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MULTICASTING SCHEME FOR PATH ESTABLISHMENT IN VEHICULAR AD HOC NETWORKS

Ramandeep Kaur , Rachhpal Singh

M .Tech (Scholar) , Assistant Professor
Department of Computer Science and Engineering , PURCITM ,Punjabi University,(Punjab)India

Abstract
The vehicular adhoc network is the type of network in which nodes are free to move from one point to another. In this, two types of communication takes place that is vehicle to vehicle and vehicle to infrastructure. The path establishment is the major issue of concern in vehicle to vehicle type of communication. In this paper, multicasting routing protocol is introduced for the establishment of the path from source to the desired location. the simulations are performed by using NS2 and shows various improvement in the network delay.

KEYWORDS: Multicasting, Routing, VANET

Introduction

All across the globe, several researchers from industry as well as academia are attracted. In order to enhance the safety of vehicles on roads, the traffic efficiency as well as the level of comfort for commuters, Vehicular Adhoc NETworks are utilized. The vehicles are known as nodes within the VANETs and the edges within the network are considered to be the distance between these vehicles on roads. A wireless medium is used in order to accept and transfer the messages amongst vehicles. Handling the safety of vehicles is another important application of VANETs [1]. In case a vehicle detects a road accident for instance, the neighboring vehicles available within that system are informed regarding this accident. However, the most important factor to be taken care of here is that every neighboring node receives these safety messages within the limited time duration without the occurrence of delay. Lives could be lost in case a single event-driven message is lost or there is delay of safety message. The development of dynamic routing protocol is one of the major challenges faced during the design of vehicular ad-hoc networks. The information from one node can be disseminated to another with the help of this protocol. Due to the highly dynamic and continuously changing topologies, there have been several changes made within the routing in VANET recently as comparison to other traditional approaches [2]. Within VANETs, few previously designed protocols for MANETs have been tested. The manner through which the delay related to passing information from one node to another can be minimized is the major challenge here. The real time applications for VANET scenario can be implemented by overcoming these challenges within MANET protocols. There is also a need to carefully examine other implications as well. The unpredicted and dynamic nature of vehicular network topology can be handled by routing protocol by examining the dynamic characteristics of VANETs. The identification and maintenance of optimal paths of communication within the required scenarios is the most difficult task to be performed within VANET routing [3]. As per the topology being used within network architecture, the routing protocols in VANET are linked. Further, whenever there is a change in network topology, the performance is modified. Another important area of research is the broadcasting in vehicular ad hoc networks (VANET). The confinement of routing problem for vehicle-to-vehicle (V2V) scenarios is one of the challenges faced due to the confinement of routing problem. For current car manufacturers, the safety and transport efficiency is very important to be maintained at fundamental level. The cars on road are used to provide this facility in opposition to the utilization of existing wireless communications design. A new routing protocol for broadcasting in VANET is required for applications provided within real-world constraint. Due to the availability of efficiency and mobility in dynamic scenarios such as VANET, there most popular research areas are the multicast routing protocols [4]. As they send multiple copies of messages to several vehicles simultaneously, the power consumption, transmission overhead and control overhead are minimized by multicasting. From a single sender to multiple destinations or group of interested nodes, the messages travel within the multicast routing protocols. The messages are transmitted to group of intended vehicles within the VANET multicast routing protocols [5]. Flooding, Tree-based, Mesh-based and Overlay-based approach, are the classifications of multicast routing methods. The messages are broadcasted through the network similar to a chain reaction through flooding. The messages are forwarded to all its neighbors except for the sender, by each node. Within the desired geographical region, the limitation to messages being broadcasted can be done. Thus, only when nodes lie within particular geographical region, the message is rebroadcasted by those nodes. It is very easy to implement the flooding algorithm. In order to transmit the messages, traditional multicast protocols utilized the tree topologies [6]. This is used to ensure that an efficient distribution topology is provided and it is not

a major concern to ensure robustness here. The source-based and shared-tree-based are the two different types of tree protocols. When there is increment in number of sources because of the high control overhead, the performance of tree-base and mesh-based protocols are minimized. The updating of routing structure needs to be maintained by these protocols thus resulting in higher number of collisions as well.

Literature Review

Anurag Shrivastava, et.al (2018) presented the main focused on the road side unit (RSU) for which it is required to improve the efficiency of energy and its throughput. They proposed an improved multicast based energy efficient opportunistic data scheduling algorithm in this paper. With the help of this method optimum data rate and optimum number of users having good channel conditions are estimated foe which it is required to know the state of channel information at the transmitter [7]. This proposed method also estimates the maximum throughput accurately and with low search complexity. The flexibility of the algorithm was tested in this paper by performing simulation on two different cases. First case is no new user is entertained until all the initial users get served and second, in every time slot there is entry of new users.

Shaffy Singh, et.al (2017) presented the movement of vehicles is not dependent on the driver when they moves from one location to another within the network is known as the vehicular Ad hoc network. They implemented the root node selection technique in this paper in order to reduce chances of link failure. The selection of path done is done using the root node in case node wants to establish path to destination [8]. They discussed the issues related to the routing in this paper and two type of communication is possible. There is reduction in packet loss, delay and increase in network throughput due to the proposed method. They performed various experiments on the proposed method in order to analyze the performance of the network within the network.

Sabri Allani, et.al (2016) presented the wireless communications technologies and low cost embedded sensors have been widely utilized in the VANET network due to which there is improvement in the road safety and transportation efficiency [9]. In this paper, analysis of literature was shown and the effective approaches were highlighted that was not able to fulfill the essential requirements due to which they are no more utilized. They proposed a new infrastructure-less Geocast protocol in this paper that eliminates all the previous limitations. Vehicles present in the Zone of Relevance only received message from this proposed method with a minimum overhead cost. On the basis of experiments, it is concluded that proposed method has minimum overhead cost while provide the high delivery ratio as well as a high Geocast precision. It is also demonstrates that as compared to other methods proposed method provide effective and efficient performance.

Xiu Zhang, et.al (2016) presented that within the wireless communications, higher attention has been paid towards the vehicular ad hoc networks (VANETs). For constraining multicast routing issue, the quality of service (QoS) is provided through this paper. A NP-complete issue is found here and it is seen that in comparison to classical algorithms, the swarm intelligence algorithms are better [10]. For handling such issue, a micro artificial bee colony (MABC) algorithm is proposed. For a continuous optimization issue, multicast routing is abstracted. Further, with MABC, this approach is linked to achieve better performances. Using three instances, the numerical simulation is implemented on a traffic environment. An optimal route is achieved as per the results achieved using MABC algorithm. Even though there is less frequent change in the network structure, the routing framework is possibly applied in real time.

Amarpreet Singh, et.al (2015) presented the bandwidth plays an essential role in any algorithm, due to which they proposed a multicasting based protocols in this paper by which bandwidth can be conserved efficiently. The performance of VANETS has been improved by the protocol known as Bandwidth Efficient Acknowledgment Based Multicasting Protocol (BEAM). This approach reduced the transactions of number of in network messages due to which bandwidth is utilized efficiently in an emergency situation [11]. The limitations of existing BEAM protocol has been overcome by the new proposed method. As per done simulation results, proposed method was compared with existing approach in terms of Throughput, PDR and Routing overhead when compared with BEAM protocol.

Hamza Toulni et.al (2015) presented that through high mobility vehicle, the characterization of VANET networks is done. Thus, within short time duration, a vehicle can join or leave the network. On the basis of ontologies and traffic information, they proposed a new approach in this paper by which packets transformation from source to destination can be done easily [12]. The delivery time and optimize routing issues has been reduced by this approach, it also improve the performance and service of road. The complex saturations are not resolved by the proposed approach. Several different concepts will be added in this approach in order to make it more effective and efficient. In order to show the effectiveness of the proposed method, they build a platform in this paper for the validation purpose.

Research Methodology

It is important to increase the lifetime of a route for improving the overall performance of protocol. For this, improvement is made in the stability of route available between source and destination. It is important to choose the nodes that participate in the route request and which travel in the direction similar to the mobility. The nodes that move in completely opposite directions create routes which can be broken easily as compared to the nodes that move in similar direction. Due to this reason, the above mentioned specifications are important to be considered. Therefore, it is important to consider the factor of choosing the direction of mobility.

1) Direction of movement: In case when a route request needs to be transmitted from node S to node D in time t1, it is possible for S to estimate the area where D is located. However, S does not know about the direction of mobility of destination node which is must. It is not possible to know the nodes that move in direction similar to that of D. In time t1, the direction of mobility of S is known that states that mobility of those nodes is known that move in similar direction. For improving the stability of path amongst source to the destination, a route request packet is forwarded to the nodes that move in direction similar to that of source. When a node receives a route request, it is possible to check the direction of motion in comparison to S. If the route request moves in the direction similar to S, it is retransmitted or else it is neglected. This kind of proposition is added on the basis of constraints of LAR scheme 1 (LAR1).

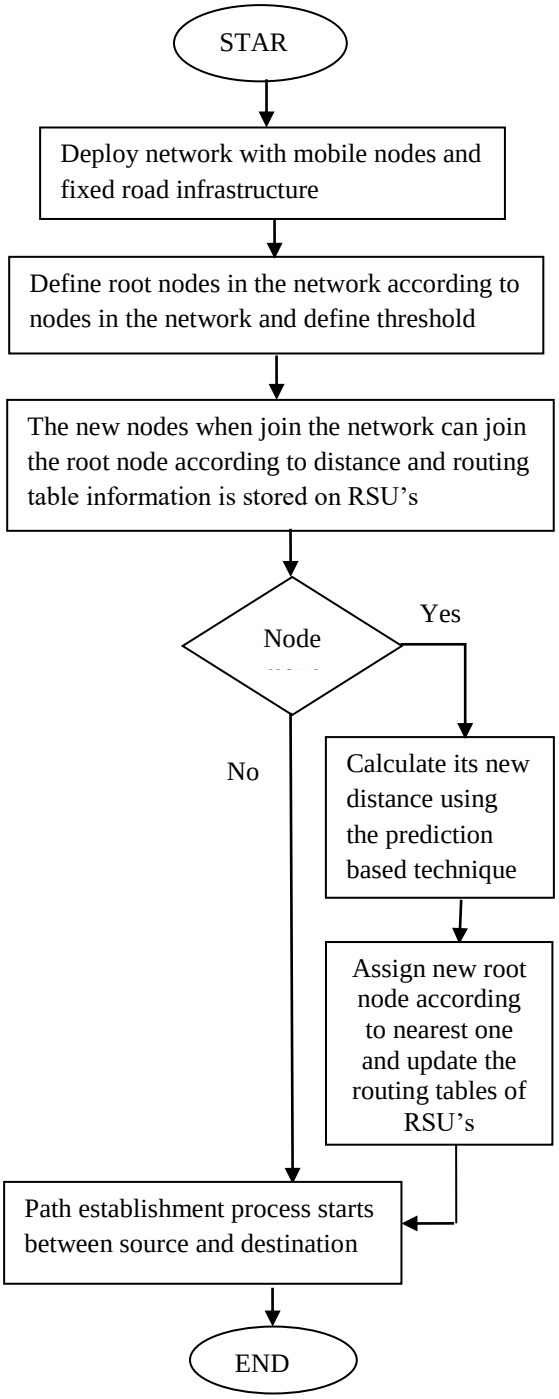

Fig 1: Proposed Flowchart

2) The neighbor to stay longest time: This step proposes to forward the route request message to the vehicle that has the highest time within the coverage area where data is to be transmitted. It is possible to eliminate the process of transmitting the route request to all the vehicles that are being forwarded in the direction similar to that of the source S. Further, the time is

calculated for which a vehicle stays within the coverage region such that the vehicle is within half-circle of the communication rage that are closer to destination D.

Experimental Results

The proposed work has been implemented in NS2 and the results are evaluated by making comparisons against proposed and existing work in terms of various parameters.

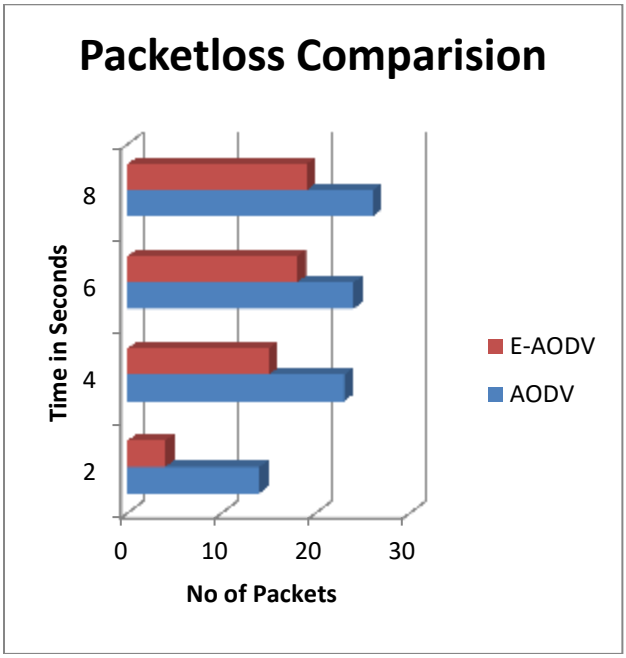

Fig 2: Packet loss Comparison

As shown in the figure 2, packetloss criteria are used to compare the old as well as the new proposed technique. The packetloss is found to be less in the new proposed technique than the already existing technique.

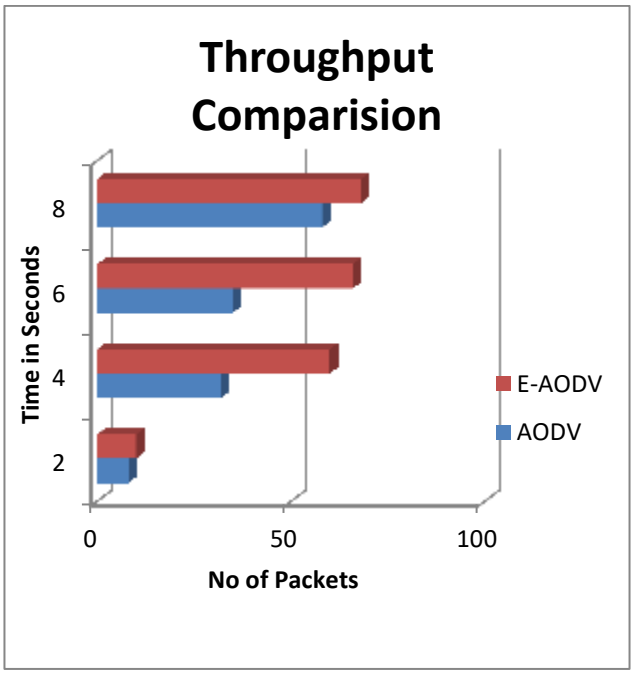

Fig 3: Throughput Comparison

As shown in figure 3, for the purpose of establishing a path the broadcasting technique is used. Also the multicasting technique is applied by the proposed algorithm in the network. Due to this reason, the throughput of the network is increased.

Conclusion

A reactive routing is performed in VANET which opens a route for communication only when vehicles actually need to transmit data amongst each other. The development of Greedy Perimeter Coordinator Routing (GPCR) is done by considering that a natural planner graph is generated by the city street. This mechanism does not need any external static street maps. It is concluded in this research that the major issue of VANETs is to establish a path since the mobility of these networks high and they are dynamic in nature. To establish a path from source to destination, a multicasting technique is proposed in this research. Zonal routing is used to propose this new technique that creates expected and predicted zones by dividing the network. The performance of proposed technique is known to be improved in terms of packet loss and throughput as per the achieved simulation results.

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