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Multicasting Node Selection Technique for path establishment in VANETs

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Abstract: The vehicular adhoc network is the decentralized in nature. The efficient routing technique is required for such network to establish path from source to destination. The location addict routing is the broadcasting routing protocol which gather network information for path establishment from source to destination. In this paper, multicasting technique has been proposed which select multicasting nodes on the basis of distance and stability. The simulation of the proposed algorithm is performed in NS2 and it has been analyzed that proposed algorithm performs well in terms of various parameters
Keywords: LAR, Reactive routing, Multicasting

I. INTRODUCTION

The vehicles are present in the networks which form the nodes of the network in the vehicular ad hoc networks. This type of network is known as the vehicular ad hoc network. The communication which is done in between the vehicles is carried on for the purpose of safety of the driver as well as his comfort. The sub-class of the mobile ad hoc networks is the vehicular ad hoc networks which differentiate the approach which hold the transport system. Each vehicle has to have this important facility. This type of network provides vehicle to roadside wireless communications across the network. This type of network is an autonomous network which also includes self-organizing the wireless communication of the network [1]. The nodes in the VANETs consider themselves as servers or clients which exchange the data across the network. The information is shared to and from the nodes which is substantially important. There are three broader categories of the VANETs [2]. These are pure cellular, pure ad hoc and hybrid. Following are the applications of VANETs:

Safety applications: For the purpose of decreasing the road accidents the safety applications are used. Due to the applications of such technology, the loss of lives of people using the vehicles is done. Due to the collisions of vehicles there have been many accidents occurring across network. For the purpose of avoiding collision the class of application provides active road safety which guides the drivers with important information at exact times.

Car speed warning: Protocols are used for the purpose of providing a combined GPS and digital maps facility to the users which will decrease the treat level for a driver which is arriving at speed.

Traffic signal violation warning: if there is any driver which causes a threat of running over the traffic signal, there will be a warning imposed to the user. A message will be sent once the decision is made by keeping in consideration the traffic signal status, the position of the vehicle and its approaching speed [4].

Collision risk warning: The possibilities of collision are detected by the vehicles and the RSU amongst various numbers of vehicles which are unable to communicate with each other. The information about the vehicles that are approaching toward the opposite direction as well as the ones reaching the destination.

Lane change warning: Within a roadway lane the positioning of the vehicle is checked and monitored. If at any instance it is not safe to change the lanes, the driver is notified regarding that.

The routing is the major issue in the vehicular adhoc networks due to self-configuring nature of the network [5]. The routing protocols are AODV,DSR and DSDV

A. DSR (Dynamic Source Routing)

On the basic idea of source routing, the on-demand routing protocol known as DSR is formed. The route caches of the network are maintained by the mobile nodes. They contain the source routes which are well known by the mobile. When the new routes are learned in the network, there is a proper updating of the route cache regarding those paths. There are two phases in the network which are route discovery and the route maintenance. The node first consults the route cache before sending the nodes to destination. This is done to make sure that there is already no path assigned to the data. If not done so, the path now assigned will be

followed by the packet. The destination address is present at the route request message which also has the source node address along with the unique identification number [6].

B. AODV (Ad Hoc On-Demand Distance Vector Routing)

It is distance vector protocol. In this process source nodes send message to a few destinations it initiates a path discovery process to locate the other node. A route request (RREQ) packet is sent to the neighbours by it. This process continues of forwarding the RREQ until the destination node arrives which holds a new destination with fresh nodes. There are some destination sequence numbers which are used by the AODV. They ensure that all the routes have no loops and also have the latest information about the route. Every node maintains its own sequence number and also broadcast ID. A while later RREP message is unicast. This is done by the destination to the originator of the RREQ.

C. DSDV (Destination-Sequence Distance-Vector Routing)

It is also known as a table-driven routing protocol and it needs each node to advertise whether which node is ready to its neighbour. A route sequence number is provided to the route information, the destination distance in hops and the sequence number of information received. The destination is provided as final from the current destination only.

D. LAR Routing in VANET

The vehicular communications are made to be more challenging due to the fact that there are various characteristics of the location based routing protocols. The networks are divided into three broad categories which are cellular, ad hoc and hybrid. Infotainment which includes latest new, or the information of the locality, is supported by the cellular network. The vehicle to infrastructure model is the basis of this category. A wide range of vehicular applications are supported by the present infrastructure. There is however, still a need of a fixed infrastructure deployment due eliminate the drawbacks found [7]. The ad hoc networks which do not require any prior infrastructure help in reducing the drawbacks identified. This is more prominent in the vehicle to vehicle communication. However, due to the network partitioning, routing link failures as well as the rapid topology changes, the network faces many challenges. The access points are deployed along the road in the network as a solution to the problems notified. In networks where there is no issue regarding the energy consumption also, this solution is opted. In the case of hybrid communication, there is a centralized architecture based cellular network in which the traffic information is gathered from the road with the help of access points. The acquired information is processed by the access points and is used by the drivers as per the requirement. In the traditional routing protocols, the performance of the network is degraded by the dynamic nature of the vehicular communication, the high speed of the vehicles as well as their mobility. The issues of the mobile ad hoc network are highlighted by the traditional ad hoc routing protocols. These are applicable for the MANETs due to the fact that they lack the high mobility and dynamic nature which is present in vehicular communication. The position-based routing protocols have proved to be more prominent for the highly dynamic and mobile networks.

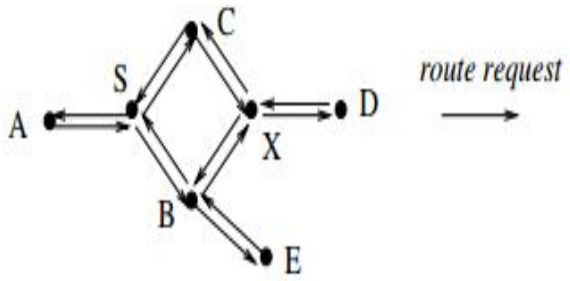

Fig 1: LAR routing algorithm

In this figure 1, there is a need to distinguish a route from S to D. For this reason a route request is sent to the neighbours by the node S. The B and C nodes are the neighbours and so when they receive the route request they send it to all the other nodes present in the network. The route request is forwarded by the node X when it receives it from B. When node C send the similar route request to node X, the request is discarded. The route request packet holds the path which is followed by the request when it is forwarded to various nodes in the network. The flooding algorithm is used here along with the confirmation that the destination

provided is reachable from the sender node. Keeping in consideration all such things, the route request message is sent. A route reply message is sent back to the sender, once the route request is received. The path is followed which is achieved by reversing the path which was followed by the route request provided to D.

There is a chance that there is no route request message received by the destination. This can be possible for reasons such as the sender is far enough or the route requests are not found due to errors in the transmission. The route discovery should start from the beginning in such cases. This is the reason that the timeout is provided to every request sent by the sender. If within a certain time interval provided by the sender the route reply is not achieved, the new route discovery begins. The sequence number used here is completely different from the one provided earlier. The multiple receptions of a similar route request are to be identified once the route reply is not received and there is need to identify a new route. The previously assigned sequence numbers are to be recalled for this purpose. The timeout conditions occur when the route reply is lost from the destination or the route request is not at all received. When the sender node S identifies that any already used route node to node D is broken, the route discovery gets started. It is also possible when there is no knowledge about the route to destination path by the source.

The node S realized that the route is broken in the implementation. The route is accepted to be utilized at certain instant of time. To a particular route when the packets are sent by the node S, a route error message is returned by the node on that path. Route discovery is initiated for the destination when the node S receives a route error message. It should be taken care that the route request is sent to every node which is in reach from the node S when the algorithm is used which basically means that all the nodes in the network must be sent the request. The number of nodes which receive the route requests that are propagated, attempt to decrease the number of nodes.

II. LITERATURE REVIEW

Rakesh Kumar and Mayank Dav (2012) represent a paper based on the VANET vehicular ad-hoc networks are upcoming wireless network environment for intelligent transportation system. In the VANET applications build upon the data push communication model where information is disseminated to set of vehicles. There are so many types of VANET applications and their communication protocol needs a systematic literature survey. In this paper mainly define the VANET applications based on the various broadcasting data dissemination protocols are surveyed separately and their fundamental characteristics are revealed. At the end of this paper comparison of all the protocols [8].

Rakesh Kumar, Mayank Dave represents a paper in (2011) on vehicular ad-hoc network is subclass of mobile ad-hoc network which provide a distinguished for intelligent transport system (ITS). According to the survey it is very necessary to use the ITS with the help of VANET routing protocol. In paper also discuss the advantage and disadvantages, applications of different routing protocols for vehicular ad-hoc networks. This paper also explores the motivation behind the designed and traces the evolution of this routing protocol. At last this paper also show the tabular comparison with various routing protocols for VANET [9].

Aswathy M and Tripti represent a paper in (2012) on vehicular ad-hoc network are special kind of mobile ad-hoc network (MANET). This paper defines the vehicles on road as nodes of network. With the help of VANET give us many applications as an intelligent transportation system. In the dynamic network architectures and node movement characteristics differentiates VANETs from other kind of ad-hoc networks. The dynamic change in topology shortens the effective time of routing. Routing in the VANET is quite complicated task. AODV (ad-hoc on demand distance vector) mostly used in the topology based routing protocol for VANET. During the process of route discovery process AODV broadcast route message (RREQ). It creates many unused routes between a source and destination node. This paper main aim to improving the performance of AODV by enhancing the existing protocol by creating stable clusters and performing routing by cluster head and gateway nodes [10].

Patil V.P (2012) represent a paper on vehicular ad-hoc network is a type of mobile ad-hoc network where nodes are constrained to move along the road. In the VANET all the devices communicate with the help of radio devices with each other and along with the road side units called the base stations. Vehicular networks aims to make the driving experience safe, efficient and enjoyable. Vehicle traffic congestion is reflected as delays while travelling, it also have a number of negative effects and create a major problem in the society. There are so many technique has been given to deal with this problem. In this paper suggest more innovative approach to deal with this traffic congestion problem using the characteristics of vehicular ad-hoc networks (VANET). This system is developed and tested using the AODV protocol od ad-hoc mobile network to deal with the problem of vehicle traffic congestion in vehicular network. Traffic congestion can be measured on following patterns like packets broadcast, percentage of packet delivered and percentage of traffic diverted and overhead to manage the problem of data traffic in the network. In the main simulation shows the domain of vehicle traffic congestion in VANET is demonstrated [11].

Reena Dadhich (2011) represents a paper in on VANETs vehicular ad-hoc networks have been recently attracting an increasing attention from both research and industry communities. VANET technology is distinguished from mobile ad hoc networks (MANET) and wireless sensor networks (WSN) by large scale deployed autonomous nodes with abundant exterior assisted information, high mobility with an organized with constrained pattern, change in frequency, topology leading to frequent network fragmentation with varying drivers behaviour factors. This paper also introduces the realistic vehicular mobility model and evaluates the performance of following routing protocols: AODV, DSR and TORA. It also introduce the different highway scenarios, characterized by the mobility, load and size of the network also be simulated. Result indicates that the reactive routing protocol performance which is suitable for VANET scenarios in term of packet delivery ratio, routing load and end to end delay [12].

III. PROPOSED ALGORITHM

The Location addict routing is the broadcasting nature protocol in which source node flood route request packets in the network to establish path to destination. The nodes which are adjacent to destination will respond back with the route reply packets. The source selects best path from source to destination on the basis of hop count and sequence number. The path which has minimum hop count is considered as the shortest path and path which has maximum sequence number is considered as most reliable path. In this work, multicasting algorithm is proposed which establish from source to destination using the multicasting nodes. The multicasting nodes are selected on the basis of two parameters. The vehicle nodes are highly mobile in nature. The node which has maximum stability and least distance from the other nodes is selected as multicasting nodes. The source and destination nodes are defined in the network and source wants to establish path to destination. The source node will send the route request message to the multicasting node and multicasting node will check the destination node in their list. When the multicasting node has destination node in their list then it will respond back to source node with the route reply packet otherwise it will forward the request to other multicasting node. The defined procedure will be repeated until path from source to destination will be established.

Proposed Algorithm
Input : Vehicle nodes, source, Destination
Output: Path from source to destination
Deploy vehicular adhoc network with the finite number of vehicle nodes
Make multicasting nodes ()
Traverse each node in the network
check the speed of each node in the network
Check distance of each node from the other nodes
The node which has minimum distance and least speed is selected as multicasting nodes
Establish path ()
The source node sends the route request packet to the multicasting node
The multicasting node check the destination node
If (destination node lies in the list of multicasting)
Multicasting node reply back to source node with the route reply packet
else
Multicasting node send request to other multicasting node
Repeat step 3.3.3 until reached to destination
The source transmit data to destination on the established path
End

IV. RESULTS AND DISCUSSION

The LAR is the routing protocol which establish path from source to destination using the broadcasting technique. The multicasting technique is proposed in this paper, for the path establishment from source to destination. The proposed algorithm is simulated in NS2 and performance is tested under various parameters

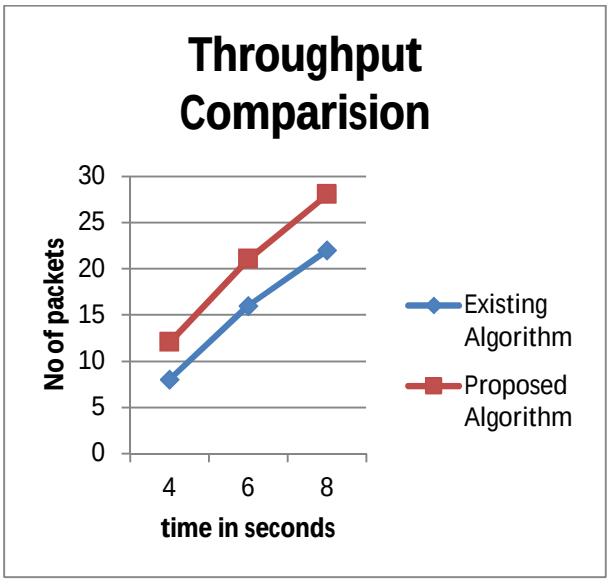

Fig 1: Throughput Comparison

As shown in figure 1, the performance of proposed algorithm and existing algorithm is compared in terms of throughput. Due to multicasting nature of the network, throughput is increased at steady rate.

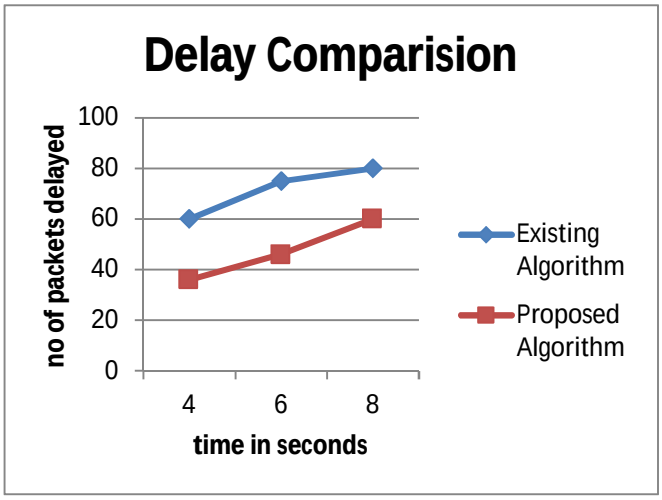

Fig 2 : Delay Comparison

As shown in figure 2, the proposed and existing algorithms are compared in terms of delay. It is been analyzed that due to multicasting in the proposed algorithm delay is reduced in the network

V. CONCLUSION

In this paper, it has been concluded that vehicular adhoc network is the self configuring network due to which routing is the major issue in the network. The LAR routing is the broadcasting nature protocol for path establishment which increase delay in the network. The multicasting technique is proposed which select the multicasting nodes in the network. The multicasting nodes are responsible to establish path to destination. The simulation of proposed algorithm is performed in NS2 and it is been analyzed that network delay is reduced in the network.

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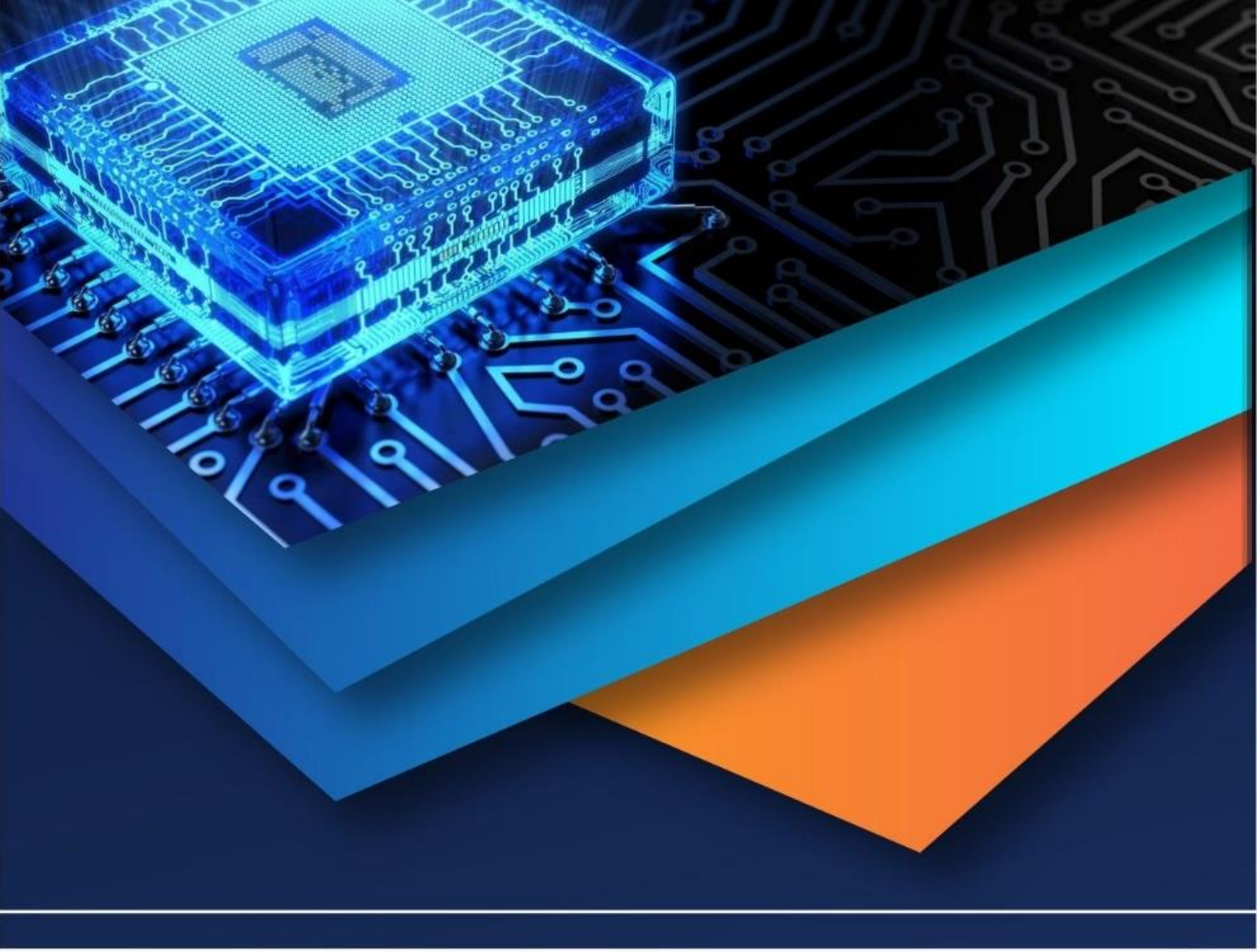

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