V2V & V2I Communication for Prevention of Road Accidents, Review Paper

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***Abstract*: The number of accidents in India are highest in the world. The actual number of accident number may be higher than documented. One person dies in every 4 min. In India now-a-days safety on roads has become a serious issue as well as all over in the world. At some places accidents occur like crossings, diversions on highways, sharp Turn. The accidents on highways can be prevented by providing the notification of infrastructure to the driver before they arrive. It is a project with innovative ideas for safety on roads and highways. An Internet of Things (IOT) with sensors is used to transmit the entire data collected by sensors communicate through wireless protocol. In this Project we are presenting an electronic system which is based on embedded and Internet of Things (IoT).**

***Keywords*: Infra-structure, RF433MHz, Road, Vehicle, Wireless Communication, WSN.**

I. INTRODUCTION

The presence of devices in an automobile that connect the device to other device within the vehicle or devices networks and services outside the car including other car, home, office or infrastructure. Connected vehicles safety applications are designed to increase situation awareness for accidents though vehicle to vehicle (V2V) and Vehicle to Infrastructure (V2I) communications.

This project has idea of prevention of accidents. In this Project all this communication is done with IOT (Internet of things). The IOT Technology can be used for providing communication & Interaction among vehicles & Infrastructure along the road side. By connecting vehicles & road side Infrastructure to the Internet real time communication, monitoring, controlling & notifications (early warning system) can be achieved.

Due to road accidents many people loss their life in the world in every year, and much more people have been injuring and maiming. The main reason of these accidents is a limitation in view of roadway emergency events that can be due to the distances, darkness, and existence of an inhibiter in the road. Road and traffic safety can be improved is drivers have the ability to hear further outside the road and Know if a collision has occurred. This can become possible if the drivers and vehicles communicate with each other. If Infrastructures information was provided to drivers the road would be safer and travelling on them would become more efficient. We are proposing the V2V and V2I communication link to prevent the road accidents. There are some issue regarding to current system so we are developing this Iterative system for Preventing Road Accident.

Here Communication is established between vehicle to vehicle and vehicle to infrastructure so that driver will able to drive more easily. Radio Frequency is used for Communication between vehicle to vehicle and vehicle to Infrastructure. We are using IOT sensor such as Ultrasonic, Proximity, and DHT11 for sensing data and some of the data is send on cloud. This project has idea of prevention of accidents. In this Project all this communication is done with IOT (Internet of things). The IOT Technology can be used for providing communication & Interaction among vehicles & Infrastructure along the road side. By connecting vehicles & road side Infrastructure to the Internet real time communication, monitoring, controlling & notifications (early warning system) can be achieved. The purpose of this system is to assess the readiness for application of vehicle-to-vehicle (V2V) communications, a system designed to transmit basic safety information between vehicles to facilitate warnings to drivers concerning impending crashes.

Objective of our project are 1. Early warning regarding any vehicle coming from left or right on the cross road where visibility is poor due to the presence of buildings or other infra-structure along the cross road. 2. Information regarding approaching on vehicle in the fog & heavy rain. 3. Information regarding any obstacle lying on the road during night. 3. Early warning regarding bridge & other structure during night.

II. LITERATURE SURVEY

[2]Swati B. Raut developed a VANET to reduce the collision of the vehicles and congestion control in the intersection of the roads efficient monitoring of vehicles is need of time for smooth traffic flow. It uses Intelligent Control Unit (ICU) and Vehicle to Vehicle communication to predict the collision probability at highway intersection. The scheme is implemented at open street map, on location of interest and makes use of warning system based on collision probabilities. Simulation results show the collision probability for near crash, no crash and crash.

In VANET, Problems are Analysis of the existing VANET protocols [11]-[13], [16], [18, 19] demonstrated that most of them result in performance bottleneck during high traffic conditions. The main problem with these protocols is the large packet size, that results in increased cryptographic and communication overheads. The above situation motivated this research to look for a reliable solution

to support both V2I and V2V communications, yet by reducing the above said overheads that are not properly addressed by other studies. The main concern of this research is, to propose an efficient protocol that can satisfy the scalability requirements and lower the message loss.
[3]GOH CHIA CHIEH proposes a novel Vehicle to Vehicle (V2V) communication system for collision avoidance which merges four different wireless devices (GPS, Wi-Fi, Zigbee and 3G) with a low power embedded Single Board Computer (SBC) in order to increase processing speed while maintaining a low cost. Collision avoidance data processing includes processing data for vehicles on express ways, roads, tunnels, traffic jams and indoor V2V communication such as required in car parks.
Wi-Fi Based System: - In Wi-Fi based system there is limitations of user in high traffic conditions. Wi-Fi hotspot only communicate with 10 users at a time. In Wi-Fi based system at first time user have to manually connect with hotspot for communication. In High Traffic condition there is chance of delay in notification and collapse of network.

a. Survey of Country:

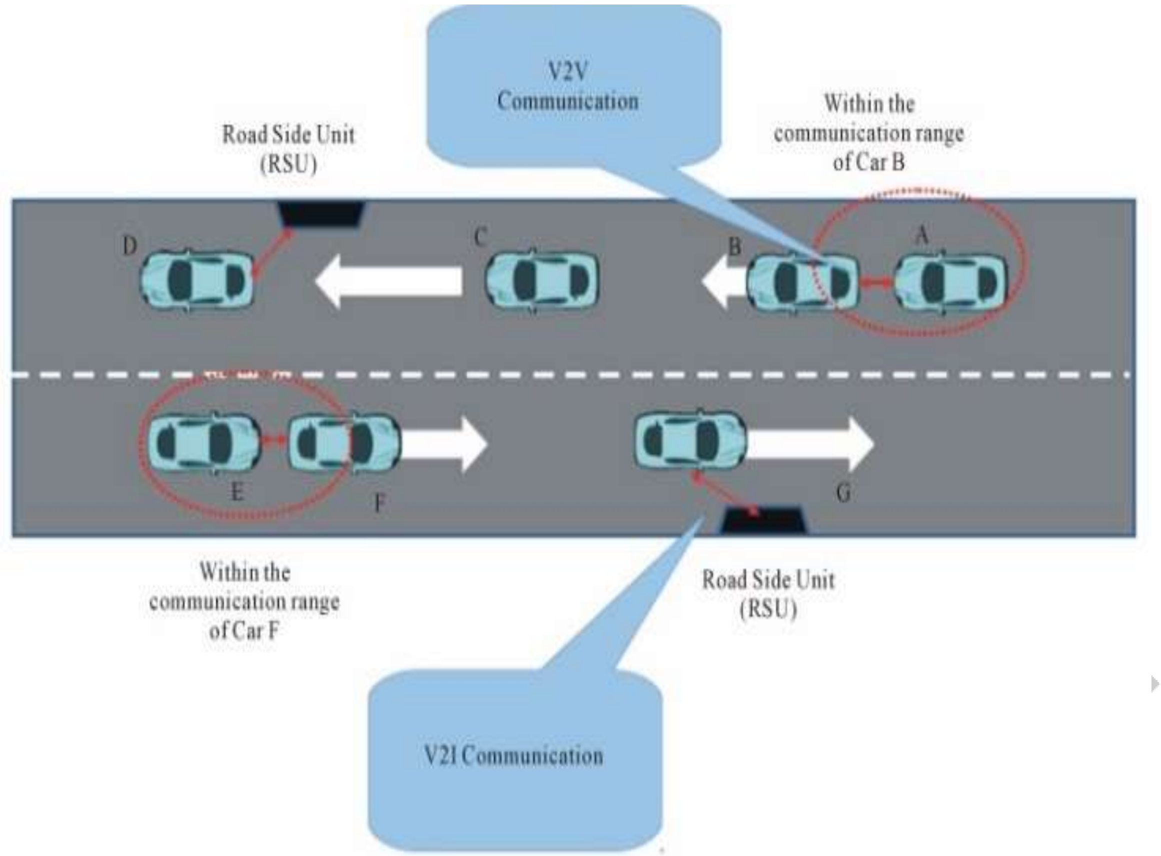
A serious road accident in the country occurs every minute and 16 dies in Indian roads every hour. 1214 road crashes occur every day in India. Two wheelers account for 25% total road accident deaths. 20 children under the age of 14 die every day due to road crashes in the country. 377 people die every day, equivalent to a jumbo jet crashing every day.

b. Survey of Maharashtra:

Every day, on an average, as many as 115 road accidents take place in Maharashtra and 37 people die in these mishaps, reveals the annual crime report released by the Crime Investigation Department. Pune, on an average, witness's four accidents per day and three deaths every 48 hours, states the report. The maximum number of road accidents 3,123 took place in Aurangabad in 2017, followed by Mumbai (2,551) and Navi Mumbai (2,223). Mumbai tops the list of road accident deaths 611 followed by Pune, which saw 543 such deaths. In 2017, Maharashtra witnessed 42,250 accidents, in which 13,685 people died and 39,301 were injured. In 2016, the state saw 44,382 road accidents, in which 13,529 persons were killed and 43,668 injured. While the number of accidents fell by 4.8%, the number of accident-related deaths increased by 1.15 %.
According to World Health Organizations (WHO), road accidents annually cause approximately 1.2 million deaths worldwide. Also, about 50 million persons are injured in traffic accidents. Western Europe a mere 5 km/h decrease in average vehicle speeds could result in 25% decrease in deaths.
The National Highway Traffic Safety Administration helps to reduce deaths, injuries, and economic losses resulting from motor vehicle crashes by setting and enforcing safety performance standards for motor vehicles and motor vehicle equipment. Vehicle manufacturers respond to NHTSA's standards by building safer vehicles. Combined with State and local government efforts, market effects, and driver behaviour improvements, NHTSA's standards have contributed to a significant reduction in annual highway fatalities and injuries, from 52,627 fatalities in 1970, to 32,479 fatalities in 2011. Safety technology has developed rapidly since NHTSA began regulating the auto industry – vehicles protect occupants much better in the event of a crash due to advanced structural techniques propagated by more stringent crashworthiness standards, and some crash avoidance technologies are now standard equipment. Between existing crashworthiness and required standard crash avoidance technologies, motor vehicles are safer now than they have ever been.
However, a significant number of annual crashes remains that could potentially be addressed through expanded use of more advanced crash avoidance technologies. The agency estimates there are approximately five million annual vehicle crashes, with attendant property damage, injuries, and fatalities. While it may seem obvious, if technology can help drivers avoid crashes, the damage due to crashes simply never occurs. The agency's push thus far for adoption of crash avoidance technologies, like electronic stability control, has helped vehicles react to crash-imminent situations, but has not yet been able to help the driver react ahead of time.
Before Intelligent Transportation Systems (ITS), the United States developed, planned, and built the interstate highway system. The interstate highway system has provided a high level of mobility for citizens as well as the efficient movement of goods. From the 1950s through the 1980s, the vision of highway transportation was focused on building roads. Yet issues began to emerge as the interstate system was being built: about traffic congestion, especially in our urban canters; about highway-related fatalities and injuries due to crashes; and about the impacts on energy consumption and air quality. The discussions culminated in a workshop held in Dallas, Texas, in 1990. During the workshop, participants invented the Intelligent Vehicle Highway Systems (IVHS) concept, which was later renamed to ITS. The overall precept was that new transportation efficiencies could be found if current infrastructure could be married with advanced technology. New developments in computing, sensors, information systems, and advanced mathematical methods could be used to increase the operational capacity of the system, and achieve better overall transportation network operations.
The ITS concept became an integral part of the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA). The Act allocated $660 million of funds for ITS research, development, and operational tests over six years. In addition, just before the Act was adopted, the Intelligent Vehicle Highway Society of America advisory organization was established; later renamed Intelligent Transportation Society of America. This advisory organization developed the first strategic plan for ITS in 1992. The plan called for the integrated operation of the system using technology to bring together information about modes and current conditions, and discussed how institutions can be organized to operate the total transportation network.
V2V communications research initially began under the Vehicle Infrastructure Integration Initiative in 2003, but its origins date back to the Automated Highway System (AHS) research of the 1990s. The actual initiation of advanced technology research was mandated by the ISTEA. The Act called for the development of an automated intelligent vehicle highway prototype that would use technology to make highway driving efficient, safe, and predictable.

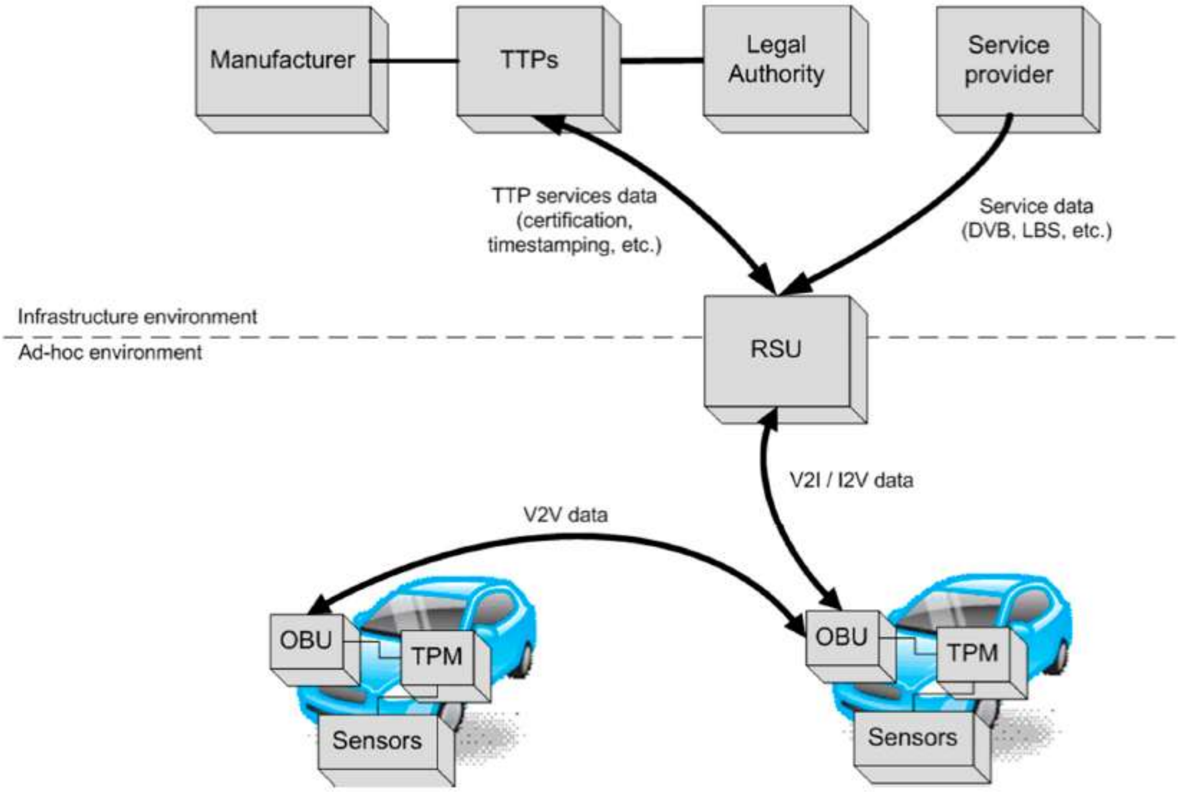
The vision of this system is to test V2V safety applications in real-world driving scenarios to support estimation of their effectiveness at reducing crashes, and to ensure that the devices are safe and do not unnecessarily distract motorists or cause unintended consequences. The Model Deployment is evaluating everyday drivers' reactions, both in a controlled environment through driver clinics, and on actual roadways with other vehicles through the real-world model deployment.
As this report focuses on the basis and potential of applying V2V technology to light vehicles, it important to note the agency is also heavily involved in V2V research related to heavy vehicles, pedestrians, and motorcycles.

III. BLOCK DIAGRAM



IV. APPLICATIONS DEVELOPED FOR V2V COMMUNICATION SYSTEMS FROM EXISTING SYSTEM

Applications developed for inter-vehicle communication systems are basically based on mobile improvisation networks. Basically, this network structure has been adapted to vehicles and received the name VANET (Vehicular Ad-Hoc Networks). Within this structure are modules that communicate with each other. Modules on the vehicles are called OBU (On Board Unit), modules in the infrastructure or road units are called RSU (Road Side Unit) and units on the general server are called SU (Server Unit). [5] Each module communicates via a certification and hierarchy policy defined with each other. If the hierarchy and the definition of certifications and their timing do not change in the way they would like to implement it, this leads to different protocols and applications. For this reason, the applications described in the following section are fundamentally the same, although they differ in terms of certification and communication rules.



i. SeVeCom:

The SeVeCom project is a project with "safe inter-vehicle communication systems" that is supported by several European Union-sponsored automotive manufacturers, supplier companies, various universities and the state. The project was created with VANET basic architecture as mentioned above. However, unlike the basic structure, the European Union has changed the certificate management to reduce the network load at the intersection point, according to their wishes. Basically, for the certification method, ELP (Electronic License Plate) distributed via RSUs are considered, but PKI (Public Key Infrastructure) has been decided on since this work can be played or imitated. Developed PKIs are permanently distributed over basic servers. The communication is between the OBU and the RSU and the information is transferred to the basic servers via RSU. With this architecture, unnecessary certification load is prevented from being overloaded to the network, and the network is made accessible.

ii. GeoNetworking:

Unlike other projects, this project aims to communicate over short-range wireless network protocols. Simply the RSUs and servers in VANET systems are not included in the project. All devices within a distance of about 100m are connected to each other via the same IPv6 protocol as the wireless network technology used in current computers. The main purpose of the project is to connect the means to organize traffic in a certain area instead of providing a general communication system. Because of the use of the IPv6 protocol, there are security vulnerability problems in current computer networks.

iii. ***Intersafe:***

The pioneering project Intersafe in Europe is aiming to develop a basic "Intersection Assistant". The first way this assistant attempts to reduce fatal accidents is to make sure the vehicle is aware of the vehicles around it. It plans to do this with various sensors and IEEE 802.11 based two-way wireless communication. On this count, several accidents can be detected in advance and warned for other driver stops. The second method is traffic light management. Traffic lights equipped with sensors and IEEE 802.11 based bi-directional wireless communication can also provide the necessary measures by informing the approaching vehicles about the traffic light condition, road conditions and potential accidents.

V. ALGORITHM OF EXISTING SYSTEM

i. Reception of a packet via radio, checking its format.

- If true: the data is passed to II.
- If not: the packet is discarded and data packet analysis is ended.

ii. The geoinformation is extracted: position and timestamp.

iii. Check timestamp to verify that the packet has not already been forwarded or it is updated.

- If true, two actions are executed: the packet is sent through the serial port to notify the PC and the packet is transmitted to step IV.

- If not: the packet is discarded and data packet analysis is ended.

iv. The distance is calculated between transmitter and receiver node *i*. Update the neighbor table.

v. Check if the distance between nodes is less than *RRBi*.

- If true: the packet is forwarded by radio.
- If not: the packet is discarded and data packet analysis is ended.

vi. Reception of a packet via serial port, checking its format.

- If true: the data is passed to vii and is sent via radio.
- If not: the packet is discarded and data packet analysis is ended.

vii. The geoinformation is extracted: position and timestamp.

viii. The *RRBi* is calculated with the speed of the vehicle, *i*. The position of the node is read to allow the calculation of the distances, and the NT is checked to eliminate discontinued nodes.

VI. FUTURE SCOPE

We are proposing a system to prevent road accidents, max 30% to 40% road accidents may be reduced by our system. By using our system if the today's loss of human life is 90% to 95% in accidents it will reduced to 25% to 30% by using our system. we will also reduce the 40% to 50% infrastructure damage. In our project smart system has been implemented for the vehicle which uses concept of IOT. This project includes use of various sensors like ultrasonic sensor that detects rear and front vehicle during Fog and Night. A novel idea is proposed for monitoring the road side infrastructure and the sharp turns on roads. Using wireless communication medium the message will be sent in vehicle and some data is displayed on Cloud server. Thus, here by we conclude that the proposing system remove some drawbacks of existing system and enhanced with the IoT system for V2V and V2I system.

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