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Reliable Broadcast using Speed Synchronized Protocol for Different Speed Vehicles in VANET

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Abstract - Vehicular ad-hoc network (VANET) provides vehicle to vehicle and vehicle to RSAs (Road side antennas) communication. By using Multichannel TDMA MAC protocol, once per frame each node is ensured to access the Control channel which may cause delay at the receiver end. The Proposed "Vehicle Speed Synchronized protocol" will work on Control channel as well as on Service channel. The proposed protocol will be designed in such a way that the receiver will get automatically tuned to different frequencies and transmit messages more efficiently based on their priority to the variable speed vehicles. In this proposed work the first module incorporates the communication between vehicle to vehicle and vehicle to RSA.

Keywords – *VANET, Speed Synchronized Protocol, Reliable Broadcast, RSA (Road Side Antenna)*

1. Introduction

The self organized network formed by such vehicles is referred to as a vehicular ad hoc network (VANET). At present, the VANET adopts dedicated short-range communication (DSRC) technology [1], which is under the process of standardization as the IEEE 802.11p/WAVE standard [2]. The performance of a safety system is dependent on the underlying media access mechanism. Although Carrier sense multiple access with collision avoidance (CA) is prescribed as the medium access control (MAC) in IEEE 802.11p [3], it results in unbounded delays and unfair bandwidth allocation. Various MAC protocols have been proposed for VANETs, which are based on IEEE 802.11 or on channelization such as code division multiple access (CDMA), space division multiple access (SDMA) and time division multiple access (TDMA) and. On the other hand, the recently proposed MAC standard is IEEE 802.11p for VANETs. The protocol is based on the legacy IEEE 802.11 standard, which is widely implemented. But it does not provide an efficient broadcast service because for broadcast frames, no RTS/CTS exchange is used and from any of the recipient of the frame, no acknowledgment is transmitted. CDMA is proposed for MAC in VANETs due to its robustness against interference and noise. The main problem which arises with CDMA in VANETs is the way to allocate the pseudo noise (PN) codes to different vehicles. Due to a large number of vehicles, it is required that every vehicle should assign a unique PN code, due to which the length of this code will become extremely long and also the required bit rates for VANET applications may not be fulfilled. As a result, it is compulsory that the PN codes be shared among different vehicles in a dynamic and fully distributed way [4].

2. Literature Survey

In VANET, the routing protocols are classified into five categories: Topology based routing protocol, Cluster based routing sprotocol, Position based routing protocol, Broadcast routing protocol and Geo cast routing protocol. These protocols are characterized on the basis of area or application where they are most suitable. Vehicular ad hoc network is wireless communication network between vehicle to vehicle & vehicle to RSA. It is also an autonomous & self-organizing wireless communication network, where nodes in VANET involve themselves as servers or clients for exchanging & sharing information [5]. The IEEE is working on the IEEE 802.11p Wireless Access in Vehicular Environments (WAVE) standard in order to provide Dedicated Short Range Communication (DSRC) for future vehicle-to-vehicle (V2V) communication. The standard shall provide a multi-

channel Dedicated Short Range Communication solution with high performance for multiple application types to be used in future Vehicular Ad Hoc Networks (VANETs).The IEEE 802.11p is a recently proposed MAC standard for VANETs. The protocol is based on the legacy IEEE 802.11 standard, which is widely implemented, but does not provide an efficient broadcast service. In IEEE 802.11p, directional forwarding was found; only 20% of the emergency messages reach the end of the area of interest at the moderate density. Therefore, for a fair evaluation, flooding is used for dissemination of an emergency message in IEEE 802.11p**.** In the existing project, the congestion-controlled-coordinator based multiple access protocols that address beacons and emergency messages [6].

In TDMA the network is partitioned into different number of segments. Within a segment, medium access is accomplished by using a time-slot-scheduling mechanism supervised by a local coordinator vehicle [7]. But considering the quantum of vehicles and their individual and relative speed there is a great chance of signal collision and signal jamming. Similarly the response time may be a bit longer which may take slightly more time for vehicle to response to the request. The proposed method will transmit messages more efficiently based on their priority to the variable speed vehicles. So that here is the scope of research that message should reach the vehicle at variable speeds.

3. Research Methodology to be Employed

1] Implementing multi-channel transmitting antenna for RSU/RSA. This antenna will transmit signals of various priorities on various frequencies. High priority emergency signals on freq f1 and relative low priority signals on freq f2 and so on.

2] Developing self adjusting receiver system. This system automatically tunes itself to one of available frequency (f1, f2, f3 so on). The aim is to prove that signal decoding will be faster as compared to TDMA as receiver is only communicating with one type of signal. Hence signal extraction time and Time sharing problems are eliminated from the system.

3] Software NS2 will be used to simulate the protocol. The test results should prove that channel selective approach of proposed project will improve response time of vehicle and will improve safety conditions.

4] The system will take some reference from up link and down link system used in satellite communication or mobile communication. Because in this system; it is already a multi-frequency communication which is used to remove signal collision. Once the system is checked for improvement over TDMA approach, the same system and methodology will be duplicated with proper amendments for vehicle to vehicle communication.

Figure 3.1 shows the general road condition where the vehicle speeds is categorized in 3 slabs given below.

Vehicle Speed Synchronized Protocol

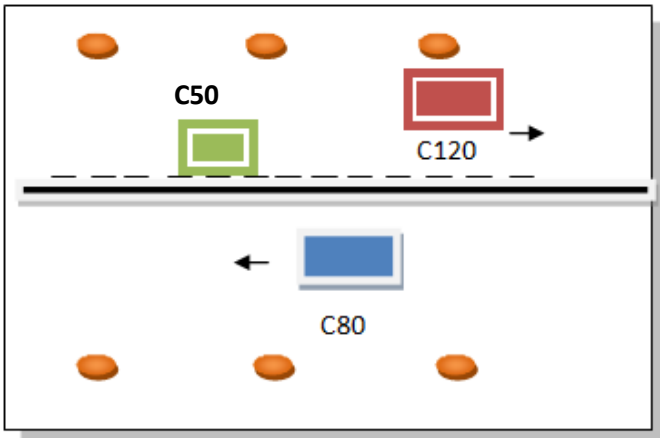

Fig 3.1 General Road Condition

->> Vehicle speed 120km/hr
->> Vehicle speed 50km/hr
->> Vehicle speed 80km/hr
->> Road Side Antenna

These slabs are represented by the notation C120, C80, C50. The carrier legends are labeled to match with title of the research work "Vehicle Speed Synchronized Protocol".

In the Proposed research, the receiver will be designed such as it will automatically tune with the speed of the vehicle and the transmitters with different frequencies which are implemented on the road side antennas (RSAs) will broadcast the messages. Short Messages to be transmitted will be divided according to their priority depend the road condition at different places. For example, if the vehicles are moving with the speed of 50km/hr, the vehicles have enough time to read the broadcast messages. But if the vehicle moving with a speed of 120km/hr will not be able to respond all the messages broadcast at that instant. The need is to transmit only that message which is more important, which will let the vehicle to respond according the road condition to avoid accident. In the proposed research messages will be categorized according to their priority. Higher priory messages will be tuned to the higher frequency and will transmit first. This will results into the vehicles moving

with higher speed will get the messages at high frequency first.

In this paper the first module of the project is explained, which provides the vehicle to vehicle communication and vehicle to RSA communication based on simulation. The first communication module consist of different nodes moving with variable speeds also the RSA is placed at the road side which broadcast the messages to the variable speed vehicles which comes under its coverage area with different frequency according to their speed.

3.1 Module 1

The first module of this research consists of the communicating model. Nodes labeled as 2,5,8,9, are kept at equal distance on road side which are playing the role of road side antennas. These antennas broadcast the information to the vehicles comes in their coverage area. Vehicles are moving with different speeds are labeled as node 0(car1), Node 1 (car2), Node 3 (car3), Node 4 (car4), Node 6 (car5), Node 7 (car6) on both directions on road and communicate with each other as well as the road side antennas in its range. The results are shown in fig 3.2 by using NS2 simulator.

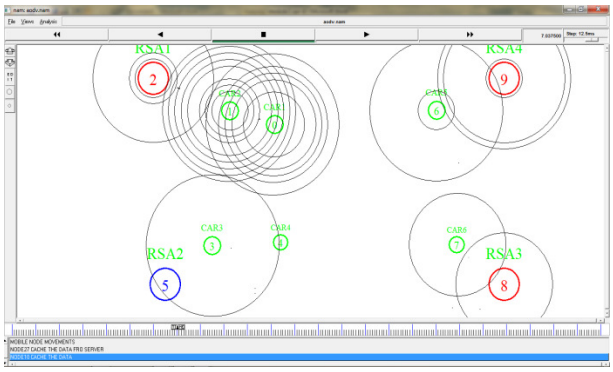

Fig 3.2 Simulation results of module

3. Conclusion and Future Work

Nodes are created successfully with RSAs (placed at equal distances) and the vehicles running on both directions. Vehicles are communicating with each other as well as road side antennas. In future, next Module will work on the speed of vehicle. The proposed protocol (Vehicle Speed Synchronized Protocol) will transmit messages more efficiently based on their priority to the variable speed vehicles. RSA will transmit the information according to the priority of messages for different speeds.

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