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Design of Prototype model for Vehicle to Vehicle Secure Formatted Communication

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Abstract: Vehicular Ad-Hoc Network or VANET is a form of mobile ad hoc network, to provide communications among neighboring vehicles and between vehicles and nearest fixed equipment, usually described as roadside equipment. Vehicular ad hoc networks (VANETs) are being developed to offer on-demand wireless communication infrastructure among vehicles and authorities. Vehicles will be consists of sensors and communication devices which will allow to cooperate with each other. Such an infrastructure is expected to deliver multiple road safety and driving assistance applications. VANET is gaining much attention in recent times because of its many important applications in transport, to improve road safety, reduce traffic congestion; to enable efficient traffic management etc.According to requirement vehicle can transmit or exchange information. Vehicles can interchange different type of information as per requests on demand for specified application. It is essential to have some standard protocols for communications between vehicles to vehicles. Hence we are proposing system which will determine the implementation of Vehicle to Vehicle communication along with considered modes of communication like control, informational and alert messages. Expected outcome of the proposed system will be to develop a prototype vehicle models which will communicate with each other using wireless technology and react upon with defined action on specific type of message from sender vehicle.

Keywords: Vehicular ad hoc networks (VANETs), control and warning messages, and prototype vehicle models.

I. INTRODUCTION

Vehicular ad hoc networks (VANETs) are being developed to provide on-demand wireless communication infrastructure among vehicles and authorities. Such an infrastructure is expected to send multiple road safety and driving support applications. Vehicles will be fitted out with sensors and communication devices such as RF that will allow them to cooperate with each other In VANET each car who is participating into network it converted to wireless router or node. The space between cars is 100 to 300 meters then only cars are link with each other and the network is connected in wide range .This contains many different things typically based on sensor data from other cars. One could think of brake warning sent from previous car, tailgate and collision warning, information about road condition and maintenance, detailed regional weather forecast, premonition of traffic jams, caution to an accident behind the next bend, detailed information about an accident for the rescue team and many other things. Vehicles can interchange different type of information as per requests on demand for identified application. It is important to have some standard protocols for communications between vehicles to vehicles. Hence we are proposing system which will demonstrate the implementation of Vehicle to Vehicle communication along with categorized modes of communication like control, informational and alert messages.

The early cooperative driving concept was researched in automated highway systems, the concept of supportive driving is being recently modified to broader applications (e.g., cooperative adaptive cruise control, cooperative intersection safety systems, and other collision warning systems), as well as to circumstances where information is communicated between vehicles and nearby infrastructure, e.g., intersection or roadside traffic controllers. Recent developments in wireless communication systems and the fact that GPS has exchange common practice in vehicle applications meaningfully support the analysis toward new applications in cooperative driving for road safety through communication. Expected result of the proposed system will be to develop a prototype vehicle models which will communicate with each other using wireless technology and react upon with defined action on specific type of message from sender vehicle The feature of this system is that it is focused on message types and how they can be illustrious from each other so that the driver will take preventative action to avoid any risky situation or follow the same path monitored by the vehicle moving in same direction.

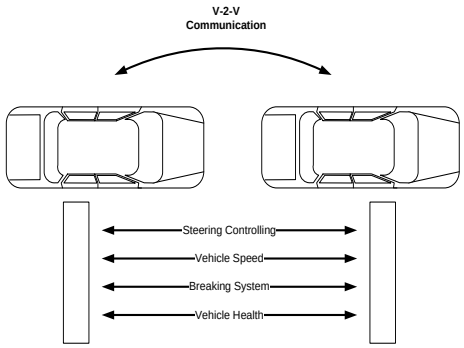

Fig.1 Types of Messages Transferred Between vehicles

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Fig.1 shows the types of messages will be transmitted between the vehicles. Steering control is the control type of message that designated the controlling scenario to get shown for the indicator signaling. Similarly the vehicle control and breaking system is the warning type of messages that helps to warn other vehicles to take cautionary action against any avoidable condition.

II. LITERATURE REVIEW

Safe Driving in LA: Report from the Greatest Inter-vehicular Accident Detection Test Ever this paper shows the concept to report on the results drawn from the most extensive accident warning system test performed to date, to the best of knowledge, on the streets and highways. They implemented and tested an accident warning system based on the multi-hop broadcast algorithm that has been proven to be best in terms of bandwidth usage and covered distance in realistic scenarios [1].

A Secure Cooperative Approach for Non line-of-Sight Location Verification in VANET, this paper shows the non-line of site communication in vehicles. They presented a collaborative protocol to verify a broadcast position when direct communication between the replied node and the verifier is not possible. In addition to verifying a node location in a multi-hop cooperative approach, several security methods were involved to improve the message reliability [2].

Modeling Emergency Messaging for Car Accident over Dichotomized Headway Model in Vehicular Ad-hoc Networks takes various useful facts developed by traffic flow theory into account and utilizes the dichotomized headway model, the braking model, and Greenberg's logarithmic model to generate vehicular mobility traces for analysis. This paper developed mathematical models to inspect the performance of a wireless collision avoidance system with or without using RSUs as ad hoc communicates. The CA system must keep broadcasting the latest road information more recurrently to drivers when the acknowledgment of traffic concentration by the VANET safety application is within this critical range. The requests and controls for collision avoidance are based on engineering understandings and practical limitations. This was a first attempt to formulate the performance of DSRC safety applications by integrating network and flow theory so that the analysis is more complete and realistic for transportation planning. [3].

An Adaptive Alert Message Dissemination Protocol for VANET to Improve Road Safety This paper shows the different protocols for making a communication between vehicles [4] shows the way to transfer the message [6]. In this paper, they proposed APAL rebroadcast protocol that use adaptive probability and interval to actuate rebroadcast. It could achieve best quality of performance compared to all other existing VANET protocols for safety alert message broadcasting.

Power-control-based Broadcast Scheme for Emergency Messages in VANETs shows an efficient broadcast scheme for broadcasting emergency messages. In this paper, they proposed a multi-hop broadcast scheme, which can ensure high reliability. To mitigate broadcast storms, the proposed scheme uses boundary nodes to relay broadcast packets. The proposed scheme provides an efficient reliable broadcast solution to broadcast emergency safety messages in vehicular ad hoc networks.

The following issues would be studied in the future. To differentiate emergency messages with various priorities, the corresponding broadcast scheme needs to be further modified [5].

The most important application of VANET is disseminating emergency messages to warn drivers in case of dangerous events, for that broadcasting is used to deliver messages. But in broadcasting many problems were faced [4].

To support efficient performance on delivery ratio and rebroadcast overhead a new street-based broadcast scheme has been developed [7].

IEEE 802.11p/DSRC protocol provides two types of channel i.e. control channel (CCH) and service channel (SCH) [13]. In V2V communication the simulating result reveal that a specific vehicle is forced to drop over 80% of its packet because no channel access was possible before the next message was generated. To overcome this problem STDMA for real time traffic between vehicles was proposed [8].

III.PROPOSED RESEARCH METHODOLOGY

Step 1:- Develop communication module to transfer and receive messages.

Step 2:- Creating messages depending upon the analysis of alert, warning or infotainment related information. For that we are proposing a packet format which will be broadcasted over channel.

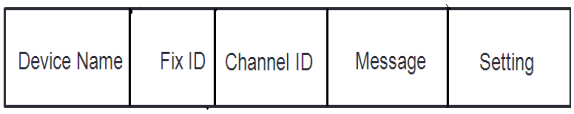

Figure II Packet Format

Device Name: - Indicates the logical name of device that will be used to logically identify the vehicle.

Fix ID: - It is a manufacturer ID that will be used to authenticate the communication.

Channel ID: - This field gives the frequency ranges over which the communication will be continued.

Setting: - This field is reserved for the future additional work.

Step 3:- Assembling a model that will help to demonstrate the functionality. Figure III shows the proposed system architecture of the system.

The diagram contains of input unit, control unit, LCD module and transceiver.

Peripheral device consist of accelerator, clutch. Input unit receipts the input from the peripheral devices like clutch, accelerator. This identifies that what categories of message want to be produced, so that the control unit will react according to these messages.

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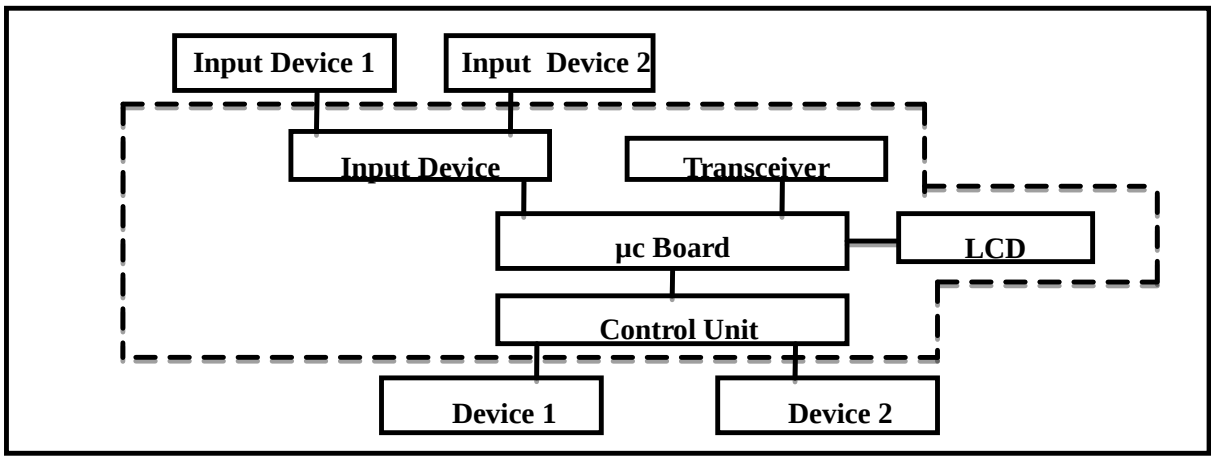

Figure I: Proposed System Architecture

Control activity is break, speed etc. these are the control unit attached to the control device and control the car.

LCD module will be interconnected to the micro-controller to display the sign related to the acknowledged message type.

This methodology leads to the following point of consideration.

1. Communication,
2. Versatile Messages,
3. Data Security.

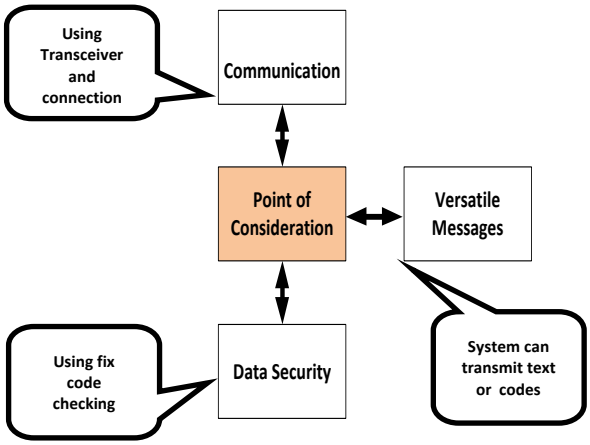

Figure IV. Points of consideration

Transceiver is used for communication between two vehicle so that the data will be transmitted between that vehicle the connection will be wireless.
The data will be transferred by using RF transceiver. i.e. the multipurpose messages any control or warning packets.

To complete that goal of identify the sender we will need a micro-controller based information interpretation hardware module and software code as well as that device having a unique ID.
The unique ID generated by RSU once the ID will be generated after that the communication will be done between two vehicles by using RF transceiver.

IV. COMMUNICATION MODULE

For the expansion of communication model following are the requirements in terms of hardware and software.

Hardware Requirement:
- cc2500 Transceiver Wireless Device
- ATmega16 development board
- LCD
- Power Supply

Development Tools:
- Atmel Studio 6.0
- iProg burning software
- Embedded C Language

The Figure V shows the device working module which is developed by using ATmega 16 development board integrated with cc2500 Transceiver wireless device and LCD.

The cc2500 Transceiver wireless device is burned with the communication logic program that helps to make the communication between devices.

When both devices are ready to establish the connection the LCD display the "Waiting for Connection……." messages.

Any device can initiate the communication here first device initiating the connection therefore the message is displayed as "Connection Open Request Sent……" at the receiving side "New Connection ... Accepted …." message displayed after 3 Sec. from the time of sending request as shown in Figure VII.

Now both devices are ready to transfer the data as shown in Figure VIII.

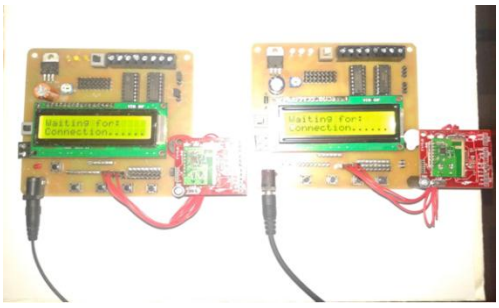

Figure V Communicating Devices

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Figure VI Establishing Connection between Devices

Figure VII Transferring Data between Devices

V. CONCLUSION

The developed module helps to transfer the messages in wireless devices (vehicles).

REFERENCES

[1] Rakhee .G.Doijad, prof.pradnya kamble, Dr .M.M. kshirsager,"design and implementation of secure vehicle to vehicle formatted communication,"ijarcsse vol-5,issue-1,january-2015.

[2] Gustavo Marfia, Marco Roccetti, Alessandro Amoroso, and Giovanni Pau, "Safe Driving in LA: Report from the Greatest Intervehicular Accident Detection Test Ever,"*IEEE transactions on vehicular technology, vol. 62, no. 2, February 2013.*

[3] Osama Abumansoor, Azzedine Boukerche. "A Secure Cooperative Approach for Nonline-of-sight Location Verification In Vanet", *IEEE Transactions On Vehicular Technology, Vol. 61, No. 1, January 2012.*

[4] Sok-Ian Sou, "Modeling Emergency Messaging for Car Accident over Dichotomized Headway Model in Vehicular Ad-hoc Networks," IEEE transactions on communications, vol. 61, no. 2, February 2013.

[5] Kanitsorn Suriyapaiboonwattana, Chotipat Pornavalai, Member IEEE, and Goutam Chakraborty, IEEE SM" An Adaptive Alert Message Dissemination Protocol for VANET to Improve Road Safety", FUZZ-IEEE 2009, Korea, August 20-24, 2009.

[6] Liqi Wei, Xiaoqiang Xiao, Yingwen Chen, Ming Xu, Haikuan Fan ,"Power-control-based Broadcast Scheme for Emergency Messages in VANETs", IEEE 2011.

[7] N. Wisitpongphan,o. K. Tonguz,j. S. Parikh,p. Mudalige, f. Bai,v. Sadekar, "Broadcast Storm Mitigation Techniques In Vehicular Ad Hoc Networks", Communications Magazine, IEEE, December 2007.

[8] Ching-Yi Yang and Shou-Chih Lo,"Street Broadcast with Smart Relay for Emergency Messages in VANET", 2010 IEEE 24th International Conference on Advanced Information Networking and Application Workshops.

[9] Vaishali D. Khairnar and Dr. Ketan Kotecha,"Performance of Vehicle-to-Vehicle Communication using IEEE 802.11p in Vehicular Ad-hoc Network Environment", International Journal of Network Security & Its Applications (IJNSA), Vol.5, No.2, March 2013.

[10] S. Biswas, R. Tatchikou, and F. Dion, "Vehicle-to-vehicle wireless communication protocols for enhancing highway traffic safety," IEEE Commun. Mag., vol. 44, no. 1, pp. 74–82, Jan. 2006.

[11] Q. Xu, R. Sengupta, and D. Jiang, "Design and analysis of highway safety communication protocol in 5.9 GHz dedicated short range communication spectrum," IEEE Trans. Veh. Technol, vol. 57, no. 4, pp.2451–2455, 2003.

[12] Q. Xu, T. Mak, J. Ko, and R. Sengupta, "Vehicle-to-vehicle safetymessaging in DSRC," in Proc. 2004 ACM VANET

[13] X. Yang, J. Liu, F. Zhao, and N. H. Vaidya, "A vehicle-to-vehicle communication protocol for cooperative collision warning," in Proc.2004 International Conf. Mobile Ubiquitous Syst.: Netw. Services, pp.114–123.

[14] C.-L. Huang, Y. P. Fallah, R. Sengupta, and H. Krishnan, "Adaptive intervehicle communication control for cooperative safety systems,"IEEE Netw. Mag., vol. 24, no. 1, pp. 6–13, Jan./Feb. 2010

[15] M. Torrent-Moreno, J. Mittag, P. Santi, and H. Hartenstein, "Vehicle-tovehicle communication: Fair transmit power control for safety-critical information," IEEE Trans. Veh. Technol., vol. 58, no. 7, pp. 3684–3703, Sept. 2009.

BIOGRAPHIES

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