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A novel Approach towards Vehicle to Vehicle Communication using IOT

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ABSTRACT

In this paper, we present initial design and technology of Vehicle-to-Vehicle (V2V) communication. Technologies that are going to be discussed in this paper include Implementation designs of VANET, LI-FI (Light Fidelity), IOT. Vehicle to Vehicle communication is the most effective solution that has been used in order to reduce vehicle accidents. The flow of this paper is structured as follows, section I explains the overview of this technology. Section II provides the block diagram; Section III gives the clear vision of vehicular components Implementation. In Section IV, we discuss the strategies and methodologies. Section V talks about the implementation using LI-FI, and in section VI, the detailed information about IOT approach is discussed.

Keywords: V2V, LI-FI, IOT, VANET, GPS

I. INTRODUCTION

Now -a -days it is very evident that the volume of the traffic is rapidly growing on roads. This result in huge traffic congestion Presently Traffic Management System work under fixed varying parameterization, inefficiencies are likely under high traffic conditions. The recent Advances in sensors and wireless technologies in vehicles are bringing the paradigm of connected vehicles nearby [3]. Vehicular community and coordinating with each other will Increase passenger's safety and also manages the traffic and reduces the waiting time of the vehicle in traffic. VANET is an intelligent technology which integrates the capability of new generation in wireless networks and vehicles. The research work in VANET plays a vital role in safety, security, ease of our road and acquire information from infrastructure and non-infrastructure services.

Fig: 1 Model of E-Vehicle driving

This paper especially focuses on vehicle to vehicle (V2V) Communication protocol which makes communication possible between the moving vehicles when the criteria for Establishment of connections are met by the vehicles, which are predefined.

The vehicle-to-vehicle (V2V) communication can supplement the sensing ability of an AV.Future generations of V2V communication May also support information relaying. V2V has the goal to facilitate efficient and reliable Communication without predominantly relying on Global system for mobile communication (GSM) Network. V2V communication uses a wireless protocol Similar to Wi-Fi known as DSRC, which combined with global positioning system (GPS) technology Provide V2V communication that offers 360 degree view of similarly equipped vehicle within its communication Range. Transmitted messages, common to all vehicles, including the current GPS position, speed, acceleration, And heading. It also transmits messages of vehicle Control information such as transmission state, break status, steering wheel angle, and vehicle path history and path prediction.

II. TECHNOLOGY

V2V uses GPS with DSRC protocols. DSRC works in the bandwidth of 75 MHz with 5.9 GHZ spectrum and approximate communication range of 1000m communication with none-overlapping 10 MHz channel plus a 5 MHz guard band in front of the frequency range [2]. Based on security reasons DSRC communication channels are separated. DSRC use 172 channels for safety communication, 174 for security related communication and 178 channels for control and channel management switching Vehicles can share their own position/velocity/acceleration information with other vehicles using V2V.

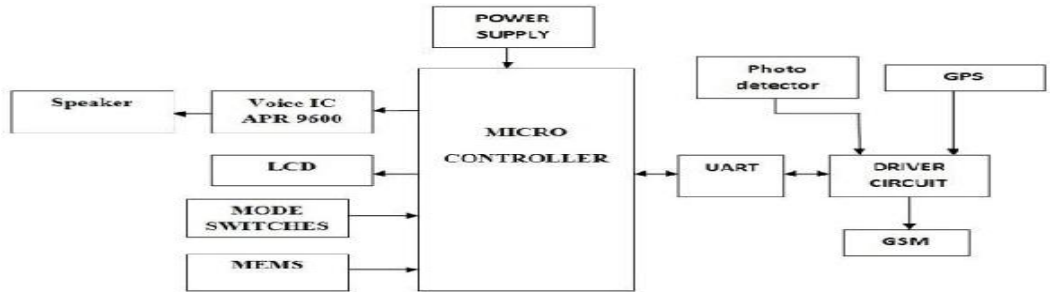

Fig: 2 Block diagram of vehicle to vehicle communication

BLOCK DIAGRAM:

This eliminates the error in estimating these quantities through sensor-based perception, and in turn results in accurate localization. Finally, vehicles can share their intentions (i.e., Future trajectory) with other vehicles, eliminating trajectory prediction [5]. The intent information helps in risk assessment and can result in better planning for AV.

III.VEHICLE BASED COMPONENTS

V2V communication requires two main Components, which include one located on the vehicle and the other on the Road Side Unit (RSU). Some of the hardware components in-vehicle can be integrated into a single unit or a discrete set of components and Consist of the following component.

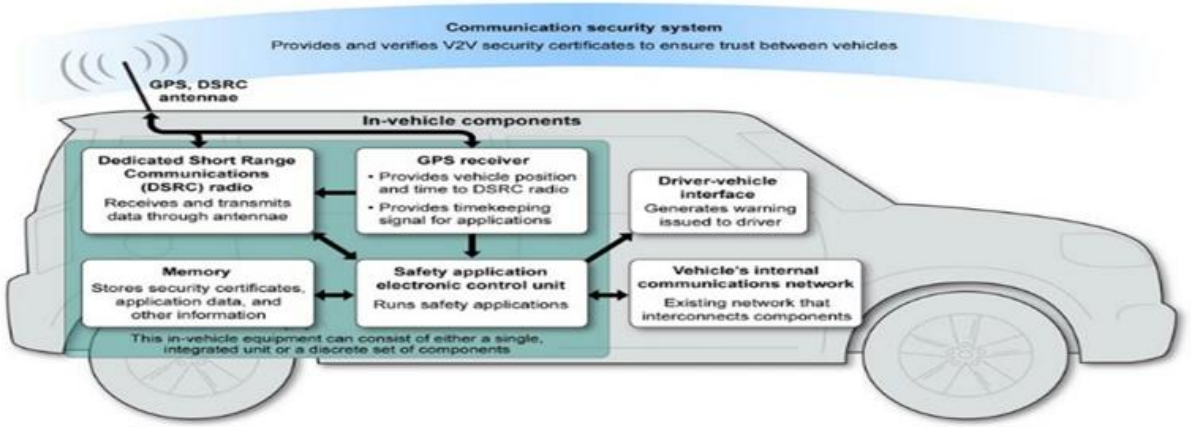

Fig: 3 Communication Security System

- **Dedicated Short Range (DSRC) radio:** Responsible for receiving and transmitting Data over antennae.
- **GPS Receiver:** Provides the vehicle position, Time to DSRC radio and timing signals for Applications.
- **Memory**: Responsible for storing the security Certificates with other information and Application data.
- **Safety Application Electronic Control Unit (SAECU):** Runs the safety applications of the System.
- **Vehicle's Internal Communication Network (VICN):** Network that interconnects comports.
- **Driver-Vehicle Interface (DVI):** Display or Generates warning to the driver.
- **Security Credential Management System Manager (SCMS):** Facilitates and verifies theV2V security certificates to make sure that there is trust between vehicles.
- **DSRC & GPS Antenna:** Interface between the Propagating radio waves and its responsible For receiving and transmitting both the DSRC And GPS signals.

IV.METHODOLOGY

The generalised block diagram of V2V communication is as shown in figure. There are two blocks given which belongs to car1 and car2 respectively. The explanation of these blocks is given as follows:

Fig : 4 Vehicle to Vehicle Signal Transmission

GPS will give information about steering angle, dimension Speed of vehicle, location co-ordinates, and path of the vehicle To the On board Unit (OBU) of all the vehicles, which will Process the data provided by GPS and

depending on the data Safety messages are generated in embedded board [9]. It will generate the safety messages depending on the position of the Vehicles. The safety messages will be transmitted and received By RF module. Basic safety messages will be displayed on the Display unit.

V. V2V USING LI-FI:

The proposed system requires a transmitter and a receiver in each vehicle in both rear and front sides of the vehicle. Thus more scenarios will be applicable. For the time being, only two scenarios will be studied in this paper.

First Scenario: when vehicle 1 is braking, the speed Meter in the vehicle will be sensing that the current speed is

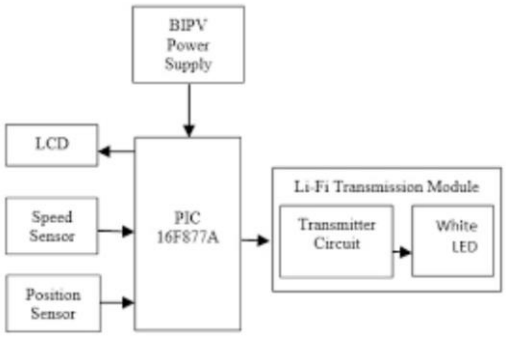

Fig : 5 Vehicle to vehicle communication using Li-Fi

Lower than the previous speed. Thus, a message will be sent through the transmitter which is placed in the rear lights to Vehicle 2. The message will be received by vehicle 2 using the Photodiode which is placed at the front of vehicle 2[8]. A notice Of (Slow DOWN) will be displayed in vehicle 2 using an LCD.

Second Scenario: when vehicle 1 is in T- junction, it will Keep sending its speed information to vehicle 2 using the LED At the headlights [8]. The speed-information will be received by the photodiode in vehicle 2 and compared to vehicle 2 speeds' [6]. If vehicle 2 is about to cross the junction while vehicle 1 is Moving with a high speed, the driver will be alerted to check The other vehicle which is around in the area.

VI. V2V USING IOT

To provide road views more accurately, a vehicle to Vehicle communication system could be established, where the Data's from the vehicles as taken by numerous sensors would be uploaded to the database using IoT [7]. Any vehicle coming in Its range could easily share the information stored by either of Them, helping them have a clearly idea of traffic and the car in Proximity thereby almost avoiding any mishap or chaos.

Simulation tools:

LabVIEW: This is a National Instruments' designed Oracle Development platform for visual programming language. With A lot of tool kit and additional add on s, this is mainly used for Data acquisition, instrument control, and industrial automation On a variety of platforms including Microsoft Windows, various Flavours of UNIX, Linux and Mac OS.

ODBC:(open Database connectivity) is a Standardized interface (API) for accessing the data from the Client. This can be used to communicate with databases from Other vendors, such as Oracle, SQL server. It is independent From any OS, database system or any programming language.

Localhost server: The PHP and SQL based database was used From XAMPP by using their apache servers to upload the data.

VII. ADVANTAGES

The coordinated group of programs, function, tasks designed to interface with the driver are:

Emergency Electronics Brake Light (EEBL): Notifies the driver of a hard breaking vehicle On the road ahead.

Blind Spot Warning (BSW): This advanced Driver assistance system lets the driver know That there is a vehicle that may not be visible And its position on the driver's blind spot. If The driver attempts to change lane still on the Blind spot the advisory will trigger an alert Informing the driver that it's not safe to Change spot.

Lane Change Warning (LCW): Is a safety Advanced driver assistance systems intended To provide a warning if a driver intend to Change lane that will soon be occupy by a fast Moving vehicle that is traveling in the same Direction.

VIII. CONCLUSION

Communication has offered many new opportunities for the automotive industry. This paper proposes a technology to Improve traffic congestion and road safety. Also, we have Analysed situations like collision, delay and redundancy etc. Which can be improved or overcome with simple warningMessage transmission? GPS is used so that V2V system Processor can identify the speed, direction and location of the other vehicle more sensors can be included for better working and Accuracy. Future cars will be more intelligent which can make Its own decision for the safety purpose. Quick help will be provided by knowing the location if the advance system also Embedded in ambulance.

IX. REFERENCES

[1] Shivkumar Vijay Raut, Shardul Ajay Jangam, Bhooshan Rajpathak, "*Improving Vehicular Traffic Efficiency by Infrared Sensors", Smart Technologies for Power Energy and Control (STPEC) 2020 IEEE First International Conference on*, pp. 1-6, 2020.

[2] Debashis Das, Sourav Banerjee, Pushpita Chatterjee, Uttam Ghosh, Wathiq Mansoor, Utpal Biswas, "*Design of a Blockchain Enabled Secure Vehicle-to-Vehicle Communication System",* Signal Processing and Information Security (ICSPIS) 2021 4th International Conference on, pp. 29-32, 2021.

[3] Albert Demba ,Department of Informatics, Clausthal University of Technology (TUC), Germany, Dietmar P. F. Molar, Clausthal University of Technology (TUC), Institute of Applied Stochastics and OR, Germany, *"Vehicle to vehicle communication technology ",* IEEE International conference on, pp. 3-5-2018.

[4] Anum Ali,The University of Texas at Austin, Austin, Texas, Libin Jiang,Qualcomm R&D, Bridgewater, New Jersey, *"vehicle to vehicle communication for autonomous vehicles:safety and manoeuvre planning"* IEEE international Conference on pp. 27-30Aug, 2018.

[5] N.G. Ghatwai , V.K. Harpale, Mangesh Kale, *"Vehicle to Vehicle communication for crash avoidance system ",*IEEE international Conference on pp. 12-23 Aug 2016.

[6] P. Sathya Narayanan, C. Sheeba Joice, *"Vehicle to Vehicle communication using routing protocols"*,IEEE International Conference On pp. 15th march 2019

[7] N. Pothirasan , M. Pallikonda Rajasekaran, "*Automatic vehicle to Vehicle communication and vehicle to infrastructure Communication using* NRF24L01 *module",* IEEE International Conference on pp. 17th December 2016

[8] Noof Al Abdulsalam, Raya Al Hajri, Zahra Al Abri, Zainab Al Lawati, Mohammed M. Bait-Suwailam, "*Design and implementation of Vehicle-to-Vehicle communication using LI-FI technology ",* IEEE International Conference on pp. 19th may 2015.

[9] Syed Faraz Hasan, *"Vehicular Communication and Sensor Networks",* IEEE potentials, vol-32 issue-4, pg: 30-33, July-Aug, 2013.

[10] Junping Xiang ,Zonghai Chen"*An adaptive traffic signal coordination Optimization method basedon vehicle-to-infrastructure communication"* Springer Science Business Media New York 2016 PP 1503–1514