STFE: Speed Based Approach for Traffic Flow Estimation in VANET

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***Abstract*— In emerging world roadways get growing with vehicle population day-to-day, due to upsurge of vehicle every year accident probability also get increases. This will lead to traffic holdup, not only due to accident but also juncture of roads approach traffic jamming problem. So there is a need to alert the forthcoming vehicles about the congestion, thus they modify their path way. This alert is done through V2V communication, V2I communication and navigation scheme, but they provide approximate but not accurate information about the congestion. In this paper we propose a navigation system by getting the average time travelled by each and every vehicle through a particular Road Side Unit [RSU]. By using the average time travelled, the traffic in an exact zone will be calculated. The data calculated will be sent to user's route navigation. This approach will increase the precision of the information and will also provide more information about the traffic.**

Keywords: Navigation, V2V, V2I, Road Side Unit, On Board Unit.

I. INTRODUCTION

Now-a-days many emerging technologies and application are been evolving/upcoming in VANET area. In this emerging queue, Navigation is the mostly used application by many people. The main purpose of the navigation is to get the path way to a particular unknown place and to know the traffic congestion available in the particular path to be travelled. Navigation can be done through smartphones and also through car navigation too. When we start navigation, GPS is the main technology that is been used, GPS is the one which will locate us. After we are been located the navigation application we allow us to give an input as a destination. Then route to the destination will be from the position we also located will be provided as output. In the fast moving world, people are in need of quick and accurate result in any type of application. Like the same way travelling speed is also need to be reduced by then. So navigation is too widely used, when we move on to metro cities, traffic is the main problem. We can't able to stop the traffic collection, but we can control the traffic flow. Giving alternative path for the approaching vehicle is the best way of reducing the traffic flow in a congested route. This alternative path will be provide by using the navigation system. The Navigation system uses the GPS as its backbone for the position identification of the requested user. When user finds way traffic congestion (or) collision in his path way to the destination, user will request for an alternative path for the destination provided. More alternative path will be provided by the navigation system, but the path provide will be more distance the previous one. To get rid of traffic difficulties user will be choosing an alternative path of his wish. In case of emergency situation such as fire service, ambulance, police vehicle navigation will be more supportive. In the same way those emergency vehicle can also clear traffic by sending information about the arrival by using the VANET system. This arrival can also be updated in navigation using RSU so that all vehicle will be knowing about the emergency vehicle arrival, so that those vehicle will be alerted so that they provide way for upcoming emergency vehicle.

II. RELATED WORKS

Many author's has come up with many state-of-the-art ideas in VANET field, with the communication between Vehicle 2 Vehicle and Vehicle 2 Infrastructure. The author [1] provides a routing on the basic of vehicle density available in the particular moving path, but in way we can see vehicle being parked at the road side, those vehicle will also be calculated in density of vehicle, which leads to approximate not accurate information. In paper [2], the working principle of the navigation system, which help in reduction in time, fuel, cost has been estimated. Before getting navigated, the vehicle need to be located, but the vehicle is located approximately, the accuracy is not acceptable for developing safety application. In paper [9], the author comes up with a new idea called RF-GPS [9] to locate the vehicle more accurately. In [6] inter urban paths which are based on an mixture of VANET networks with both inter-vehicle communication (IVC) and vehicle road-side device communication (VRC), here communication between the vehicles are holding strong so that they can exchange more information in high speed. In paper [3] the author proposed by giving a security to the navigation system by privacy preservation protection for navigation, this will allow all independent user to get more private. So that the information about them such us their location, destination point will not be shared in public. Paper[8] proposed a scheme called VAN, short time path navigation, which allow the user to move in shortest distance, which navigation gets as the result.

III. ORGANIZATION OF THE PAPER

We have passed away from abstract which give the overview and also say about the main concept of the paper. In section I, served with a brief and clear introduction about the VANET and navigation progress. In session II, Literature survey gone through has been given as related work. In session III, system which is in present, is given as existing system. In session IV, the proposed concept will be given as Proposed System. Session V has the conclusion. Session VI finishes the paper with the future work that can be possibly done.

IV. EXISTING SYSTEM

Each and every time when we connect to get navigated, using GPS the location of our self will be revealed. Then a destination will be provided as input by the user. Using Global Positioning System the destination will also be located, with the traffic information. This traffic information is based on the traffic density in the particular route. The traffic density is founded by Road Side Unit[RSU], which get connected to the On Board unit[OBU]. By using the number of vehicle connected to the RSU the density of the road traffic will be founded. When the GPS gets activated, the signal from the device given as user segment in the fig: 4.1 send the signal to the nearby base station. The base station receives the signal and send to the master control station, which gets the signal from more base station nearby.

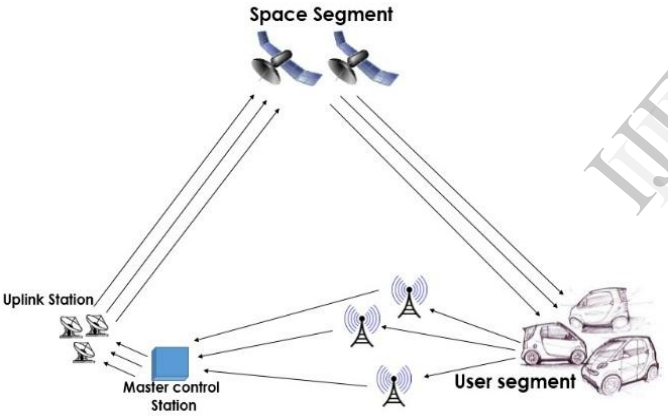

Fig 4.1: Locating through GPS

The master control station, manages the uplink station where the received signal from the base station will be uplinked to the satellite's evolving around the earth. The satellite will make an arc on a particular area where it received signal. The coincidence of the arc will be the location of the requested user. This information will be directly send to the base station near by the requested user,then the user get located. Then the user will give the input as the destination point to be reached. At this point the destination location will be located by using the name given and will be mined from the data base about the location details. Then path way will be provided with the traffic density though out thepath from the location till the destination. In Fig:4.2 the VANET communication is specified with Vehicle to Vehicle Communication [V2V], Vehicle to Infrastructure Communication [V2I]and Infrastructure to Infracture Communication [I2I]. Vehicles communicate with each other by using the V2V and V2I by means of RSU and OBU. By using the number of vehicles connected to the RSU, traffic density in a particular region cover by RSU will be determined. The obtained information about the traffic density will be uploaded simultaneously to the base station nearby.

This information about the traffic density will be obatined by the RSU. These data will be sent to the master control station or base station and also updated simultaneosly. When any user request for the information about the traffic in the path, the data will be responed to them.

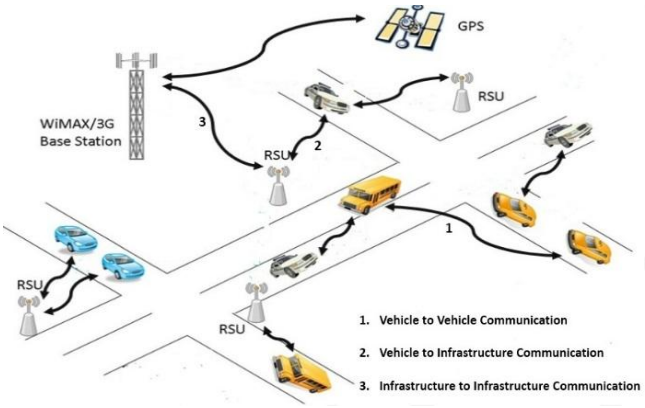

Fig 4.2: VANET communication

The drawback in this system, the data provided is approximate information about the traffic. GPS positioning also not accurate, 100mts around user will be shown as current location. The problem solution is to locate the user by using proposed RF-GPS[9] and also the traffic information that we provide is Time calculation based data So that the requested user can know that the vehicles are moving in an average speed. This paper allow to provide the timing information along with the existing system too make the data more accurate.

V. PROPOSED SYSTEM

As understood before to navigate first, the user must be located. We use a system called RF-GPS [9], which allow us to locate the user more accurate. RF-GPS, a RFID-assisted localization system that constantly supports lane-level location exactness [9]. It advances accuracy of the GPS system by engaging a DGPS-like concept. When a vehicle moves with an OBU it simultaneously send signal to connect with an RSU. When the vehicle comes under a range of an RSU, connection will be established between vehicle and infrastructure. This range of the RSU is depending upon the ADOV protocol used in the RSU, this will determine the range of the RSU. In roadways many vehicle will be travelling in different speed, when such vehicle travel through a particular RSU range the vehicle will be connected to the Infrastructure.In this paper we explore the average time taken by vehicles to cross a particular RSU, which cover distance of"k" kilometer. In fig: 5.1 The RSU range,and an vehicle approching with an OBU has been shown. The RSU range will be covering some particular kilometer of distance. But without using an RSU device the

vehicle can also comminicate with the other vehicle using the OBU. But the vehicle will not be know to the infrastructue until it connectes with an RSU.

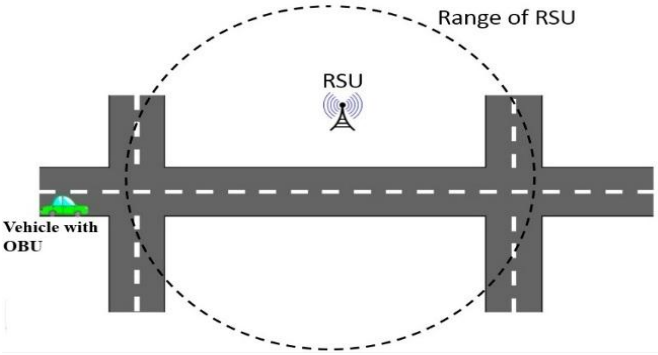

Fig 5.1:RSU Range, vehicle entering with OBU

The proposed work starts here, In fig:5.2 the vehicle with OBU enters the RSU range, as soon as the vehicle enters, authentication process will be done. To find that the vehicle is an authorized vehicle. If the authentication process has been completed a certificate "C" will be provide to the vehicle. The clock starts for the particular certificate will be certificate and will be running simultaneously. In the same way for "V" number of vehicles "C" number of certificate will be provided.

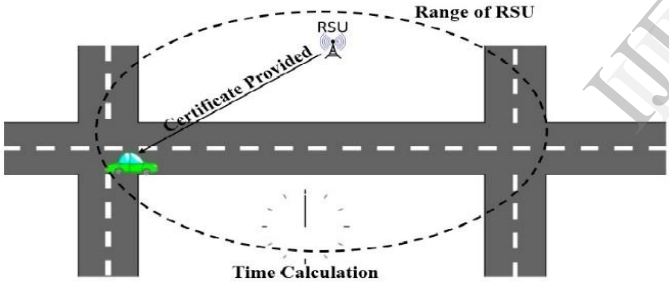

Fig 5.2: Providing Certificate

The vehicle will be travelling with the certificate provided, and sideway the clock will also be running to calculate the time. In fig:5.3 we have the vehicle which has a certificate authority provided, the vehicle will hold the certificate. Here the clock is also shown in the fig:5.3 to show the process of time calculation.This process will be running on for the vehicles which are all in the range of the RSU, with the certificate provided by the RSU after the authentication process. If a vehicle has a certificate authority from the RSU, then the vehicle can communicate with other vehicle by using RSU. This allow the vehicle to get V2I communication, so that the vehicle will be able to get information from the infrastructure about the path way, and about the traffic in a particular area, by requesting to other vehicles connected with RSU, as like as before it has the certificate, the vehicle has V2V communication.

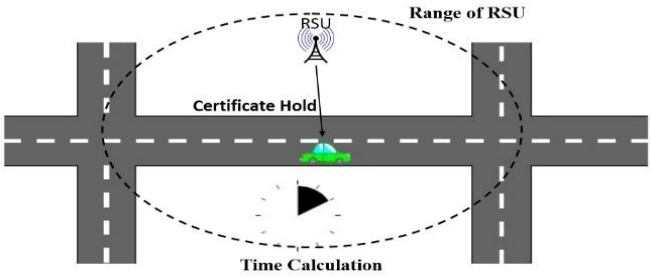

Fig 5.3: Holding Certificate

When the Vehicle "V" exits the range of the RSU, the certificate "C" which has be provided by the RSU will be released, and clock running will be stopped as the certificate released. Now the RSU knows that the vehicle "V" which has a certificate "C" has travelled a particular distance of kilometer "K" at a time "T". This time "T" will be calculated for the vehicle which are in the range of the RSU. Now the Road Side Unit knows the time travelled and distance travelled by a particular vehicle. To know the speed/velocity of the vehicle,

$$speed(S) = \frac{distance(K)}{time(T)}$$

Here distance (K) is the area/kilometer covered by the vehicle. Time (T) is the time taken by the vehicle to cross the particular distance (K). The speed calculation will be done for each and every vehicle crossing over the RSU.

In below fig: 5.4 the certificate release has been shown as the vehicle exists the range of the RSU. At the same time the clock stops ticking, and save the time taken for the vehicle to cross the range. Mostly the certificate provided time and certificate release time will be taken for the time calculation, each vehicle which move over the range.Then the vehicle will moves over to the other RSU path, the same calculation will be done and will be provided as output. As the output will be the average of the vehicle velocity under a particular RSU. When a vehicle is for away ask for the traffic density through its path, the information provided will be with the traffic flow in the particular path requested. So that the vehicle pilot can decide to take an alternative way or not, even if the traffic is higher.The information provide will be with the existing system too, with the path way navigation, about the traffic density estimated by the number of vehicle connected to the RSU, speed of the user vehicle moving and with the proposed average speed of vehicles that crosses the particular area covered.

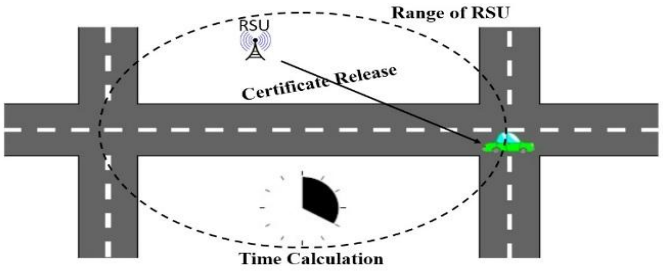

Fig 5.4: Release Certificate with Time Calculation

$$Average\ vehicle\ Speed = \sum \frac{v1+v2+v3+\cdots..+vn}{n}$$

Let we consider "V" is number of vehicle's speed taken for calculation, then

$$Average\ vehicle\ Speed = \sum \frac{Vn}{n}$$

NAVIGATION SYSTEM

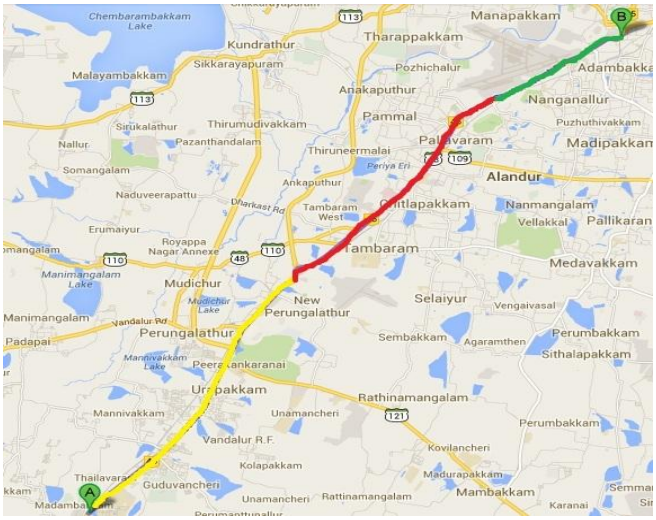

Fig:6.1 Traffic Density Estimation

The above diagram fig: 6.1 gives the current navigation system, used in the smart phones and car navigation system. Here we can see the information about the navigation to the destination and the traffic density information. And in below figure 6.2 given the TIDE Navigation, in the proposed navigation system, not only the navigation to the destination, traffic density information will be provided. It is provided with the addition information of the traffic flow of vehicles.

The proposed schme allow the pilot to take own destination before itself after viewing the traffic flow in the current path to the destination.

Fig: 6.2 STFE Navigation

VII. CONCLUSION

The above proposed navigation scheme is based on the average time taken by top vehicle travelled to cross the particular road way. This is more accurate than the existing pattern of analyzing the density of vehicle under a Road Side Unit [RSU]. The proposed system will also reduce cost, time,fuel usageand control air, noise pollution too.Mostly in every work security will be lacking in some areas, as like as navigation does also lack in security. Any attacker can intrude and can provide wrong information. So security is need to be implemented and also more accuracy will be done as future work.

REFERENCE

[1] A VANET Routing based on the Real-time Road Vehicle Density in the City Environment. Hyun Yu, JoonYoo, Sanghyun Ahn,2013.

[2] Design and Implementation of the Travelling Time- and Energy-Efficient Android GPS Navigation App with the VANET-based A Route Planning Algorithm Ing-Chau Chang, Hung-Ta Tai, Dung-Lin Hsieh, Feng-Han Yeh, Siao-Hui Chang, 2013.

[3] VSPN: VANET-Based Secure and Privacy-Preserving Navigation T.W. Chim, S.M. Yiu, Lucas C.K. Hui, and Victor O.K. Li, Fellow,2014.

[4] A Novel Design and Realization of the Vehicular Driving Navigation System based on VANETYi Wu1, Zhenhong Shao, Wenfeng Li, LianfengShen Xiao Lin,2010.

[5] 'Smarter and Safer Road Traffic Using Advanced VANET and Wireless Augmented Reality' Bahnisikha Dutta, Abhishek Sreedhar,C.Sandeep,2012.

[6] "Acquiring Real Time Traffic Information Using VANET and Dynamic Route Guidance", Ayla HasanalizadehKhosroshahiParvizKeshavarziZiaddinDaieKozehKananiJafarSobhi 2011.

[7] "Research of Hybrid Positioning Based Vehicle Interactive Navigation System"Mingke Fang, Lei Li Wei Huang,2011.

[8] "VAN: Vehicle-Assisted Shortest-Time Path Navigation' Wenping Chen, Sencun Zhu, Deying Li,2010.

[9] "RF-GPS: RFID Assisted Localization in VANETs", Eun-Kyu Lee, Sungwon Yang, Soon Y. Oh, and Mario Gerla,2009.