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Inter-Infrastructure and Vehicle Communication for Traffic Information Sharing in VANET

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***ABSTRACT** : Establishment of vehicular ad-hoc network is most demanding in smart traffic management system. By sharing the information between traffic system, road side unit and vehicles research can create vehicular network. Automatic detection of road signs has recently received attention from the computer vision research community. The main objective of this system is to detect signs from a moving vehicle. Road Traffic Sign Detection is a technology by which a vehicle is able to recognize the traffic signs put on the .we are proposing the system which will use one signal transmitter in each and every symbol or message board at road side and whenever any vehicle passes from that symbol the receiver situated inside the vehicle will receive the signals and display proper message or the symbol details on display connected in car. Now driver can concentrate on driving Position information is a fundamental requirement for many vehicular applications such as navigation, intelligent transportation systems (ITSs), collision avoidance, and location based services (LBSs)...*

***Keywords**: Ad hoc network, Road Traffic Sign, Symbols, VANET.*

I. INTRODUCTION

The Field of vehicular ad hoc networks (VANETs) is constantly drawing research attention due to their wide range of technological applications and the technical challenges they exhibit. Forming a subclass of mobile ad hoc networks (MANETs), VANETs are distinctive from generic MANET sin many ways. The most prominent feature of VANETs is the high mobility of the nodes, which is the underlying cause of a series of VANET-specific attributes requiring the development of applicable solutions. With the increase of road traffic volume in major cities and towns of most of the countries experiencing traffic congestions, accidents and greenhouse emissions leading to poor quality of city life. VANETs are distinctive from generic MANETs in many ways [1].The most trusting features of VANETs are the high mobility of the nodes, which is the underlying cause of a series of VANET-specific attributes requiring the development of applicable solutions. Transient connectivity due to node mobility is an inherent attribute of all mobile networks, which becomes even more evident in the case of vehicular communications. This causes significant problems as communication is disrupted very often, resulting in poor performance. The constantly changing topology has numerous adverse effects on the efficiency of the operations of higher layers on the Protocol stack. More accurately challenging. As the dynamics involved imply that the underlying connectivity capabilities change rapidly, collected routing information becomes stale, and established communication routes become invalid in a short time. The resulting disruption of information flow causes considerable delays, and route reconstruction depletes a significant amount of network resources.

Consider the following scenario. Suppose a driver would like his/her vehicle to continuously display on a map, at any time, the available parking spaces around the current location of the vehicle. Or, the driver may be interested in the traffic conditions one mile ahead. Such information is important for drivers to optimize their travel, to Alleviate traffic congestion, or to avoid wasteful driving.The challenge is processing queries in this highly mobile a distributed database stored at fixed sites that is updated and environment, with an acceptable delay, overhead and accuracy. Many times driver confused by seeing at symbol board on the square or on the road side. There is no driver guidance system in car up till now so keep this in mind we are planning to build a system.

Most of the concerns of interest to mobile ad hoc networks (MANETs) are of interest in VANETs, but the details differ. Rather than moving at random, vehicles tend to move in an organized fashion. The interactions with roadside equipment can likewise be characterized fairly accurately. And finally, most vehicles are restricted in their range of motion, for example by being constrained to follow a paved highway. Such a network might pose safety concerns (for example, one cannot safely type an email while driving). GPS and navigation systems might benefit, as they could be integrated with traffic reports to provide the fastest route to work. It was also promoted for free, VoIP services such as Google Talk or Skype between employees, lowering telecommunications costs.

Nazmus S. Nafi and Jamil Y. Khan [1] proposed the use of VANET based Vehicle to Infrastructure (V2I) based road traffic control system which can collect traffic information from individual cars and share the road traffic information over a wide area network to dynamically control the traffic signaling cycle. Most of the previous works on the detection method of real time traffic in intelligent transportation system are based on wireless sensor networks (WSNs), Radio frequency identifiers (RFIDs). The rest of the paper is organized as follows. The design challenges are discussed in section II, followed by proposed work in section III, and the related work is visited in section IV.

II. DESIGN CHALLENGES

There were lots of researches related to driving safety presented in the past decade. According to a research report, there are 74.83 million vehicles sold in 2011. That indicates a growth of vehicle markets. Although car bring people the convenience of mobile life, bad driving environment, congestion of traffic flow and lack of good vehicle maintenance threaten peoples' life and property. Thus, traffic safety becomes one of the important issues in vehicle technologies recently. In the existing system real time traffic information [8], there is the ability for the system to detect and estimate real time road traffic and develop an adaptive traffic signal controller .The model uses V2I communications mechanism of the VANET to detect individual vehicle arrival from different lanes and to adaptively change the traffic signaling phases at the intersection with respect to vehicles density. Where as in other system [3, 4, 5, 6, and 7] have different implementations as VANET is a technique which does not work on predefined scenarios.

Looking over to all the researches being done detection of road side symbols and identifying vehicle status is being unexplored problem. To this end, we discuss core research challenges in VANET, and propose our approaches along each of them. We then assemble building blocks into functional prototype hence various problems arise while extracting the communication details

1. Difficulty in Information Gathering and Display Roadside Symbols

The limitation that came across in our proposed system is when the transmitter broadcasts the message to all the vehicles i.e. the road side symbols which are received; there is a major issue for bidirectional vehicles to receive the same set of messages due to which the message could also be received to the wrong identity .For this a GPS device is introduced because of which the exact location with the direction of a vehicle could be grabbed , along with when the direction of the GPS device and the receiver is same then only the message is broadcasted .

2. Building reprogrammable transmitter Module

Developing the transmitter for an individual symbols transmitting is creating a problem because of which a transmitter need to be reprogrammed to broadcast message of symbols code. It will have two mode of power supply that is battery power or solar power. Transmitter will have a channel and device ID setting option for wireless frequency matching and device identification.

III. PROPOSED WORK

This paper proposes a system which could deal with infrastructure to vehicle and vehicle to vehicle communication .By using this system there would develop a real time positioning of the road traffics and other related issues. The proposing prototype is for the drivers who would get all the updates consistently during the driving period itself. Hence the proposed system will work out as mentioned.

For Infrastructure to vehicle communication consider a scenario were in daily life every vehicle (car) driver while driving the car may have to face to problems like they don't know the status of signal symbol, the nearest path, the status of his/her vehicle. To overcome this issue proposed system is designed to have an infrastructure to vehicle communication to share infrastructure information. Whenever any vehicle passes away from any symbol its signal get detected by the signals detectors which are connected in car. This signal then converted in to proper symbol and displayed on the display panel connected in the car. This is how it show specific symbols to the driver which help driver in finding specific symbols and there meaning also. The communication infrastructure of the proposed (IIVCTI) is shown in figure 1.

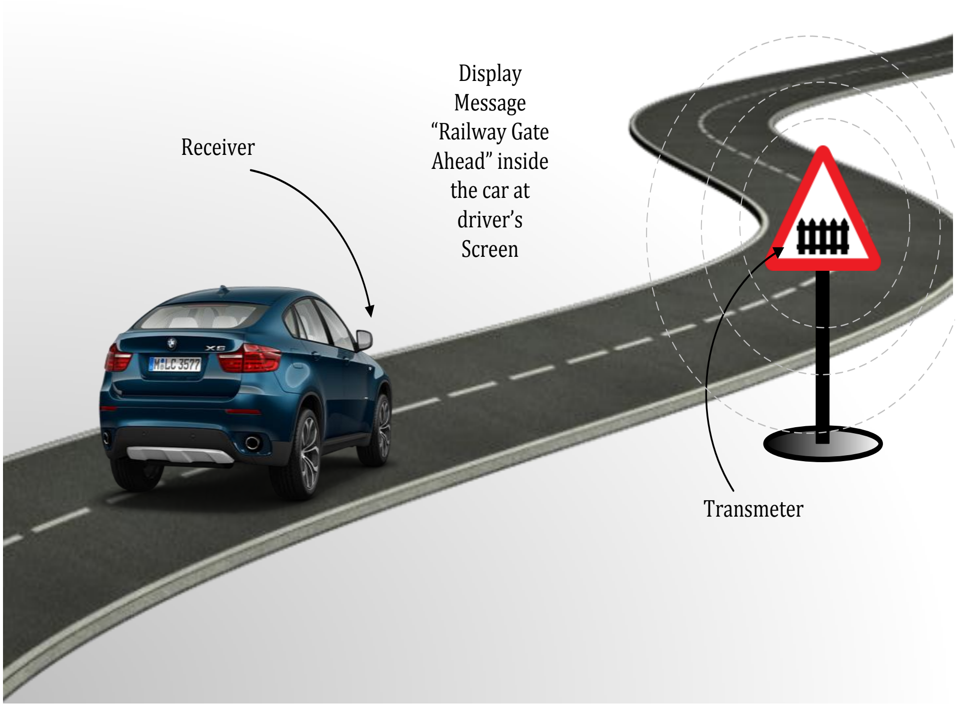

Fig.1 road side symbols are identified

Every symbol or navigational boards has unique symbols and the unique meaning. Figure 1.describes basic functionality of symbol detection part. Every symbol generates some kind of signals continuously and these signals having unique ID defining the identity of the symbol. Whenever any vehicle passes away from any symbol its signal get detected by the signals detectors which are connected in car. This signal then converted in to proper symbol and displayed on the display panel connected in the car. This is how it show specific symbols to the driver which help driver in finding specific symbols and there meaning also.

Similarly the next proposed method is Vehicle to Vehicle Communication where as another scenario taken into consideration is, suppose a vehicle having different information like vehicle location, vehicle statistics or vehicle health. This information need to be share with other vehicle in VANET in order to avoid traffic conjunction and to dealevery symbol or navigational boards has unique symbols and the unique meaning. Figure 1.describes basic functionality of symbol detection part. Every symbol generates some kind of signals continuously and these signals having unique ID defining the identity of the symbol. Whenever any vehicle passes away from any symbol its signal get detected by the signals detectors which are connected in car. This signal then converted in to proper symbol and displayed on the display panel connected in the car. This is how it show specific symbols to the driver which help driver in finding specific symbols and there meaning also.

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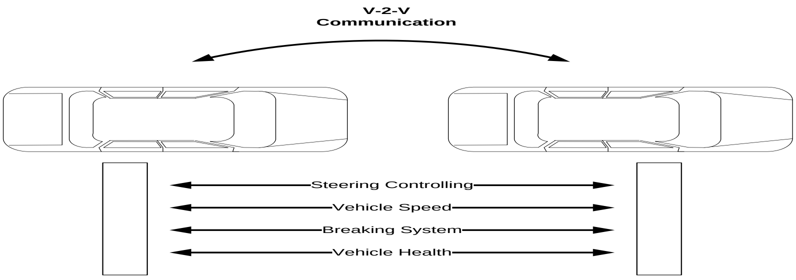


Fig.2 identifying the vehicle status

Forth is Proposed prototype we are developing a dashboard (VANET device) application to read sensor data, here we will connect the dashboard (vanet device) with vehicle in-car system using compatible communication ports like serial communication port .Develop a program to communicate with other vehicle in order to share the data. This device will work on wireless technology like RF, Wi-Fi, Zig Bee, Etc.As every vehicle will have in-Car VANET device. This device can use wireless trans-receiver module to communicate in bi-direction. These devices were simply broadcast the vehicle information like vehicle location, vehicle statistics or vehicle health in transmission mode and in receiving mode this device will show available vehicle in network and user can select any one from nodes to get the details. All the data acquisition and inter vehicle communication with other vehicle is depending on the Vanet device so it is important to interface the Vanet device with hardware or in car system.

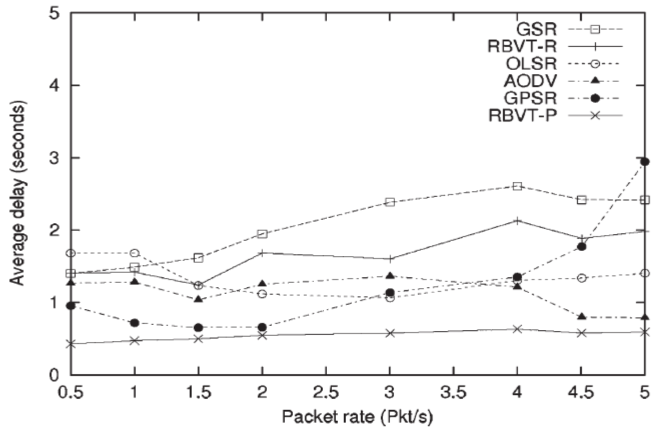
IV. RELATED WORK

The simulation model was run with different vehicle flows densities from different directions both for fixed and adaptive signal cycle system. Some of the reviews that came across which are being mentioned below are as follows. The parameters such as data rate, vehicle flow, road type transmission range etc. with specific values is mentioned in the following table 1 named as simulation parameters. Some of the graphs showing the Average delivery ratio for various protocols in the network with 15 flows and different node densities figure- a depicts one hundred fifty nodes and figure (b) Two hundred fifty nodes and in figure (c) Three hundred fifty nodes. Are shown graphically

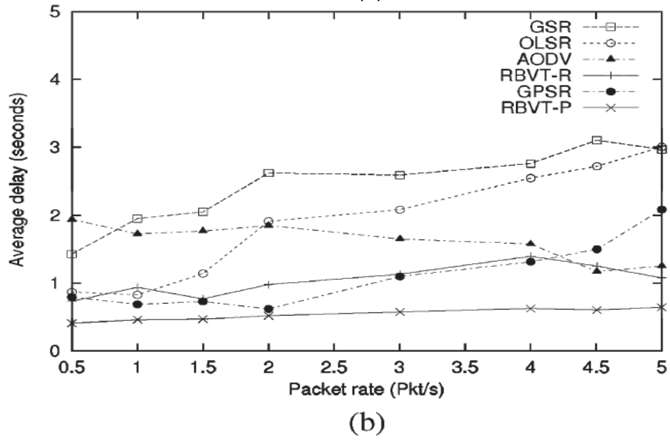
In order to analyze the performance of the proposed IRTSS Intelligent Road Traffic Signalling System a discrete event simulation model using the OPNET Modeler 17.1 is used. The OPNET modeler uses a powerful finite state machine (FSM) approach to support detailed specification of applications, algorithms, and queuing policies. The simulation model consists of two different types of nodes- RSUs and OBUs. The communication section is based on the IEEE 802.11p WLAN network where the RSU acts as the WLAN access point (AP) and the OBU acts as the WLAN mobile stations. Each individual node model is a comprised of standard WLAN MAC modules (antennas, MAC processor and a MAC Interface processor) along with an application module that implements the proposed intelligent RTS scheme. Both RSU and OBU have got different application modules based on the VANET based intelligent RTS system requirements. The FSM of the both application module have two different states to execute the events. The transmission frequency was set to 5.9 GHz and the transmission link was modeled using free space path loss model of WLAN. The important simulation parameters are listed in the Table 1.

TABLE I. SIMULATION PARAMETERS

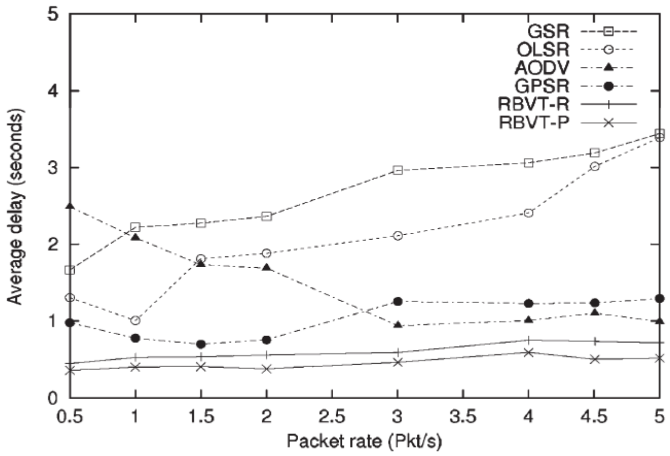
Parameters	Values
Data Rate	6 Mbps
Vehicle flow (EW-NS veh/h)	400:400,400:300,400:200
Road/Lane type	Bidirectional crossroads
Transmission Range	510 m
RSU Transmit power	50 mW
RSU broadcast interval	1s
Channel Bandwidth	10MHz
Packet length	1300 bits
Length of the vehicle	6 m
Max Speed of the vehicles	60km/h
Simulation Run time	5400s
With of the intersection	30m
Start up time	4s
Saturation headway	2s
Intersection clearance time	1s



(a)



(b)



(c)

Figure3.Average delivery ratio for RBVT-R, RBVTP, AODV, OLSR, GPSR, and GSR in network with 15 flows and different node densities (a) one hundred fifty nodes (b) Two hundred fifty nodes(c) Three hundred fifty nodes.

Average delivery ratio: Figure. 3 shows that RBVT-R outperformsthe other protocols, with as much as a 40% increasecompared with AODV and as much as 30% increase comparedwith GSR. For most cases, we observe a decrease in the averagedelivery ratio as the data traffic increases. The descending slopeis not acute, which means that the protocols can cope withthe offered load. This result is partly due to the presence ofobstacles on the map area, which limit the level of contentionin the wireless network. RBVT-P performs better in mediumand dense networks than in sparse networks. The reason is that,when the density is small [see Fig. 3(a)], network partitionsprevent the CPs from covering large sections of the map, thuslimiting the information gathered by the CPs.Across network densities, we observe that the delivery ratioof protocols that integrate road layouts (i.e., RBVT protocolsand GSR) increases as the network becomes denser. BothRBVT protocols perform better than GSR for all the densities,because they integrate real-time knowledge of the vehiculartraffic on the roads. When the network is sparse, GSR does notperform as well as some node-centric protocols [see Fig. 3(a)].However, as the node density increases, the shortest path alongthe roads map becomes more likely to have enough nodes; thus,there is an increase in the average delivery ratio.Higher node densities do not necessarily mean improvedperformances for protocols that do not consider the road layouts.

For example, in OLSR, the increase in the number ofnodes translates into an increase of the link state updates. Twoobservations can be made on GPSR. First, given that city roadsinclude irregularities such as dead-end streets, following theshortest Euclidean distance is not always equivalent to followingthe shortest path through the roads. Second, the GPSRprotocol is stateless, and this condition generally providesmany advantages for the routing of data packets. However, ifa local maxima forms in the network, the stateless nature of theprotocol means that packets will follow the same path to theposition of the local maxima, and once there, the forwardingmode of each packet will be set to perimeter forwarding. Thiscase is unlike protocols that implement feedback mechanisms,e.g., AODV, which can perform a local repair or send a routeerror notification to the data source node

V. AUTHOR'S VIEWS ABOUT THE VANET

JosianeNzouonta, NeerajRajgure, Guili Routing on City Roads Using Real-Time Vehicular Traffic Information (Grace) Wang [8] published a paper on VANET where large number of nodes that participate in these networks and their high mobility, debates and still there exist the feasibility of applications that use end-to-end multihop communication. The main concern that arises in routing the routes on city level is that whether the performance of VANET routing protocols can satisfy the throughput and delay requirements of such applications. Hence this paper presents a class of road-based VANET routing protocols that leverage real-time vehicular traffic information to create paths consisting of successions of road intersections that have, with high probability, network connectivity among them. Furthermore, geographical forwarding allows the use of any node on a road segment to transfer packets between two consecutive intersections on the path, reducing the path's sensitivity to individual node movements.

Lei Zhang, Qianhong Wu, AgustiSolanas [9] published a paper on A Scalable Robust Authentication Protocol for Secure Vehicular Communications In this paper the actual problem definition is related to security and privacy ,whereas these are the two critical concerns for the designers of VANETs also the different issues i.e., protocols, methods, and procedures that are able to detect whether a message has been modified by an attacker, determine who the real sender of a message is, and avoid identity theft. This paper had worked upon privacy of VANET users the basic protocol uses the sign encryption scheme, which is used, is used to help a vehicle to secretly receive a secret member key from an RSU. Sign encryption is a public-key primitive that has the ingredients of both digital signature and data encryption. A sign encryption scheme allows a sender to simultaneously sign and encrypt a message. An attractive point is that it takes less computational Time and has lower message expansion rate than the sign-then encrypt procedure. The basic requirement for a sign encryption scheme is that it should satisfy the properties of message confidentiality and signature enforceability.

Nazmus S. Nafi and Jamil Y. Khan [1] published a paper A VANET Based Intelligent Road Traffic Signaling System on December-2012.In this paper they developed a safe and conflict free movement of vehicles through different roads, junctions and other traffic structures. It adopts an adaptive signaling scheme that optimizes the signal durations based on a real-time traffic estimation technique. The optimized adaptive signaling system, vehicular mobility model and communication network model cooperate with each other within the same control platform of a co-simulation model based on OPNET.

As per literature published by Nazmus S. Nafi and Jamil Y. Khan existing system worked only to control the traffic signal duration Our proposed work is to detect the road side symbols and vehicle status.

VI. CONCLUSION

The proposed work develops a system that is able to share Infrastructure to vehicle and Vehicle to Vehicle Communication with Message and Sign and symbols Detection. So towards this goal the system i.e. Design and Implementation of inter infrastructure and vehicle to vehicle communication for traffic information sharing detects signs from a moving vehicle and vehicle to vehicle communication. Road Traffic Sign Detection is a technology by which a vehicle is able to recognize the traffic signs put on the road have been developed based on a simplistic VANET architecture. Hence our proposed system conclude that for every vehicle it becomes very easier to deal with the traffic issues and many more accidental scenarios that come across due to the lack of real time road side issues vanet technology thought help it to develop a complete prototype model to show traffic sequence.

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