A hybrid Dynamic routing protocol for congestion free traffic in Vanets

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ABSTRACT: *Vehicular ad hoc networks (VANETs) are highly mobile wireless networks that are designed to support vehicular safety, traffic monitoring, and other commercial applications. The main benefit of VANET communication is seen in active safety systems that increase passenger safety by exchanging warning messages between vehicles in vanets where the topology change is very high a single protocol is not sufficient to show good performance. Since all the nodes are mobile in nature and the mobility rate is high the links between the nodes gets broken easily. For this purpose already used EG-RAODV (evolving graph based reliable ad hoc on-demand distance vector) method. But it cannot provide better routing solution. To avoid this issue HDRP (hybrid dynamic routing protocol) and beacon message is proposed in this paper, which is use to find the reliable path to control the traffic and for the safety purpose.*

Keywords: Vanet, Hybrid, EG-RAODV, HDRP, Reliable

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1. Introduction

With the rapid development of wireless communication systems, there will be a need for the network deployment of independent mobile users [1]. VANETs are vehicular ad hoc networks. Ad hoc is a collection of wireless node that forms a temporary network. It is the digital communication between vehicle to vehicle communication,[2]-[4] vehicle to roadside communication and inter-roadside communication. These VANETs are used for safety management, traffic management and for the internet services. The moving vehicles in the roadside are considered as nodes and these nodes can communicate with each other. These vehicle nodes are equipped with wireless devices to connect with the other devices fitted in the vehicles. During the communication, the vehicles communicate and transfer the information like road condition, traffic condition.

Each vehicle in the network can send, receive, and relay messages to other vehicles in the network .reliability value is calculated using the location, direction and the velocity information of vehicle along the road. Unlike Normal wireless networks, VANETs have high transmission power, high computational capability.

Due to the continuous dynamic nature the existing protocols and schemes cannot provide better routing solution to these networks also it having the poor reliability. We propose hybrid dynamic routing protocol (HDRP) and beacon message for the purpose of finding reliable path to control the traffic and for the safety purpose.

The following paper includes: Section 2 Routing protocol, Section 3 AODV Routing ,Section 4 Existing and proposed system, Section 5 Simulation, and Section 6 Conclusion

2. RoutingProtocols

In VANET, the routing protocols are classified into five categories:

Topology based routing protocol
Position based routing protocol
Cluster based routing protocol
Geocast routing protocol
Broadcast routing protocol

2.1 Topology based routing protocol

These routing protocols use link information that exists in the network to perform packet forwarding.

They are further classified as Proactive and Reactive routing protocol.

2.2 Proactive routing protocols

The proactive routing means that the routing information from source to destination is readily available irrespective of the communication requests. The packets are constantly flooded among nodes to maintain the path and a routing table is constructed and maintained within a node which indicates next hop node towards a destination. The main advantage in these routing protocols is that there is no need for route discovery process, since the destination route is stored in the background. But it provides low latency for real time application [5], it maintains unused data paths unnecessarily, which causes the reduction in the available bandwidth. [6] This is considered as the main disadvantage.

2.3 Reactive routing protocols

A protocol which tries to find routes from source to destination only on-demand fashion. In the Reactive routing protocol, a connection between two nodes is created, only when there is a request from the source. A route is found and it is kept by a route maintenance method until the destination no longer exists. In reactive, when a node wishes to send a packet to a particular destination, a route discovery process is initiated in order to find the destination. The solution for packet routing provided by the reactive routing protocol is cost-effective. However, when routes are requested, nodes need to send out a route request into a large part of the communication network, which could lead to low latency of route response and potentially a large penalty in network resources. A situation like this causes throughput loss in high mobility scenarios, because the packets get lost quickly due to unstable route selection.

2.4 Position based routing protocol

Position based routing consists of set of routing algorithms. They use the property of using geographic positioning information in order to select the path from source to destination. Without any map knowledge the packet is sent to the one hop neighbour which is nearest to the destination node. Position based routing is advantageous since no global route from source node to destination node need to be created and maintained. Position based routing is generally classified into two types: Position based greedy V2V protocols, [5] Delay Tolerant Protocols.

2.5 Cluster based routing protocol

In Cluster based routing protocol the nodes of a wireless network are divided into several disjoint or overlapping clusters. Each cluster elects one node as the head which is called the cluster head. The cluster heads are responsible for the routing process. Cluster heads are able to communicate with each other using gateway node [11]. A gateway is a node that has two or more cluster heads as its neighbours or when the clusters are disjoint, there should be at least one cluster head and another should be a gateway node [7]. The routing process itself is performed as source routing by flooding the network with a route request packet. The routing Overhead in this case is reduced because the communication is done by only cluster heads instead of all the nodes.

2.6 Geocast Routing Protocol

Basically Geocast routing is a location based multicast routing. The main aim of Geocast routing is to successfully deliver the packet from source node to all other nodes within a specified geographical region (Zone of Relevance ZOR). Vehicles external to the ZOR are not alerted, to avoid redundant hasty reaction [9]. Geocast routing is considered as a multicast service within a specific Zone of Relevance. Normally a forwarding zone is defined, where it directs the flooding of the packets in order to reduce

message overhead and network congestion caused by simply flooding packets in the network. In the destination zone instead of multicast routing, unicast routing can be used to forward the packet. One drawback of Geocast is network partitioning and also unfavourable neighbours which may hinder the proper forwarding of messages. The various Geocast routing protocols are IVG, DG-CASTOR and DRG [10].

3. AODV Routing

AODV is a well known topology routing protocol which has a very high packet delivery ratio and low routing overhead[14]-[18].AODV works as follows Whenever a node wants to communicate with another node, it checks in local routing table to find an available path to the destination node. If there is no path available, then it broadcasts a route request (RREQ) message to its neighbourhood. The node that receives RREQ looks its table for a path leading to the destination node. If there is no path then, the RREQ message is re-broadcasted and a path to the originating node is formed that has sent RREQ message. This helps in establishing the end to end path when the same node receives route reply (RREP) message as shown in Figure 2.All the node in the network follows this process until this RREQ message reaches a node which has a suitable path to the destination Node. At the end of this request-reply process a path between source and destination node is created and is available for further communication.

In this way, the originating node that generated RREQ receives an RREP message as shown in Figure 1.

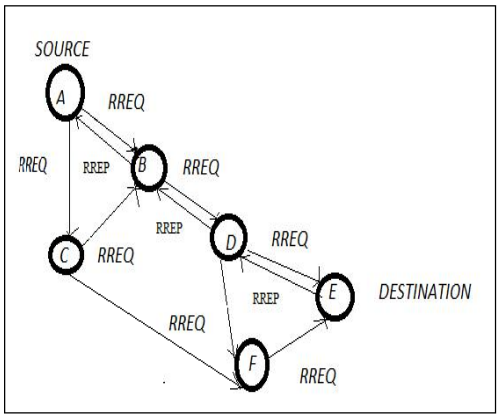

Figure 1. Message routing

To maintain a connection with the sink node is a crucial issue to collect data from networks without any interruption[19]-[21].While networks are typically deployed in abundance, losing the connectivity with the sink node due to frequent path break eventually reduces the quality and efficiency of the network operation.

4. Existing and Proposed System

In the existing system, evolving graph based routing on demand distance vector (EG-RAODV) is used for finding the routing reliability while is used to searching the route from source to destination.EG-RAODV includes the dijikstra algorithm and the prediction algorithm. Dijikstra algorithm is used to find out the vehicle reliability for that it calculate the vehicle distance[22]-[23] ,but it won't send the message to the other vehicle and the second one is the prediction algorithm, by using this algorithm it maintain the constant velocity and speed. Both the dijikstra algorithm and the prediction algorithm should find the shortest path. The main problem of this paper is not providing the security and it has the time delay.

In proposed system, aims to identify the critical road segment and to prevent the traffic jam before it actually occurs for that first we understand the nature of traffic breakdown, which describe the spontaneous drop of the average velocity on a stretch of the road and we have to reduce the traffic congestion with the help of vehicle to vehicle communication.

Each vehicle contains the routing table which includes routing information of vehicle. Emitted beacons are used to analyse the traffic flow and to warn other drivers, after getting this message the driver will select the reliable path, this is high secure based

on the beacon message.

The proposed system shows that the networks first analyse the number of vehicles and it assigns node ID, network ID, routing table. When moving the vehicle it checks its own routing table for path selection, if collision occurs in the destination place means vehicle passing the beacon message to other vehicle, based on the beacon message vehicle change its velocity and identifies the reliable path using routing table. Finally it reaches to destination place.
The proposed system is mainly having three methods. Methods are,

1. Hybrid dynamic routing protocol (HDRP)
2. Beacon message
3. Alternate path

Hybrid dynamic routing protocol
HDRP is used to send the packet (message) from one vehicle other vehicles. So that it reduce the packet loss.

Beacon message
Beacons are used to analyse the current traffic state, each node moving on the same speed, if any vehicle identifies the congestion means it will send the warning messages like green, red and lights to the other vehicle to change their speed

Alternate path
After getting the warning message the vehicle have to decide whether it will select the alternate path or it will reduce the speed. If it selects the alternate path based on the routing table then that is the reliable path. This routing table contains the vehicle ID, speed, event time (start time, stop time), using this routing table network maintaining and monitoring the each and every vehicle.

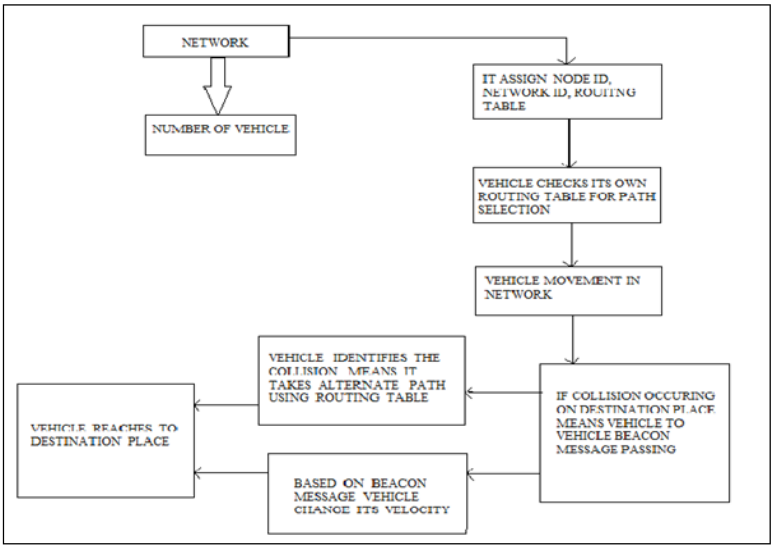

Figure 2. Design flow

Here it shows the data transmission between the vehicles in the network. Each node having their own ID and network ID. Based on the vehicles movement, routing table update the vehicle information. So that it reach the destination. Fig 2 shows the clear information about the data flow. Fig 3 shows the Flowchart of HDRP

5. Simulation

The simulation is carried out using the NS-2 simulator and the x-graph is plotted for various performance metrics like End to end delay, Throughput. Table 1 gives the simulation parameter values.

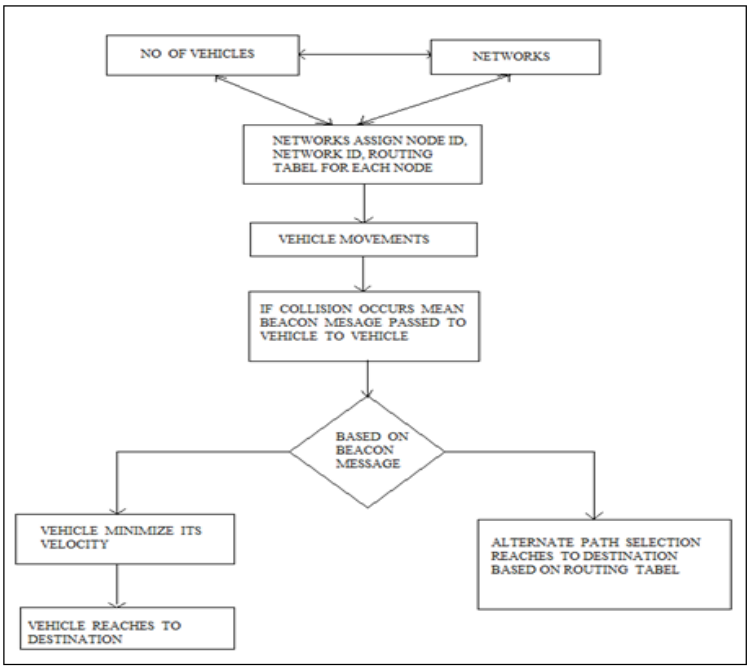

Figure 3. Flowchart of HDRP

Parameters	Value
Routing protocol	HDRP,EG-RAODV
Grid area	1800*900m
Frequency	50hz
Packet size	1000kbps
Mobility speed	900s
Interval time	0.09s
Propagation model	Two ray ground propagation

Table 1. Simulation parameters

The simulated results are shown below Fig 4. Shows the end-to end delay vs. No of nodes. The delay of our proposed protocol is low when compared to the existing protocol each vehicle sends this beacon message for communication purpose. To use vehicle-to-vehicle communication to ease congestion is solely based on beacon messages. Beacon messages are periodically broadcast status messages containing parameters like position of the vehicle, vehicle's velocity and acceleration, a time stamp and a unique vehicle identifier. By periodically emitted beacons to estimate the current traffic state. Vehicles change their driving pattern in dense traffic and intimate the following vehicles. After a vehicle has altered its driving pattern, it is expected to be less likely the trigger of traffic breakdown. This makes our method different from many previous approaches that guide vehicles to less-congested routes to escape congestion which reduces the End-to-End delay in our proposed protocol

Throughput: It gives the overall performance about the vehicular network.

In this proposed work the vehicle will identify the traffic or an accident is occurred by indicating the signal that was passed anyone of the Vehicle ID. So that the vehicle can know that the traffic has been occurred in the specific path. Then the vehicle will take an alternative route to reach their destination by using routing table. That intimation will flow the network maintaining

and monitoring for each and every vehicles. Fig 6. shows that, while using beacon message the packet delivery ratio is high and the non beacon message packet delivery ratio is low.

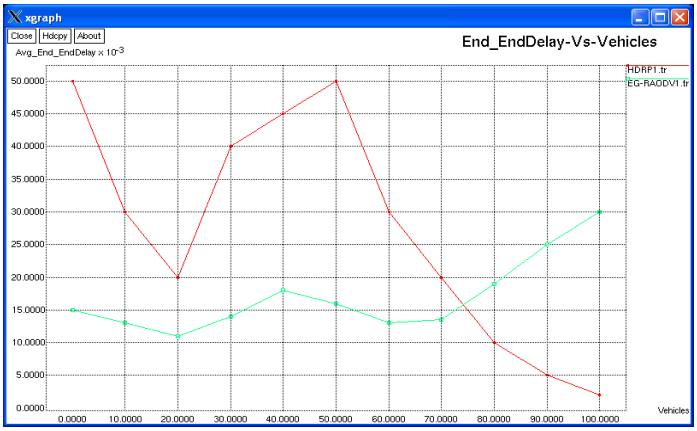

Figure 4. End-to-End Delay Vs No Of Nodes

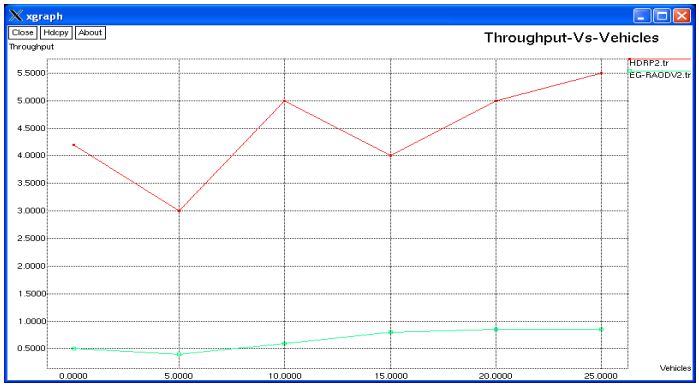

Figure 5. Throughput Vs No Of Nodes

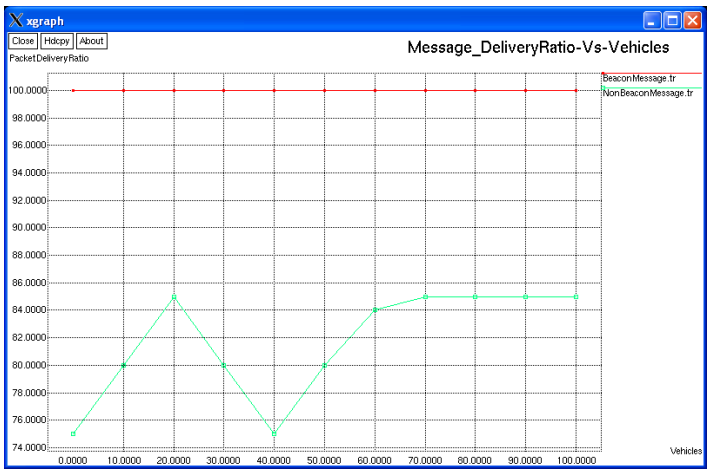

Figure 6. Message Delivery Ratio

6. Conclusion

In this paper we have presented a method to reduce congestion and improve traffic flow based on the use of vehicle to- vehicle communication. The traffic state is estimated periodic beaconing of messages and considering velocity and position. The proposed method makes minimal requirements to the technical implementation. In contrast to several previous studies where choice of route was altered in response to an already existing congestion, this technique becomes effective prior congestion occurs. For this purpose, our approach requires a traffic state analysis that does not only take into account vehicle density by evaluating vehicles' position and velocity, with these information vehicles decide to change their driving pattern. With a sufficient number of vehicles applying our strategy, the original traffic breakdown can be no longer observed. Simulation showed that even low penetration rates suffice to considerably improve traffic flow. With only one in ten vehicles being able to communicate, the raise in move time reduced compared with the case without communication. All of the abovementioned points suggest that VANETs are an adequate means to increase traffic efficiency and to improve traffic state estimation.

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