# A Survey over various Congestion Control Techniques in VANET

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**Abstract: VANET(Vehicular ad-hoc network) is an inter vehicle communication network which is just like mobile ad-hoc network (MANET), in that DSRD (Dedicated short range device) are used to provide a wireless communication network using cars or vehicle and road side units as a node. In that a real time communication is required to update user about the traffic. A congestion control system is required to provide reliable communication for the network. VANET network used protocol to propagate the data packet in network. Algorithms make use of technique and process the data over congestion and other network scenario, thus the different protocols been use to provide the effective services over the nodes. In this paper a survey over the various techniques which used to provide a congestion control system is presented. Here the different author contribution is presented where the following technique proposed by them and further problem formulation over the existing work and proposed work on the existing scenario can be perform is applied.**

**Keywords: - VANET, MANET, DSRD, Congestion control, VANET protocol.**

## I. INTRODUCTION

VANET is analogous to the MANET which used to communicate among the vehicles by the use of wireless network to share information related to the traffic. In Figure 1.1 a demonstration of the congestion control system is presented. In this system DSRD (dedicated short-range devices) are used to provide wireless network for the vehicles, these devices having approximate bandwidth of 5.9 GHZ to 7.9GHZ. To form a VANET these devices are used on vehicles and road side units to form a wireless Network. As shown in the Figure 1.2 satellite communication is also used to update the data about the traffic. So when any emergency event occurs message is send to the nearby vehicles to update about the event. VANET provides a wide range of services like traffic information system which uses to provide the information about the traffic and broadcasted to all the vehicles. An overview of the events (accidents) which are occurs on roads, are presented below in Figure 1.1, a message is broadcasted to inform about the event to the other vehicles, to avoid traffic jam over roads. RSU (Road Side Units) are used to transmit that message, there is a message is transferred to the yellow color car to provide information about the event.

In this paper a survey over the collision and congestion avoidance techniques is presented. in that there are many techniques like braking model, dichotomized headwaymodel, greenwich alogrithm model are used to provide are used to provide congestion control system

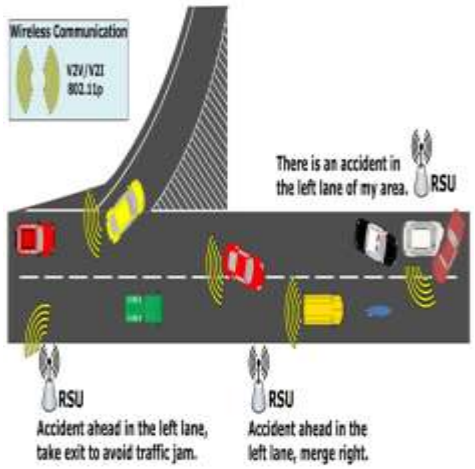


Figure 1.1. Occurance Of Events Which Causes Collision On Road

VANET is one of the influencing areas for the improvement of Intelligent Transportation System (ITS) in order to provide safety and comfort to the road users. VANET assists vehicle drivers to communicate and to coordinate among themselves in order to avoid any critical situation through Vehicle to Vehicle communication e.g. road side accidents, traffic jams, speed control, free passage of emergency vehicles and unseen obstacles etc.

 

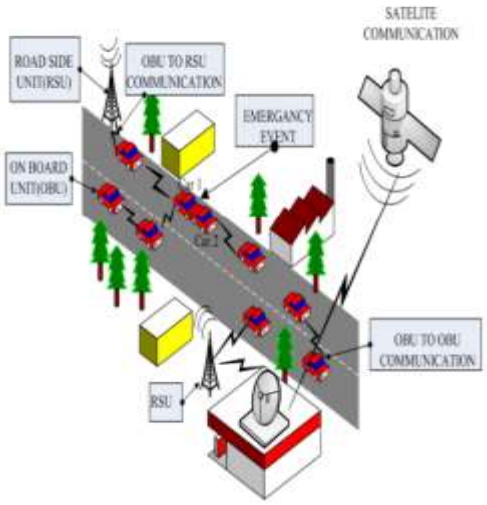


Figure: 1.2 Congestion control system in VANET

Since VANET offers various opportunities to increase network performance, but it also faces various challenges at the same time. The characterization of VANET has rapidly changing topology. In VANET the network is frequently fragmented and the diameter of the VANET networks is small. It has limited redundancy both temporally and functionally. It posses many security challenges apart from other networks. These challenges occur because of the high vehicle mobility, the topology that changes frequently in VANET and the communication link between the vehicles is more complex. Since vehicle travels at high speeds, the link between the vehicles is of short lifetime. The connecting links form in such networks are for less time, this happens due to the high speed of moving vehicles. In such networks, large number of vehicles broadcast the safety messages at high frequency or the event driven messages are broadcast multiple times through which network is easily congested. So it is necessary to control congestion in vehicular ad-hoc networks. The high mobility results into a highly dynamic topology due to which congestion control should be perform at each node of the network. It should be performed in decentralized and self organized way.

## 2. LITERATURE REVIEW

In [1] an analytical model is presented which uses less no of road side units to transfer the warning message for the collision avoidance system. In VANET (Vehicular ad-hoc network) there is the issues like congestion control, continuous change in the topology, there no proper central mechanism is provided. Thus a congestion control system is required that provide an avoidance of the congestion. In this paper an analytical model which uses Dichotomized head way model, the Braking model, and Greenberg's logarithmic model to provide an enhanced congestion control system.

In [2] a decision making system is presented which is used to make decision what data to be consider to avoid the collision. This system works on events and provides information about the accidents and an event based system is used to inform the user when any event occurs. In this system vehicles are divided into three categories in that first category is where those are not affected by the event, second are those who are affected by the event and third are those are affected by the event and can changing their route. In that case all the vehicles are connected with a wireless hardware network and a message should be sent when any event occurs. But there is improvement is required to enhance the performance.

In [3] a secure pre warning collision avoidance algorithm is presented. In that technique a secure framework is provided to transmit message with in I-VAN (inter vehicular ad-hoc network). There are many attacks like jamming, replay attack, privacy etc., are performed which put serious effect on the performance of the vehicular network. In that technique a RSA algorithm is used to provide a public key encryption for the data is presented. In that case, encrypted message is broadcasted and intended user can decrypt that message by the private key that provided to the user.

In [4] an inter vehicular network system is presented. In that a collision avoidance system is presented which a public key encryption technique is used to encrypt data. In public key infrastructure two keys are provided to the user by which data encrypted and broadcasted within the network and intended user can decrypt that data by the use of their private key. In that system a message is broadcasted, that contains the information of the vehicle's current status. That can help to avoid the collision in the traffics and also update about the events (accident) which happens on the road side.

In [5] a congestion control system is presented. In that system there are two parts one is measurement based detection and the other one is event based detection. In measurement based detection, monitoring of the congestion control channel is perform which used to check that message in the channel not exceed to the threshold value. To overcome that drawback a safety message is discarded from the message queue. In event based congestion control, monitoring of the event driven congestion control message is conducted and congestion control is started when any event driven message is generated. But in case of energy

 

consumption some improvement is required to maximize he energy consumption.

In [6] safe spacing algorithm based model is presented. Safe spacing algorithm provides a mechanism by which current vehicle can adjust the velocity as per the front vehicle. Because vehicles are travelling in the same direction need to find the distance between one and other to maintain speed for the safety purpose. That requires the information called travel time, flow rate, density. That way they can maintain safety in the traffic.

In [7] a technique to resolve congestion in the scenario of multiple vehicles and many beacon transmitting message simultaneously, is presented. In that technique three phases called congestion detection, scheduling, rebroadcasting are there. In congestion detection monitoring of the channels is conducted to check congestion while transmitting message in multiple beacon scenario. In scheduling priority to the different event is assigned to avoid congestion. Due to congestion there is loses in message is occurs, rebroadcasting mechanism is used broadcast that message again.

In [8] a virtual traffic light based technique is used to avoid collision. In that vehicle initiates a request to move forward and share that message to the other vehicles. In virtual traffic light, the vehicle which nearest to the intersection point act as a virtual traffic light and transmit request to stop then by that way collision is avoided. That technique reduces the maximum waiting time and enhancing the efficiency of the system.

## 3. PROBLEM DEFINITION

In existing techniques there are mechanisms like safe spacing, a secure pre warning, a decision making system to data sharing about the collision and some other techniques are discussed. But in all these techniques a proper system for message transfer is required to informed user about the event, but these processes takes too much time to transfer that message and complex mechanism too. Thus a new fast and simple technique is required to transfer that message. he communication channels are being used also having limited bandwidth that also causes congestion in transferring message thus an enhanced technique is required to provide more no. of channels to communicate.

## 4. PROPOSED TECHNIQUE

In existing techniques like in [7], [8] several congestion control methods are presented, but they are not efficient to provide better mechanism to deal with problems like there is no mechanism for emergency vehicles for example ambulance, fire beacon and others.

Thus in proposed work, a technique is presented which inherit the properties of both the techniques called VTL (Virtual Traffic Light) and congestion control in multiple beacon scenarios to build a technique which resolve all the issues of previous methods and provide a better scheduling to reduce the waiting time of emergency vehicles and a better functionality for congestion control.

## 5. CONCLUSION

In this paper a survey over the various techniques which are used to provide a congestion control system in the VANET is presented. Techniques like Safety spacing algorithm, measurement based detection and event based [5] are also presented which are used to provide a congestion control in the network. But these methods required some enhancement in the case of efficiency in the energy and some other factors. There is method called VTL (virtual traffic light) which reduces the waiting time of the vehicle. A new enhanced technique is presented for the future work which resolves the defects of the existing techniques.

**Table 1: comparison analysis of existing techniques**

| Technique | Advantage | Disadvantage |
|---|---|---|
| Safe spacing algorithm | Safe distance between two vehicle is maintained | If any time connectivity between these vehicles is lost, then serious faulty events (accidents) can be occurs. |
| VTL (Virtual Traffic Light) | Reduce the waiting time of the many vehicles. Improve the efficiency of the technique | There is no provision for the emergency vehicles. |

 

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|---|---|---|
| Congestion control in multiple vehicle scenario | Avoid the collision when there are multiple beacons are presented. | Consume time and monitoring is required. |

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