, in standard OLSR. It defines path price as the sum of weights of the intermediate nodes alongside the path plus a consistent weight, equal to 1, that corresponds to the supply node. It does not consider the receiver's weight, because the energy consumption in the transmission of a packet from an intermediate node is more extra than the power intake of the receiver.

Gurpreet Singh Saini [3] 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.

It modified the MPR selection criteria, and similar and also modified the path determination algorithm. MPRs are a subset of the 1-hop neighbors and it provides access to all 2-hop neighbors of node. For OLSR optimization, reducing the number of MPRs each node selects is key. Determining the minimal MPR set is a NP-tough, but the OLSR RFC indicates a simple heuristic to approximate this minimal set. The heuristic iteratively provides 1-hop neigbnors with connectivity to the most range of two-hop associates to the MPR set until all 2-hop neighbors are protected.

This approach is to iteratively upload 1-hop neighbors with maximal residual power degree to the MPR set till all 2-hop associates are protected. As routes in the long run are construct from MPRs this may avoid nodes with low residual power tiers, until they're the supply or destination. This algorithm modifies the change in the weight associated with each link rather than assigning each link the same constant weight of 1 and assigns it the reciprocal value of sending node's residual energy stage. Again, it needs to penalize routes that traverse nodes with low residual energy level. Using the reciprocal value it has the advantage that the algorithm does not need artificial thresholds to determine when a node's residual energy level goes low and the link must therefore be assigned a higher weight. When the node's energy level decreases, the path determination algorithm tries increasingly harder to avoid such nodes.

Zheng Li, Nenghai Yu, Zili Deng [4] presents Optimization on OLSR Protocol for Reducing TC Packets. Optimized link state Routing (OLSR) protocol is very important routing protocols for mobile ad-hoc Networks. In OLSR, every node uses Topology Control (TC) message in the network. Every individual node uses these records to enumerates routes to all destinations.

OLSR contains a Multipoint Relays (MPR) selection algorithm to lessen the TC packets overheads from marking the subset of neighbors as MPR. The enhancement of the MPR selection algorithm which may take benefit of the original algorithm and introduces a further decision parameter for choose MPR primarily based on neighborhood databases of neighbor nodes prolonged to three hops. The main aim is to reduce in addition of number of TC packets. It is used to pick out MPR by using a simple amendment in OLSR protocol without extra signalling overheads.

In the MPR selection process, source node has limit of visibility to its two hop neighbors. Some time, a particular situation may occur when two candidate nodes have the same choice to become MPR for a source node. It means that two nodes have the same reachability and degree. In this situation, the algorithm chooses randomly one between the two candidates. Or, if it extends visibility to three hop neighbors of a source node, it can identify the best one. This idea is to extend the visibility to a three hop nodes and uses this information when two hop neighbors gives the same reachability and degree. The main idea of this technique is to give more opportunities to nodes for selecting a best MPR set even in case in particular condition.

Yazhou Yuan [5] presents Efficient Localisation of nodes. It presented a recursion dependent localization technique over an ad hoc network composed of wireless nodes. In wireless network structure, if any mobile node wants to find out its own position, then it need to find the nearest two or three reference nodes around itself who possess their localization information so that by utilizing these nodes localization information's, the mobile node would find out its own location.

Localization is classified by two categories that are range-based and range-free. Range-based localization gives the accurate distance between two nodes. In this type of localization special and costly hardware is used for estimating the distances between anchors and nodes. Anchors know their own location and can share this information with the nodes who do not know their location.

In range-free localization, distance estimation cannot be considered; the nodes predict their position with the help of the information, locations gained from the neighbours or anchors. Other nodes can be informed by the anchor nodes about their location with transmitting messages. After the distance estimation process, the nodes estimate its own location with the help of many different methods such as multilateration or triangulation.

Dr. Deepti Gupta [6] 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.

It is a new tree construction approach inside each cluster to minimize the energy consumption of the sensor nodes. It also gives a new approach to maximize the network lifetime by constructing a tree structure in each cluster.

Mona N. Alslaim [7] presents an enhanced MP-OLSR protocol for MANETs. It is a extension of multipath OLSR; a well known proactive routing protocol developed for Mobile Ad hoc Networks. For discovering the multiple paths, MP-OLSR applies the multipath Dijkstra's algorithm. This algorithm acquires considerable flexibility and scalability from using the cost functions, route recovery and loop detection mechanisms in order to increases MANETs performances.

MPOLSR have some drawbacks.

1. Data packets can be distributed into different paths by applying Round-Robin (RR) scheduling algorithm. RR is unable to balance load between heterogeneous multiple paths.
2. Without adaptability to network condition the cost functions return fixed values.

To remove these drawbacks it combines the Weighted Round-Robin (WRR) scheduling algorithm with the MP-OLSR for supporting heterogeneous multiple paths with different hop count. It also proposed a Fuzzy Logic Controller (FLC) to alter the cost functions as function of hop count metric.

SI YU DONG [8] presents QMPR selection depends on fuzzy for OLSR routing protocol. Here 'Q' stands for quality MPR. It gives a more efficient selection of multipoint relays(MPR) in optimized link state routing protocol. MPR selection is the very important function of OLSR protocol. It proposed a fuzzy based routing metric for MPR selection which is based on energy, stability and buffer occupancy of the nodes.

FL theory is totally based on fuzzy sets. It is a set without a crisp and define the boundary clearly.. The fuzzy set may hold a partial part of membership of an element. A membership function can be any curve which defines how each point of

input space is related or mapped to a degree of membership value in-between 0 and 1.

The proposed FL based model reflects on all three factors as inputs and gives a crisp value of quality of a node using the rule base. All inputs must be categories into fuzzy sets viz. Low, Medium and High. The output QMPR is categories as High, Medium, and Low. All possible 27 combinations of inputs can considered to design the rule base.

RupaKamboj [9]presents Energy efficient OLSR routing protocol for mobile ad-hoc networks. It proposed two mechanisms for the OLSR protocol for improving energy and performance of the network. It modifies the selection of MPR that is based on willingness concept. Additionally, it shows that the prohibition of the energy consumption due to the overhearing may expand the lifetime of the nodes without doing any compromise in the OLSR functioning. It gives a novel energy aware MPR selection policy.

This novel property allows energy node can be preserved for longer time. A traffic load balancing between MPR nodes has given.

Marcelo G. Rubinstein [10] presents W3-OLSR-ETX: Wired-cum-Wireless WMN OLSR-ETX for scalable networks. The load balancing in the network and placing the data on the efficient link can improve the performance of the network. It classified the load balancing algorithms in three different categories. It also categorizes the routing metrics in three groups based on key components used to design metric. It also considers the heterogeneous network by using wired-cum-wireless WMN for supporting the hybrid architecture. The load balancing among the mesh routers is given by using OLSR with expected transmission count (ETX) that is OLSR-ETX.

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.

Manish Sharma, Jaspreet Kaur [11] gives Cartography Enhanced OLSR for Mobile Multi-Hop Ad Hoc Network. It presents the integration of a cartography gathering scheme in OLSR protocol to increase the capacity so that it can properly track node movements in dynamic networks. It is called as CE-OLSR. It is designed for multi-hop ad-hoc network. First it gives efficient network cartography collection algorithm which is based on OLSR signalling traffic. It is quite different from topology gathering by seminal OLSR. It shows better responsiveness and cooperates appropriately with the nodes mobility.

Ms. Balwinder Kaur Dhir [12] gives analysis of MP-OLSR in mobile ad-hoc network. It presents a hybrid multipath routing protocol called as MP-OLSR. It is depend on the link state algorithm and enlist periodic interchange of messages for maintaining the topology information of the networks. It uses on-demand scheme to update routing tables. And it forwards the packets in multiple paths which is determine by the source. If it detects any link failure, the algorithm automatically recovers the route. It also uses the redundancy coding to improve the delivery ratio.

It contains Multipath Dijkstra Algorithm which is used to discover the disjoint routes. It also performed the route recovery to forward the packets. It gives better end-to-end delay and load balancing.

Imran Khan [13] proposed a Lifetime and Energy Hole Evolution scheme in to Data-Gathering Wireless Sensor Networks. It gives an analytic model to calculate the whole network lifetime from network initialization until it is completely discharged, and it also calculate the boundary of energy hole into a data-gathering WSN.
It theoretically calculates the traffic load, energy consumption, and lifetime of sensor nodes during the whole network lifetime. After that it examine the temporal and spatial calculation of energy hole, and apply the analytical results to WSN routing to balance the energy consumption and increase the network lifetime.

III. PROBLEM IDENTIFICATION

In existing techniques there are various variants of OLSR are presented. But, in these techniques multiple routes are considered to provide solution. Thus selection mechanism is required to select an optimized route to transmit packet. That process consumes too much time which increases the waiting time to route packets, that increases the delay which degrades the performance of the whole technique. There are multiple links presented to connect one node to other, when an optimized route selected some other shortest route also selected with that which also increases the normalized routing ratio.A new technique is required which resolves all the routing related issues in existing techniques.

IV. PROPOSEDMETHODOLOGY

A one-hop clustering based technique is presented which provides an enhance mechanism to route packet from source to the destination. In this technique a one hop clustering for all the nodes is conducted. Cluster is formed in a manner, each node having one link to the other node to transmit data packet. That reduces the time taken to route packet from source to the destination node. Because it takes small span of time to select

optimized route to deliver packet from source to the destination.
In that technique first cluster head for the cluster is performed, to select cluster head a hello message from one cluster is broadcasted, replies for that broad casted message are counted which comes from the various nodes. Then a comparison for the last information sent by different nodes is conducted. If two nodes information matched then a check for the speed of the nodes is conducted the node having higher speed is selected as a cluster head.

Cluster head notification. :

- Broadcast hello packets in network (Weight).
- Receive replies.
- Put packet in a table [Wi].
- if (W < a [Wi])
- Wait for Cluster Head Declaration
- Else
- Broadcast its address as Cluster Head

PSEUDO CODE:-

1. Start
2. Clustering the nodes on the basis of one hop to the other node.
3. Select cluster head using cluster head selection mechanism.
4. Send data-packet and compare the properties of the cluster head address and input file source address if match found then that packet is consider to deliver to the destination. Otherwise discarded.
5. Then send that data to the destination.

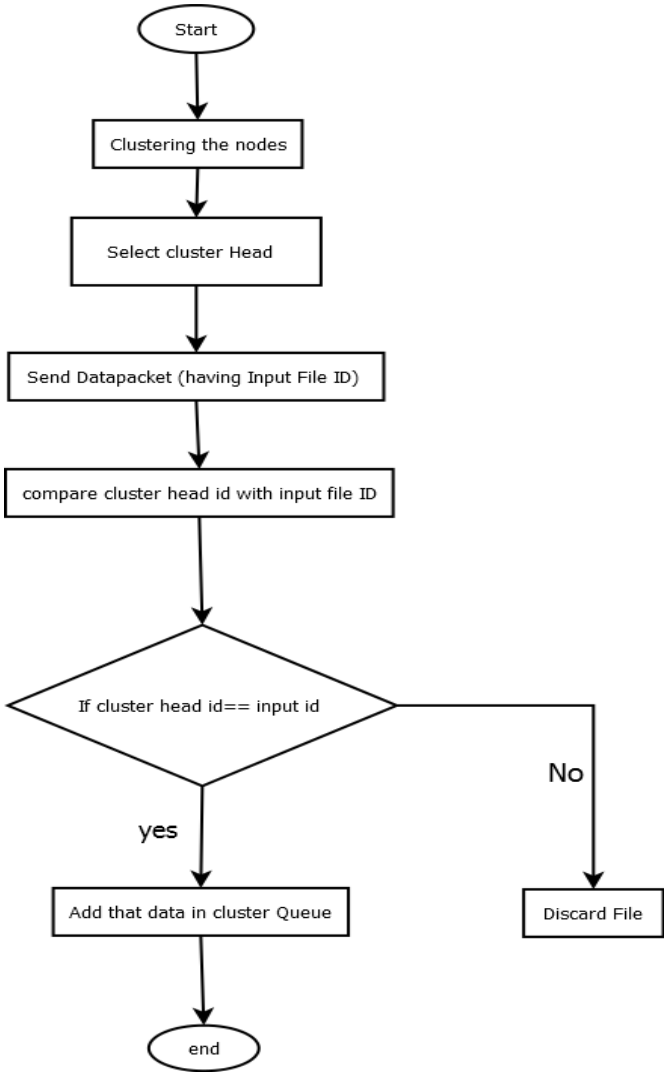


Figure 1.2: Flow Diagram for proposed technique.

In the above flowchart the proposed technique is shown.
In computer network, open-source event-driven simulator is invented especially for research called as NS2. Considering its establishment in 1989, NS2 possess continuously won incredible attention from industry, academia, and government. NS2 contains of modules for numerous network additives including routing, transport layer protocol, software, etc. to analyze network performance, researchers can easily use scripting language to configure a network, and perceive consequences generated by way of NS2. NS2 is emerged as the most commonly used open supply network simulator, and one of the maximum extensively used network simulators. Maximum research desires simulation modules that are beyond the scope of the integrated NS2 modules.

V. RESULT ANALYSIS

A comparison analysis for the results for existing and proposed technique is shown in this section.

Evaluation Parameter

Normalized routing load, PDR (Packet Delivery Ratio), throughput, end-to-end Delay and energy are used to evaluate the performance of the technique.

Normalized Routing load:- Routing load over the various nodes is in MANET is measured to manage the routing load in MANET.

Throughput:- It is the measure of whole performance of the technique which measures the performance of the techniques.

PDR (Packet Delivery Ratio):- It is the ratio of, no. of packet accurately delivered to the to the destination.

Average Delay:- It is measure of time taken to getting response to deliver packet from source to destination.

1. Packet Delivery Ratio (PDR) Vs Speed

It is the ratio between the number of data received packets by destination and those sent by the sources.

PDR= ∑ Number of packet receive / ∑ Number of packet send

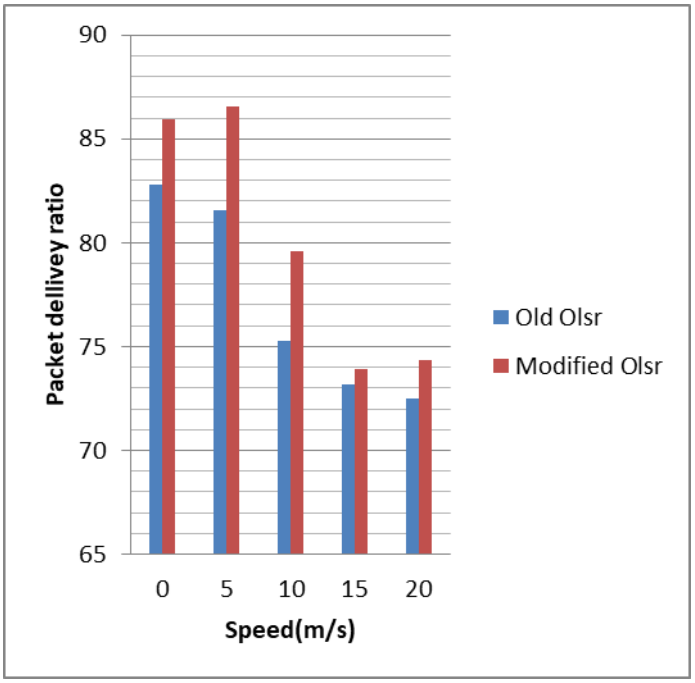
Packet delivery ratio increases because the chance of packet loss due to path breaks reduces. So it is clear that modified OLSR performs better than the original one.

A statistical for the proposed technique is shown in Table 1.1 That shows numerical value of the results. A graphical analysis for the proposed technique is shown in graph 1.1, which shows a graphical comparison over the techniques.

Table 1.1: Packet Delivery Ratio (PDR) Vs. Speed.

Graph1.1: Packet Delivery Ratio (PDR).

In the above graph the packet delivery ratio has been calculated.



In the above graph the packet delivery ratio vs. speed are shown for OLSR and modified OLSR.

2. End-to-end Delay Vs Speed

It is the time taken for a packet to be transmitted in the network from source to destination. Because of clustering and central coordinator delay is decreases of modified OLSR as compare to the existing OLSR.

Speed(m/s)	OLSR	Modified OLSR
0	82.77	85.93
1	81.54	86.54
5	75.27	79.60
10	73.19	73.89
15	72.49	74.33
20	69.59	75.49

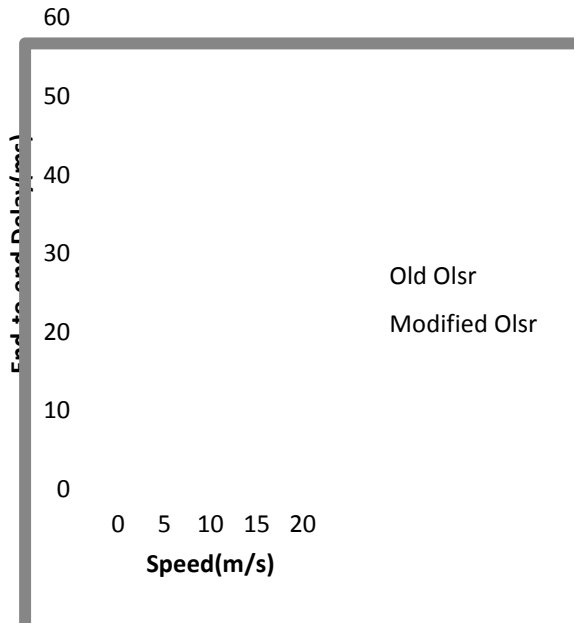
End-to-end delay= ∑ (arrive time – send time) / ∑ Number of connections

Table 1.2: Average Delay Vs. Speed

Speed(m/s)	OLSR	Modified OLSR
0	29.20	25.41
1	20.84	19.42
5	24.95	23.15
10	45.12	41.17
15	56.20	55.65
20	69.96	69.03

In the above table the average delay vs. speed has been calculated in OLSR and modified OLSR.

Graph 1.2: End-to-end Delay Vs Speed



In the above graph the comparison of the old OLSR and modified OLSR is performed.

3. Throughput Vs Speed

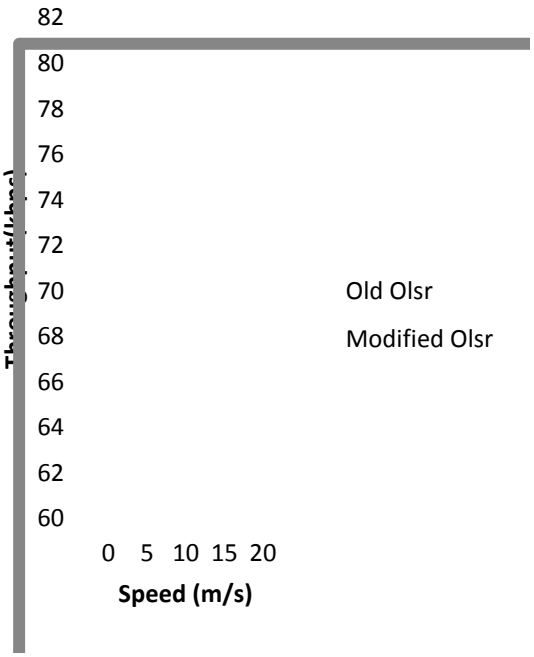
Network throughput is the average of successful message sent over a communication network. This data can be delivered over a physical or logical link.
Transmission Time = packet Size / Bandwidth (sec)
Throughput = packet Size / Transmission Time (kbps)
Because PDR increases, the impact of it clearly shows on throughput that increases too.

Table 1.3: Throughput vs. Speed

Speed(m/s)	OLSR	Modified OLSR
0	76.89	78.46
1	77.27	80.00
5	73.26	75.60
10	70.32	71.63
15	67.47	69.44
20	61.28	62.81

In the above table the calculation over the modified and the OLSR is performed in m/s.

Graph 1.3: Throughput Vs Speed.



In the above figure the calculation of the speed in m/s is done.

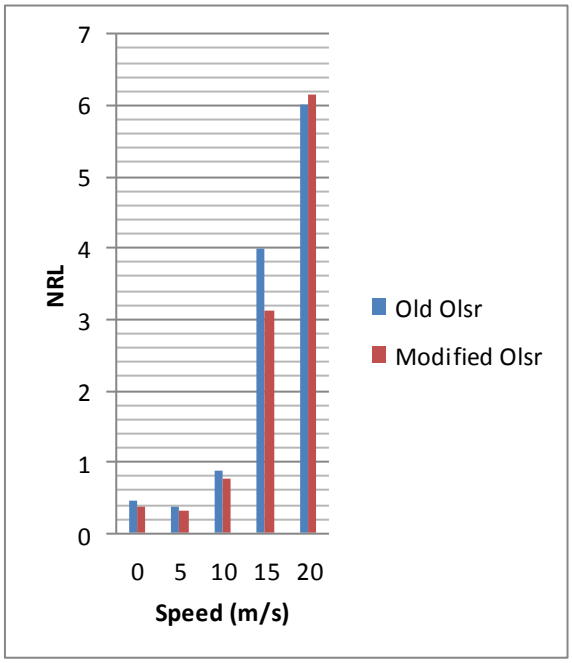
4. Normalized Routing Load (NRL) Vs Speed

Normalized Routing Load (or Normalized Routing Overhead) can be defined because the entire variety of routing packet transmitted per info packet inside the network. It may be determined by dividing the equal variety of routing packets transmitted (includes expressed routing packets also) individually all variety of info packets collected. This is all ends up in enlarge in NRL.

Table 1.4: Normalized Routing Load Vs Speed.

Speed(m/s)	OLSR	Modified OLSR
0	0.46	0.37
1	0.37	0.33
5	0.89	0.78
10	3.99	3.11
15	6.02	6.16
20	4.04	3.99

In the above table comparison is performed.



Graph 1.4: Normalized Routing Load Vs Speed.

In the above graphthe calculation is performed over the normalized routing vs speed.

A description over the implementation scenario to implement proposed technique and evaluation of the results of one's approach is presented during this division. On the decision conferred in grow opinion part, decision ever each of the framework shows that fact, proposed approach provides enhance follows as equal to the existing approach.

VI. CONCLUSION

MANET help in efficient communication and finding an energy efficient packet delivery to the end nodes. Different path selection algorithm are proposed in the past which help in next hop node selection and then finding a feasible nodes to make overall energy utilization. This help in finding optimal path and communication. This paper discussed the proposed algorithm and present the efficient result obtained while packet transmission between the nodes. The further work can be done by implementing current algorithm in vehicular network and IOT real time application.

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