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Periodic Safety Message Broadcasting in VANETs Using Recursive Algorithm

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ABSTRACT- Faster and more reliable connection establishment is the primary purpose of periodic safety broadcasting in VANETs. For this purpose we propose a sublayer in the application layer to increase the reliability of safety applications. Our proposed method uses several rebroadcasting schemes safety messages, which considerably improves the overall reliability. It also handles the synchronized collision problem as well as congestion problem and vehicle-to-vehicle channel loss. We propose a zone based algorithm to increase reliability of safety messages. We also use a Recursive Algorithm to give priority for the safety message being generated. We use wi-fi protocol instead of dsrc protocol in order to improve the reliability. Based on this model, a upper bound for the network coding algorithm is derived. Using the results based on analysis and ns-2 simulations we conclude that our method overcomes the previous problems.

KEYWORDS: Dedicated short range communication(DSRC) protocol;Gossip algorithm; Random linear coding algorithm ;Recursive algorithm and Zone based Routing Protocol(ZRP).

I.INTRODUCTION

A Wireless network is a type of network that uses wireless data connections for connecting nodes. In this paper[]we examine that each vehicle has small state information that should be received by neighbor within a short lifetime. This paper is based on Opportunistic network coding. Terrestrial microwave communication uses Earth-based transmitters and receivers resembling satellite dishes. Terrestrial microwaves are in the low-gigahertz range, which limits all communications to line-of-sight. Relay stations are spaced approximately 48 km (30 mi) apart[2].Satellites communicate via microwave radio waves, which are not deflected by the Earth's atmosphere. The satellites are stationed in space, typically in geosynchronous orbit 35,400 km (22,000 mi) above the equator. These Earth-orbiting systems are capable of receiving and relaying voice, data, and TV signals .In paper[1] we focus on the design of reliable medium access control scheme. Each vehicle is willing to form a network and regularly communicate with other vehicle in its vicinity. It has the disadvantages that Information communicated through this is short lived and there no central entity managing medium access. In this paper[2]we study the design of DSRC protocol for a vehicle to send safety messages to other vehicles .But these messages are very short, have brief useful lifetime ,but with high probability .The only limitation is that the channel model is memory less. Paper[3] tells that broadcast communication is considered to be important in delivering safety messages in vehicular environment. Here Optical Orthogonal Codes are used to increase Probability of detection and reduce reception delay.

. II. EXISTING SYSTEM

A.DSRC PROTOCOL:

Wireless vehicular networks operating on the dedicated short-range communications (DSRC) frequency bands are the key enabling technologies for the emerging market of intelligent transport system (ITS). The wireless access in vehicular environments (WAVE) is significantly different from the Wi-Fi and cellular wireless networking environments. The specifications defined by IEEE802.11P and IEEE1609 represent the most mature set of standards for DSRC/WAVE networks. The primary challenge is to develop scalable, robust, low-latency and high throughput technologies for safety applications that will significantly reduce collisions and save lives and property loss. Most of

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the communication technologies in the CALM family are borrowed from other mature applications, with the exception of the recently proposed WAVE standards on the dedicated short range communications (DSRC) frequency band.

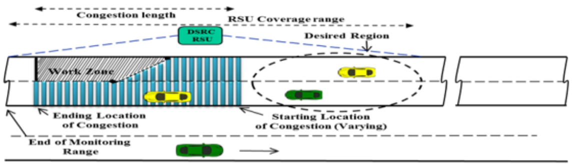

Fig.1 DSRC protocol

DSRC Applications include Emergency Vehicle Signal Preemption ,Approaching emergency vehicle warning, Weather and road conditions warning, Curve speed warning, Do not pass warning, Cooperative Adaptive Cruise Control, Cooperative Forward Collision Warning.

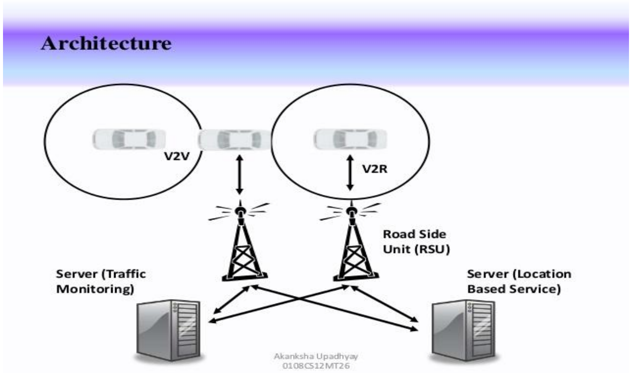

Fig 2 DSRC Architecture

B. *MESSAGE BROADCAST*:

When a safety message is generated it should be delivered to neighbors within the message lifetime and the safety messages are only transmitted once during a time frame and this is due to the fact that in IEEE 802.11p broadcast mode there is no retransmission or acknowledgement. To assure the message delivery by the end of its deadline, several random rebroadcast schemes have been proposed. In Synchronized Fixed Repetition (SFR), timeslots are randomly chosen the retransmission. In Synchronous Persistent repetition at each timeslot a message is generated with probability p. The Retransmission pattern of each node is assigned based on predetermined binary codes. To limit the number of collision Positive Orthogonal Codes (POC) have been proposed. The ones represent transmitting timeslots in the frame. Any pair wise shifted version of two POC code words has limited correlation. This correlation has shown to increase the message delivery ratio by limiting the number of collisions.

C.*RANDOM LINEAR CODING ALGORITHM*:

The random linear coding algorithm is simple: each node enqueues all the received messages and when it has a transmission opportunity based on its retransmission pattern it broadcasts a random linear combination of all the already received messages in its queue with the coefficients in GF(q)(Galois field with order *q*). At the end of the sub frame, if the node has *n* linearly independent coded vectors it can decode all the original packets. Next, all nodes empty their queues and start a new transmission for the next sub frame.

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III.PROPOSED SYSTEM

A.*WI-FI PROTOCOL*:

IEEE 802.11 is a set of media access control (MAC) and physical layer (PHY) specifications for implementing wireless local area network (WLAN) computer communication in the 2.4, 3.6, 5 and 60 GHz frequency bands. They are created and maintained by the IEEE LAN/MAN Standards Committee (IEEE 802). The base version of the standard was released in 1997 and has had subsequent amendments. The standard and amendments provide the basis for wireless network products using the Wi-Fi brand. While each amendment is officially revoked when it is incorporated in the latest version of the standard, the corporate world tends to market to the revisions because they concisely denote capabilities of their products. As a result, in the market place, each revision tends to become its own standard.

B.*RECURSIVE ALGORITHM*:

Priority mechanisms are used to optimize the network utilization, while meeting the requirements of each type of traffic. The user may generate different types of traffic flows by using loss priority capability and when buffer overflow occurs, packets from low priority can be selectively discarded by network elements. Priority Mechanism can be classified into two categories time priority and space priority. Time Priority can control the transmission sequence of buffered packets. Space priority controls the access to the buffer. Chipalkatti et al [6] studied the performance of time priority mechanism including Minimum Laxity Threshold(MLT) and Queue Length Threshold(QLT) under mixed traffic of real time and non-real time traffic. Space Priority mechanisms have been investigated primarily are Pushout mechanism and Partial Buffer Sharing mechanism. In both this mechanisms each source marks every packet with priority level indicating high priority and low priority. In pushout mechanism, high priority packet may enter the queue even when it is full, by replacing the low priority packet in the queue. But if a low priority packet enters the queue when it is full, it will be discarded. In Partial buffer sharing mechanism both high priority and low priority packets are accepted by the queue until it reaches the threshold level.

C.*ZONE BASED ALGORITHM:*

It is based on the concept of zones. It is defined for each node separately and the zones of neighboring node overlap. The number of nodes in the routing zone can be regulated by adjusting the transmission power of zones. Lowering the power reduces the number of nodes. Zone Based Routing Protocol(ZRP) refers to locally proactive routing component as Intra-zone Routing Protocol(IARP).Globally reactive routing component is named as Inter-zone Routing Protocol(IERP).ZRP is a hybrid routing protocol which effectively combines best features of proactive and reactive routing protocols. IARP is used in the zone where particular node employs proactive routing. IERP is used beyond the zone where particular node employs reactive routing.

D.*HANDOFF:*

The term handover or Handover refers to the process in which transferring an ongoing call or data session from one channel connected to the core network to another. Satellite communication is the process of transferring satellite control responsibility from one earth station to another without loss or interruption of service.

E. *VERTICAL AND HORIZONTAL HANDOVER IN VANET*:

The switching mechanism from serving network to target network is called vertical handover (VHO) can be driven by the vehicle or by the infrastructure, and is executed according to a well defined decision criteria. Handover is also known as handoffs, is an event taking place whenever a mobile node moves from one wireless cell to another, without loss or interruption of services.

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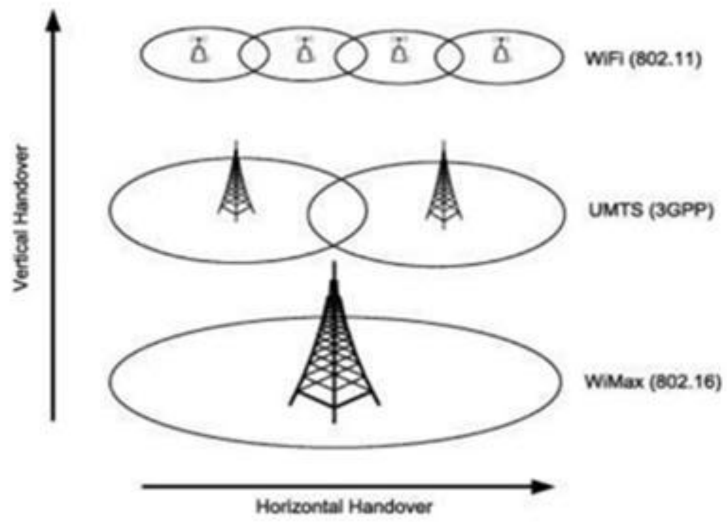
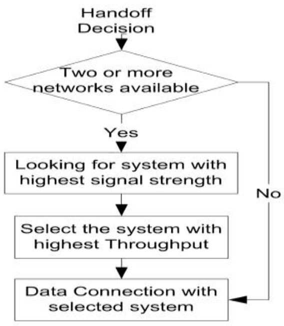


Simplified Architecture of Vertical and Horizontal Handover

F.DECISION ALGORITHM IN HANDOFF:



Flow Diagram of Decision Algorithm

Decision in horizontal handover is different with decision of vertical handover. The horizontal handover decision involves networks from the same link layer technology. The vertical handover decision involves the network from different radio access technology . In horizontal handover process single parameter of Received Signal Strength is enough to trigger handover, but in vertical handover, more parameters are needed to decide handover accurately. Number of handover is a fundamental parameter in handover due to resource management. Unnecessary handover may reduce the network performance in terms of throughput and network occupancy. Compared to single-criteria decision making, Multi-criteria may increase the handover delay as it considers several parameters to decide the handover.

IV. SIMULATION RESULTS

In this section we first present the numerical results based on our graph. The performance of loss, throughput, delay are compared numerically. Next, the simulation results using a realistic vehicular channel model is presented.

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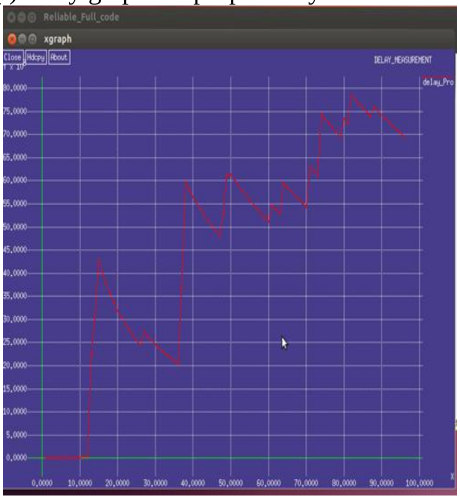
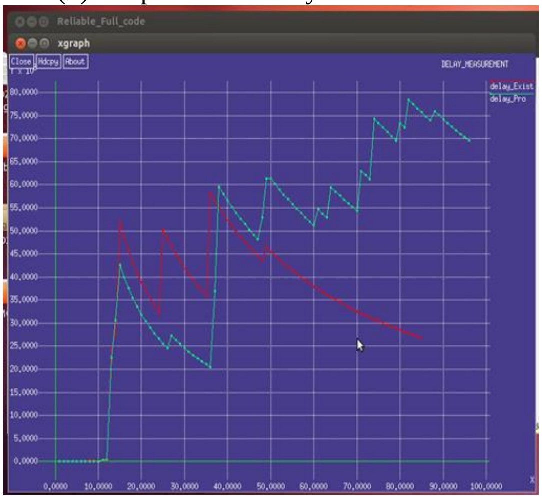
A.DELAY ANALYSIS:

Delay refers to the time taken for a packet to be transmitted across a network from source to destination. Hence delay has to be reduced in VANET in order to improve the reliability.Delay for the existing system using Dedicated Short Range Communication(DSRC)protocol and for the proposed system using Wi-Fi protocol are simulated and the comparison are given below.

(i)Delay graph for proposed system:

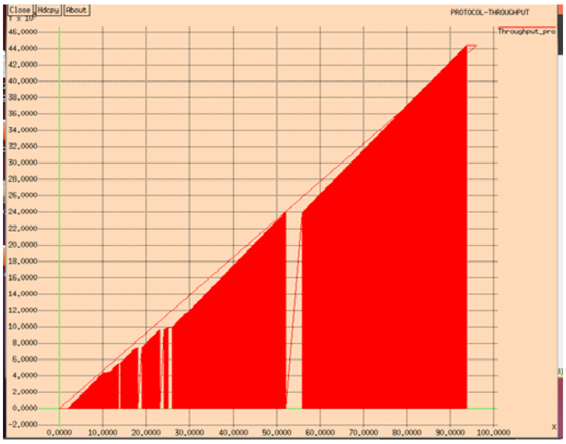


(ii)Comparison of Delay:

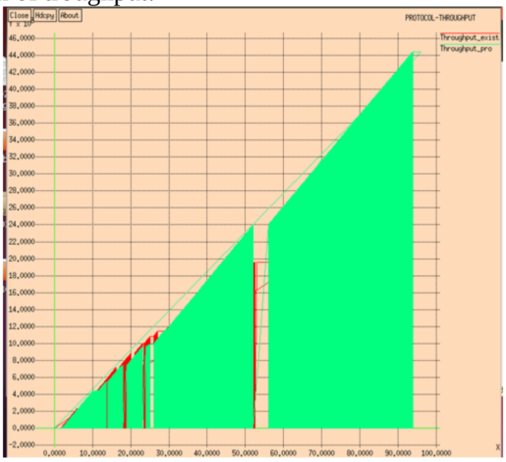


***B.**THROUGHPUT ANALYSIS*:

When used in the context of communication networks, such as Ethernet or packet radio, throughput or **network throughput** is the rate of successful message delivery over a communication channel. The data these messages belong to may be delivered over a physical or logical link, or it can pass through a certain network node. Throughput is usually measured in bits per second , and sometimes in data packets per second (p/s or pps) or data packets per time slot.In the existing system throughput is calculated using DSRC protocol and in the proposed system it is calculated using WI-FI protocol the graphs are simulated and are shown below.



(i)Throughput analysis using wi-fi protocol:
(ii)Comparison of troughput:



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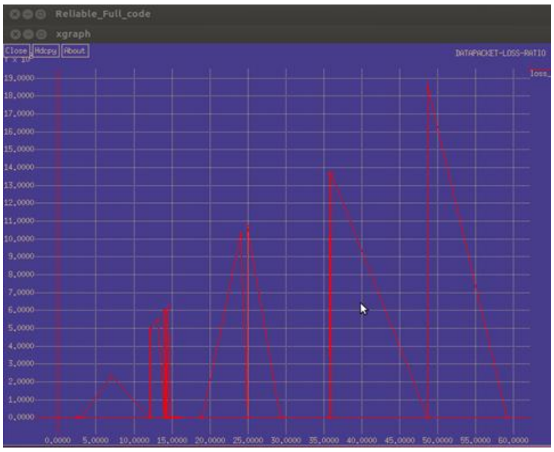
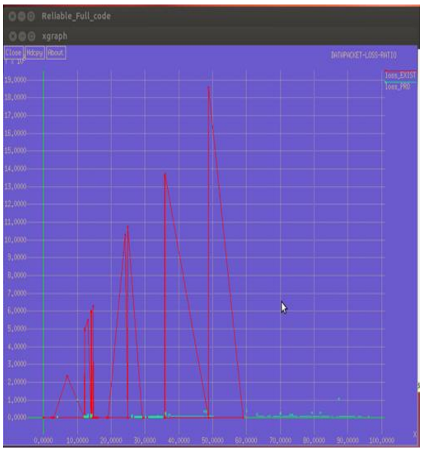
C.LOSS ANALYSIS:

Packet loss occurs when one or more packets of data travelling across a computer network fail to reach their destination.Packet loss for both existing and proposed system are simulated using DSRC and WI-FI protocol and their graphs are simulated.

(i)Loss using Wi-Fi protocol:



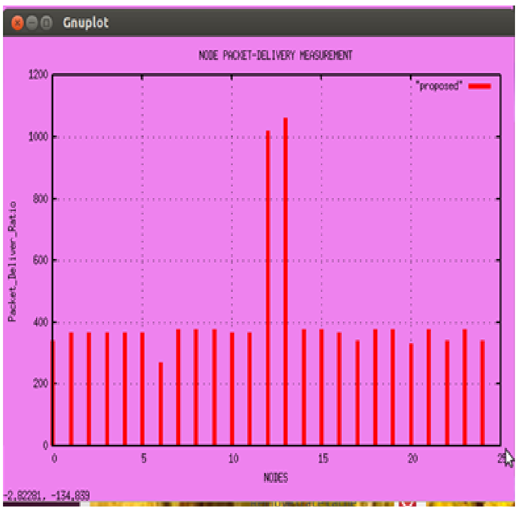
(ii)Comparison of Loss:



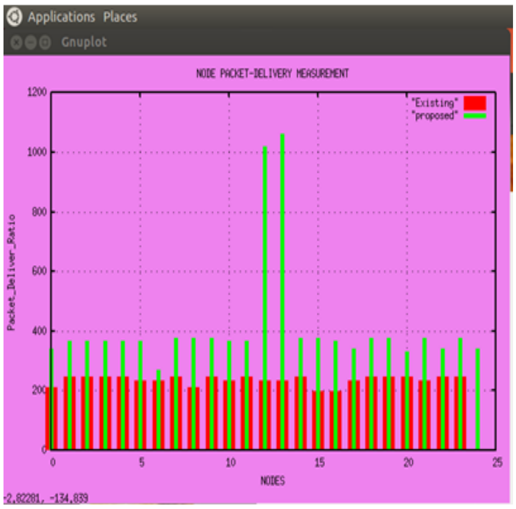
D. *PACKET DELIVERY RATIO ANALYSIS:*

Packet delivery ratio : the ratio of the number of delivered data packet to the destination. This illustrates the level of delivered data to the destination. The greater value of packet delivery ratio means the better performance of the protocol. The ratio of packets that are successfully delivered to a destination compared to the number of packets that have been sent out by the sender.

(i)Using Wi-Fi protocol:



(ii)Comparison of packet delivery ratio:



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V.CONCLUSION

We have proposed a sub layer that optimizes the reliability of periodic broadcasting in VANETs. The core of our design is the random linear network coding which is used to provide reliability for small safety messages with low overhead. We have also studied how the message rebroadcasting can be utilized when there is congestion. Numerical results based on our analysis confirm the superior performance for our method compared to previous schemes. Our design can be implemented in conjunction with the WAVE architecture and does not need any modification to the WAVE communication stack.

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BIOGRAPHY

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