Traffic Congestion Detection and Management Using VANET

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ABSTRACT

The well-known traffic congestion problem in every environment has negative impact on many areas including economy, environment, health and lifestyle. Recently, a number of solutions based on vehicle-to-vehicle communications were proposed for traffic congestion detection and management. Vehicular Ad hoc networks (VANETs) are used to collect and aggregate real-time speed and position information on individual vehicles to optimize signal control at traffic intersections. Vehicular ad hoc network (VANET) is a promising technology to enable the communications among vehicles. But some problems occur during the transmission of messages like Low Energy signals , Delays in Reporting signals ,Signals are Easy to duplicate .Due to this problem result become low delivery ratio ,less throughput and high load so overcome this problem, We present a strategy to control traffic congestion with the help of Vehicle-to-Vehicle (V2V) and Vehicle to infrastructure (V2I) communication. This is achieved by transmission of messages which alerts the drivers about possible traffic breakdown. The message transmitted will guide the driver so as to take the decision needed to control the traffic congestion. In this paper proposed Greedy Forwarding and Event Driven Safety message to improve packet delivery ratio and throughputs.

Keyword: - *VANET, Broadcast Alert message, High delivery ratio, Less Congestion, Throughput;*

1. INTRODUCTION

During the last decades, worldwide road traffic density has been increasing year after year. This case has led to the fact that, currently, motorway traffic congestions are one of the most common phenomena that motorists have to face in their trips. Apart from being a quite-stressful experience for current drivers, they [7] also have a negative impact on the environment and the economy. In addition, the road traffic conditions affect the safety of the population since 1.2 million people worldwide are estimated to be killed each year on the roads.

For this reason, nowadays the automotive industry and governments invest many resources to increase road safety and traffic efficiency, as well as to reduce the impact of transportation on the environment. One of the most promising areas of research is the study of the communications among vehicles and road-side units, or more specifically the Vehicular Ad-hoc Networks (VANETs). This kind of networks are self-configuring networks[7] composed of a collection of vehicles and elements of roadside infrastructure connected with each other without requiring an underlying infrastructure, sending and receiving information and warnings about the current traffic situation. To achieve the efficiency in transportation with the help of vehicular communication, our approach is based on following points.

1. Data packets are generated and broadcasted by affected vehicle itself which contains decision message.
2. Based on decision vehicles adapt the driving behaviour and helps in controlling congestion.
3. Roadside infrastructure monitors the traffic and if traffic is above threshold value it broadcasts the messages.

In proposed technique the data packets will be generated in case of event occurrence only. This further reduces the packet flooding problem of broadcasting as periodically data packets are not transmitted. Data packets are broadcasted [7] to all neighbours in reception range and receiving vehicles will rebroadcast the data packet thus receiving vehicle will be responsible for forwarding the message along to the rest of the vehicles. Roadside units are continuously monitoring the traffic and if the traffic is above predetermined threshold value they will broadcast control messages, ex: Reduce the speed.

2. RELATED WORK

M. Sheela Devi and K. Malar proposed a D-FPAV(Dynamic Fair Transmit Power Adjustment) [1]Algorithm that support both traffic & non traffic situation, in the algorithm to calculates transmit power control value at each vehicle with the help of beacon message information .Then interchange the transmit power value calculated among the neighbouring vehicle and last select best power value . IEEE.802.11p[1] WAVE mode improves the performance of broadcasting safety messages in VANET by enabling two vehicles to communicate immediately without imposing any connection setup overhead till they operate in the same channel Thus event driven safety messages are exchanged quickly and with guaranteed delivery using BSSID[1].

R. Yugapriya, P. Dhivya, M. M Dhivya, and Mr. S. Kirubakaran aver proposed method to reduce traffic signal control problem to the problem of scheduling jobs on processor, and propose algorithm called the Greedy Forwarding Algorithm [2] to transfer the data faster .The information consists of Speed data which can be gathered from the vehicle speedometers, and position information data can be gathered using GPS receivers fitted to the vehicles. All the data encapsulated in one packet and broadcast over wireless medium. The jobs are subdivided into the equal size. Within 100m all the node the vehicle are called platoon. Nodes are subdivided into equal size platoon each jobs are scheduled under oldest job first algorithm [2], then transfer a data from car to roadside sensor platoon the information passed to another vehicle. This second vehicle will check the information with platoon. By this checking the fault information is detected. This Greedy forwarding algorithm is used to increase the data rate, throughput and decrease the load.

My Driss LAANAOUI, and Pr. Said RAGHA Y to solve the broadcast storm problem using greedy forwarding and decomposition zones, in which firstly used GyTAR (Improved Greedy Traffic Aware Routing protocol)[3] which is an intersection-based geographical routing protocol capable to find robust routes within city environments. It consists of two modules: (i) Selection of the junctions through which a packet must pass to reach its destination, and (ii) an improved greedy forwarding mechanism between two junctions. Hence, using GyTAR, a packet moved successively closer towards the destination along streets where there are enough vehicles to provide connectivity. LAR is an on-demand source routing protocol. LAR sends location information in all packets to (hopefully) decrease the overhead of a future route discovery [3]. Author also present a new geographic routing protocol VANET called "Intelligent Routing protocol in urban environment for VANET "(IRUV).

Milos Milosevic and Vaseline Rakocevic present an algorithm designed to enable each vehicle in the network to detect and quantify the level of traffic congestion in completely distributed way, independent of any supporting infrastructure and additional information such as traffic data from local authorities [4]. Therefore divided this algorithm in two mechanisms: - (i) congestion detection and quantification, and (ii) information dissemination [4].In first mechanism measures are speed, travel time and delay, volume, level of service, demand and capacity, cost, etc. The authors concluded that congestion is a function of reduction in speed, and that the setting of a threshold that is directly related to travel speed is most appropriate to use as a metric of traffic congestion. Every vehicle measures its own speed and time during which the speed is lower or higher than the threshold.

Cheng-Wei Fan, Ke-Chian Su, Hei-Min Wu, Wei-Lin Chang and Yao-Hsin Chou present, position base broadcast module, named Broadcast Control Unit (BC Unit), in order to reduce the re-broadcast nodes and minimize emergent message conflict. If quantity of vehicles increased, the message delivery rate will decrease significantly due to the message contentions and collisions. In order to deal with the message contentions and collisions, the Urban Multi-Hop Broadcast protocol (UMB)[5] alternates the original RTS/CTS (request to send/clear to send) handshake mechanism with IEEE 802.11 defined RTB/CTB (request to broadcast/clear to broadcast) which include GPS information, and also apply Black-Bust mechanism (letting receivers sending black-burst signals with a duration which is proportional to their distance from the source) to select the furthest node being next forwarder. In

[5], a Binary Partition Assisted Broadcast (BPAB) protocol was proposed, it improves UMB by using Binary-partition method to divide the area within its transmission range into many subareas, and chose the next forwarder in the farthest segment randomly [5].

Ms. Sarika Rakhade and Ms. Hemlata Dakhore proposed system distinguish to besieged the problem of traffic jam on crossroad at the traffic signal system is introduced .In this place the first intention is to analyze the density[6] of vehicle on the road for flow traffic smoothly without obstruction. Second purpose is developing priority based signalling which helps to give the priority to the emergency vehicle.

- Traffic Volume based signal timing
- Priority Based Signaling

On other hand to stop abuse of this system design generate the report for each time signal controlled by any ambulance [6].

Two Algorithms are used.

- Density Algorithm
- Scheduling Algorithm

3. PROPOSED WORK

A. Proposed Flow Chart

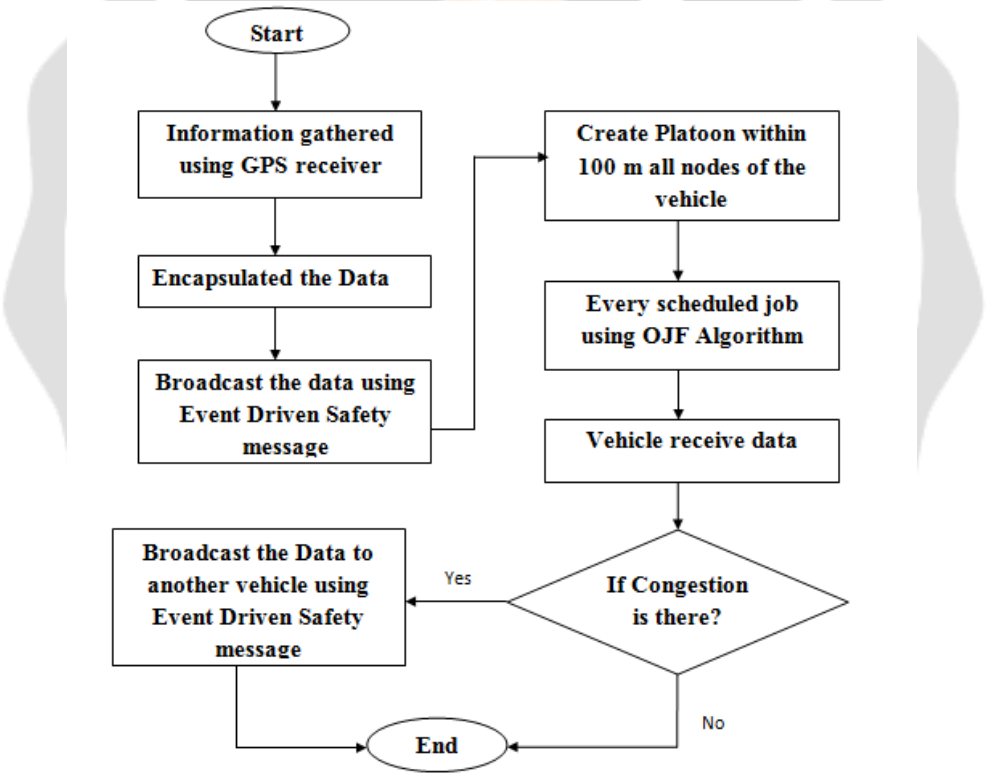

Fig 1 Proposed folw chart

Data are gathered and encapsulated in data packets that are broadcast over the wireless medium. This is what calls the data dissemination phase. Data dissemination process done using "Event Driven Safety Message". Event Driven Safety messages may be generated as a result of a dangerous situation or when abnormal condition is detected such as road accident. This message usually has strong reliability and need to be delivered to each neighbour with almost no delays

The jobs are subdivided into equal size. Within 100m all the node of the vehicle are called platoon. Nodes are subdivided into equal size platoon. Each job is scheduled under oldest job first algorithm basis [2].

This Greedy forwarding algorithm is used for increase the data rate, throughput and decrease the load. Event Driven Safety Messages can increase high delivery ratio, less congestion and increase throughput [2].

B. Parameters

i) Packet Delivery Ratio: Defined as the ratio between the received packet by the destination and the generated packets by the source.

= (Total num. of packets delivered/Total num. of packets transferred)*100

ii) Throughput: How many Packets are processed in given time?

= Number of packet sent/Time taken

C. Performance criteria

Simulation Parameter	Value
Simulation Tool	NS2.35 , SUMO
Simulation Area	200 x 200 m
Protocol	AODV , Greedy
Simulation Time	200 ms
No. of Nodes	20 nos.
Speed of the vehicles	15.86 meter/second
Vehicle type	Passenger car
Number of lanes	8
Antenna model	Omni Antenna
MAC type	802.11
Max packet in ifq	50

Table: 1. Performance criteria

4. RESULT ANALYSIS

The performance of Greedy algorithm is compared with the Hybrid approach of greedy algorithm, OJF ,Event Driven Algorithm to compare the time, data rate, throughput, load. Whenever vehicle receives the information, this information according driver can change the route or decrease speed.

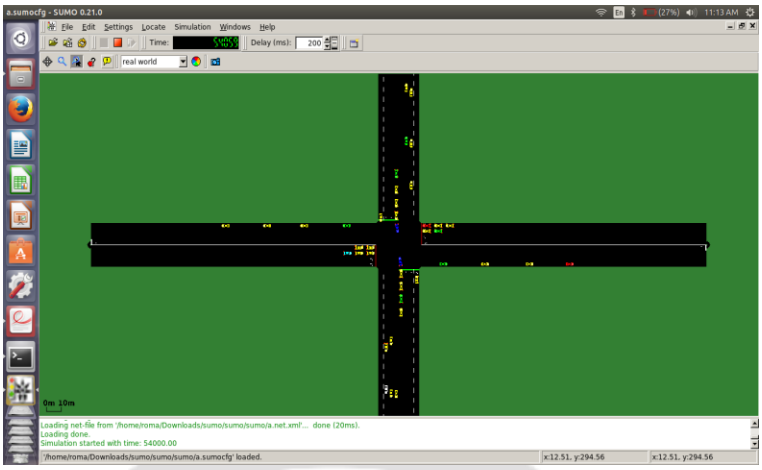

Fig 2 Traffic signal

The above snap shows the traffic signal in working condition at the time of 'No Traffic Congestion' as normal condition.

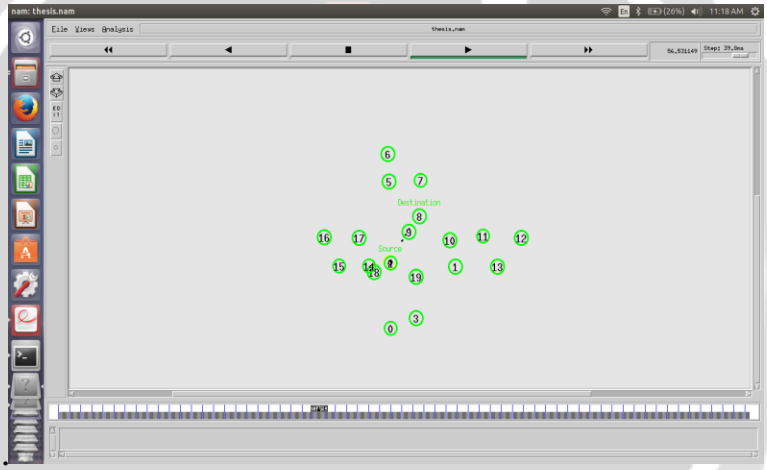

Fig 3 Node transmit data

The above snap shows vehicles 2 & 4 nos. nodes as in abnormal 'Traffic Congestion' situation and vehicle 2 or 4 work as source which transmit congestion signal and nearer vehicle node 8 as destination for receiving congestion signal from source.

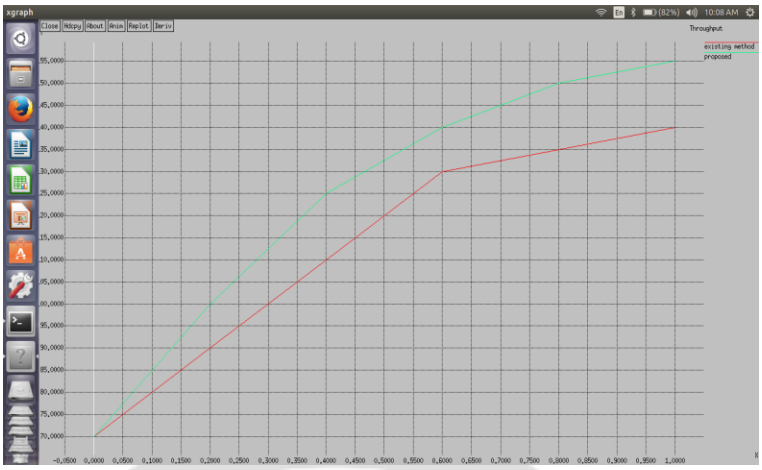

Fig 4 Delivery rate

In this simulation graph hybrid algorithm has high delivery rate compare to the existing system. The load which indicate traffic density

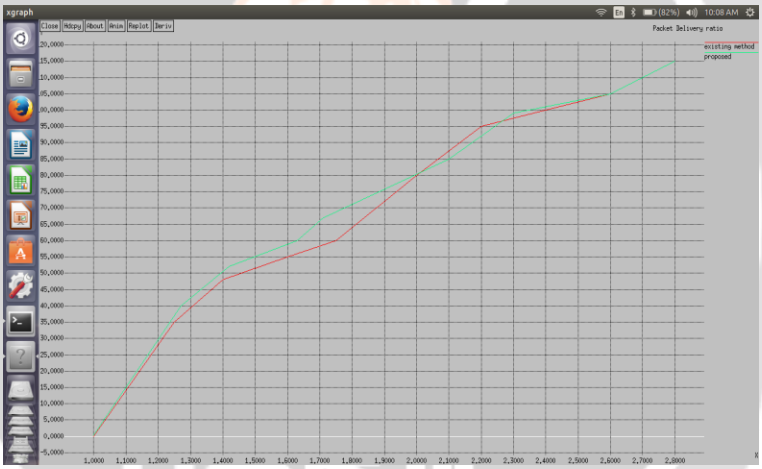

Fig 5 Throughput

In this simulation graph hybrid algorithm has high throughput compare to the existing system.

This simulation had done using "NS–2" simulator. Which follows "C^{++} coding" and "OTCL" (Object Tool Control Language).

5. CONCLUSIONS.

The Traffic congestion reduction is main task in VANET. In Traffic Congestion, the main issues are low delivery ratio and fewer throughputs. To overcome this problem, my proposed work presents an efficient approach for Traffic congestion reduction. In my proposed approach, Vehicle detects traffic and sends the information to nearest vehicle using Greedy Forwarding, OJF and Event Driven Safety Message. This hybrid algorithm is used for increase the data rate, throughput and decrease the load compare to the only greedy algorithm. In future, the mobile application built using this approach.

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