Detection & Management of Traffic Congestion Using VANET

[1] Mr.Avinash N.Pawar, [2] Dr. R.K.Agrawal, [3]Dr.Abhay E.Wagh
[1]Lecturer, [2]Associate Professor, [3]Director DTE Maharashtra
[1]Department of Instrumentation,
[1]IOPE Lonere (India)

Abstract

Vehicular Ad hoc Networks (VANET) may be the option for avoiding traffic congestion and accidents on Indian roads. This which provides IEEE 802.11p based wireless communication between vehicles to vehicles and vehicles to infrastructure which operates on the short range communication, frequency band of 5.85-5.925 GHz. Such types of communication system allow vehicles to share various information like traffic safety, vehicles speed, and position, provided by the number of sensors & transducers.
From last few years safety on roads has become a main issue for public, traffic department and vehicle manufacturers. For every citizen of metropolitan cities getting struck in long traffic jams has been the major concern of the era. Introduction of short range communication capabilities to vehicles, the devices form a mobile ad-hoc network, allowing vehicles to exchange information about road 7 traffic conditions. This paper aims at creating a healthy communication network among the vehicles so that every other vehicle on the road can get to know the traffic situation ahead on the lane by communicating with the vehicles ahead so that the driver can take a adequate decision of changing the path or staying on the same path. This system will trigger a message every time it faces over traffic situation on the road. This situation will be judged by the traffic simulators on the traffic lights. And the message will be forwarded by a decentralized type of wireless network called ad hoc network generated by taking cars as nodes. The system will be useful in preventing the never ending and annoying traffic jams on roads and will save the precious time of the people.

Index Terms -Vehicular Ad hoc Network (VANET), Inter vehicle, Short Range Communication, Vehicle-to-Infrastructure (V2I).

INTRODUCTION

Modern mobile computing & wireless communication have introduced smart transportation system. Introduction of short-range communication capabilities to vehicles, the devices form a mobile ad-hoc network, allowing cars to exchange information about road conditions. This is often referred to in the literature as Vehicular Ad-hoc Networks (VANETs) or inter vehicle communication systems.VANET have came as the need to support the increasing number of wireless systems that can now be widely used in vehicles.

Because of huge population growth Maharashtra from last few years increases the density of government & privet vehicles. So it directly affects on the parking of vehicles on road side and also in residential areas. Because of huge number of government & privet vehicles it consumes more cost on construction of roads, parking areas also on accidents.

PROBLEM OF CONGESTION AND PARKING IN NASHIK

Nashik has grown from a population of 21940 in 1901 to 1077236 in 2001and and 14.86 lakhs in 2011 and current population of Nashik is approx. 18 lakhs. Population growth rate of Nashik has been constantly more than any of the cities in the Maharashtra state, and is the fourth largest city in terms of existing population. The projected population for the year 2031 is 37.5 lakhs. Nashik is situated on Mumbai-Agra national highway as dedicated freight corridor between Delhi and Mumbai. Nashik is also one of the important cities of the golden triangle project of Govt. of Maharashtra. As Nashik is also well known leading district in onion & grapes production so having big markets in nearby area. This is the main area of concern for traffic congestion and road safety.

In the year 2001, urban population is 27.8% but it is likely to increase to 38% and 47.5% in the year 2031 and 2051 respectively and provision of transportation infrastructure is a tough task for such huge population. As per survey of City Mayor foundation Nashik is the 16th fastest growing city in the world.

 © 2018, IJREAM All Rights Reserved.

Fig 1. Traffic congestion at Nashik

VEHICULAR NETWORKS AS AN INTELLIGENT OPTION

VANETS PROVIDE WIRELESS COMMUNICATIONS BETWEEN VEHICLES WITH HIGHER FLEXIBILITY AND SCALABILITY THEN SYSTEMS THAT RELY ON COMPLEX INFRASTRUCTURE DEPLOYED ON THE ROADSIDE.

This paper aims at creating a healthy communication network among the vehicles so that every other vehicle on the road can get to know the traffic situation ahead on the lane by communicating with the vehicles ahead so that the driver can take a adequate decision of changing the path or staying on the same path. This system will trigger a message every time it faces over traffic situation on the road. This situation will be judged by the traffic simulators on the traffic lights. And the message will be forwarded by a decentralized type of wireless network called ad hoc network generated by taking cars as nodes. The system will be useful in preventing the never ending and annoying traffic jams on roads and will save the precious time of the people.

OVERVIEW OF VANET

Smart transportation systems

In smart transportation systems, the users, drivers or passengers, can be provided with useful information and with a wide range of interesting services. One category of such services includes safety applications, like various types of warnings like speed,position,etc.In this system each vehicle acts as a sender, receiver of information to the vehicular network or transportation agency, which then uses the information to ensure safe, congestion free traffic.

Inter Vehicle Communication

Inter vehicle communications comprises a wireless network where vehicle send messages to each other with information about what they're doing. In this communication data used like speed, position, etc.On below of the situation is of inter vehicle communication wherever the road has been style and on it street road the nodes can create that represent a vehicle. Wherever some general nodes are created that represent a bunch of car to create a cluster. This vehicle node then communicates with one another to send and alert messages.

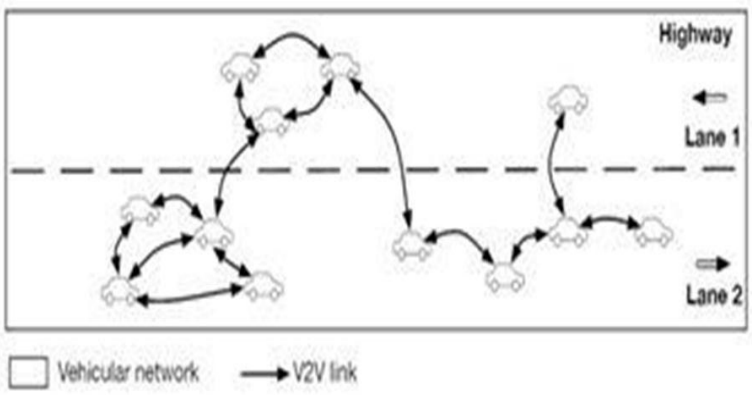

Fig.2 Inter Vehicle Communication

 © 2018, IJREAM All Rights Reserved.

Vehicle-to-roadside unit (RSU) communication

In this communication a unit is installed at road side on every kilometer or as per distance requirements. So that this unit will send proper information about vehicles moving on that road. This unit will also display the traffic condition and schedules of buses of time of heavy traffic. If any driver or vehicle is not following rules like speed limit or unauthorized parking on road then a message will be sent as a primary warning through vehicle to road side unit. Figure 3 shows structure of vehicle to road side communication unit.

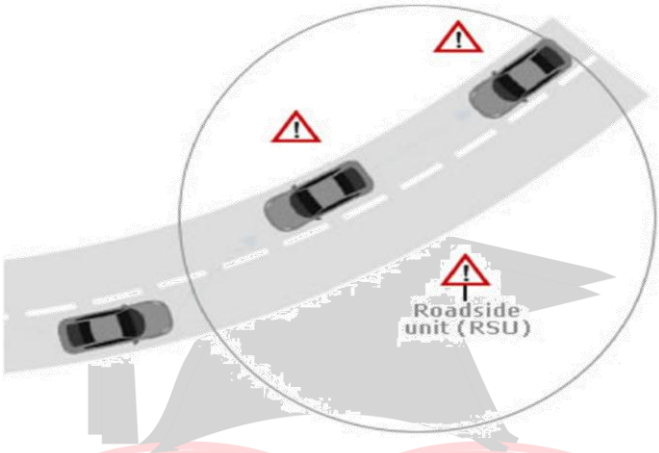

Fig.3Vehicle-to-RSU communication

E) VANETs Characteristics

1. Continuous power source: Vehicle is itself is a continuous source of power in VANET so it reduces the cost and solves the problem of power source. Because the devices are installed in vehicles, some of the limitations of traditional mobile ad-hoc networks are overcome.
2. Space requirements: There is sufficient space in a vehicle to install a computing device with good processing power in low cost so everyone can afford.
3. Topology: Because of rapid mobility of nodes there may be problem of topology; it may cause connection braking between units. But with the deployment of Road Side Unit (RSU) and using connectivity sources like GPRS & 3G/4G topology issues may be reduced.

ARCHITECTURE OF VEHICULAR NETWORK

Organizations like IEEE, ISO and C2C-CC have been proposed VANETs architecture that varies from region to region. The IEEE introduces WAVE for single hop, unicast vehicular communication using DSRC. Whereas, ISO's proposed CALM i.e. Continuous Air Interface for Long to Medium Range which supports uncast as well as inter vehicle communication. It focuses on inter vehicle multi-hop and geo-networking using DSRC and other WLAN standards. The communication modes of C2C-CC are unicast, broadcast, geo-unicast and geo-broadcast. Figure 5 explains the VANET architecture in detailed view.

 © 2018, IJREAM All Rights Reserved.

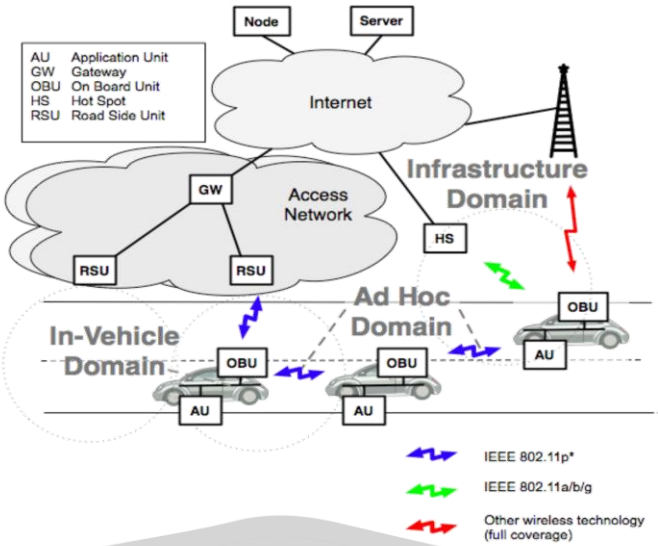

Fig.4 Architecture of VANET

In the first domain i.e.in-vehicle domain it uses two important unis like On Board Unit & other is Application Unit that connect either with wired or wirelessly. Though, the ad-hoc domain represents the vehicles that are equipped with OBUs and RSUs. Here, OBU act as a mobile node of MANET whereas RSU is fixed at a location that connects with internet via Gateway. In, infrastructure domain, OBUs can communicate with internet through RSUs. In this domain, OBUs can also communicate with each other by using cellular radio networks (GSM, GPRS, 3G and 4G) in absence of RSUs.

A REPORT ON CURRENT SENARIO OF TRAFFIC IN MAHARASHTRA &NASHIK.

The population of motor vehicles on road in the Maharashtra state as on 1st January 2017 was around 2.8 (24,400 vehicles per 1 lakh population), it shows the continuous the increase than 2016. Our capital i.e. Mumbai having around 30lakh vehicles i.e. 10% of the state vehicle population. The category wise numbers of on road vehicles are shown in Table I.

The number of vehicles in the Nashik region has gone up by about 10 per cent in the past one year. As on December 31, 2013, the Nashik regional transport office (RTO) has a record of 11, 27,224 vehicles in the city, which is 9% more than the population of vehicles by the end of 2012.

The Nashik region contains huge area of around 11 talukas under a single traffic office, with the exception of only 4 talukasi.e load shared by Malegaon traffic department.

RTO officials said the total population of vehicles in 2011 was 9, 33,454. In 2012, it increased to 10, 30,332, which was a rise of 10.38% rise. In 2013, it increased to 11, 27,224, a rise of 9.40%.

From this report it is clear that the population of vehicles on road in Maharashtra is rising significantly.

1. Maharashtra has high traffic volume with less arrangements on roads like lanes, small width so that traffic congestion is become common issue.
2. With the help of smart transportation system this problem can be solved.
3. Because of contactless communication between inter vehicles will not only gives information about traffic congestion but also helps in minimizing the number of accidents.

 © 2018, IJREAM All Rights Reserved.

TABLE I. Types of vehicles on road in Maharashtra

Type of Vehicle	*In 2016*	*In 2017*	*%*
Two wheelers	9,800	21,500	7.9
Auto rickshaws	726.1	744.2	2.5
LMV	24877	4,433.4	8.8
Buses	4,074.8	127.7	10.6
Goods vehicles	1,422.8	1,505.2	5.8
Tractors	603.6	639.2	5.9
Trailers	384.5	396.2	3.0
Ambulances	14.3	15.0	4.9
Others	47.0	56.8	20.9
Total	**27,270.1**	**29,394.4**	**7.8**

THE PROPOSED VANET METHODOLOGY

This paper suggests, IEEE 802.11p based wireless communication between vehicles to vehicles and vehicles to infrastructure which operates on the short range communication. The main goal is to send safety message with high reliability and low delay to every vehicle.

There are several goals that can be taken into consideration when designing proposed system.

- Keeping low the value of average delay of vehicles approaching an intersection points.
- reducing the queue length of all approaches to an intersection

Figure below shows the proposed system which describes the inter vehicle and vehicle to road side unit communication. In this proposed system each vehicle is equipped with wireless network so inform can be easily exchanged between vehicles & RSUs. In this communication a unit is installed at road side on every kilometer or as per distance requirements. So that this unit will send proper information about vehicles moving on that road. This unit will also display the traffic condition and schedules of buses of time of heavy traffic.

In traffic congestion situations these road side units will send messages to vehicles coming on this road to take diversion or exit to avoid long traffic jams. These units will also inform about accidents ahead. Road Side Unit (RSU) communicates with vehicles using connectivity sources like GPRS & 3G/4G.

 © 2018, IJREAM All Rights Reserved.

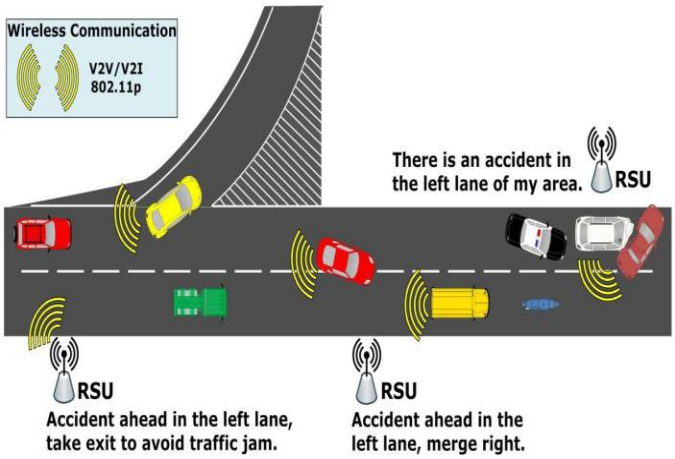

Fig.5 VANET equipped with RSU

CONCLUSION

This paper put emphasis on the need of Smart Transportation System and the importance of Vehicular Ad-hoc Networks.

REFERENCES

[1] VANET. *Wikipedia.org.* [Online] en.wikipedia.org/wiki/VANET.
[2] Economic Survey of Maharashtra State 2016-2017.
[3]Intelligent Transportation Systems, IEEE Transactions on (Volume:4 , Issue 3)
[4] V. Namboodiri, M. Agarwal, and L. Gao, "A study on the feasibility of mobile gateways for vehicular ad-hoc networks," in Proceedings of the First International Workshop on Vehicular Ad Hoc Networks, pp. 66–75, 2004.

 © 2018, IJREAM All Rights Reserved.