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RESEARCH ARTICLE

A NOVEL APPROACH TO ENHANCE THE PERFORMANCE OF VANET BY REDUCING DELAY IN COLLISION WARNING SYSTEMS

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Abstract - Vehicular ad hoc networks becomes an emerging technology. It helps in vehicle to vehicle communication. It helps to transfer data from one point to other. It can be with the help of RSU, RSU stands for road side unit. In this paper, our main focus is to reduce the delay. In the previous work, if the collision occurs between two vehicles, the RSU broadcast the message to all the vehicles. Then vehicles change their path. Here the delay occurs. Here our main focus is to reduce the delay.

Keywords - VANET, ACO, Security, Traffic

I. INTRODUCTION

VANET stands for vehicular ad-hoc networks. VANET is the technology of building a robust Ad-Hoc network between mobile vehicles and each other. It shares some common characteristics with general Mobile Ad Hoc Network. VANET has the high node mobility. VANETs have turned into an important research area over the last few years. VANETs are distinguished from MANET by their hybrid network architectures, node movement characteristics, and new application scenarios. There are various characteristics of VANET that distinguish it from the MANET, [5] as: Drive behavior, constraints on mobility, and high speed and the major characteristics are as follows: High mobility and Rapid changing topology. Vehicles move very fast especially on highways. When the vehicle density is low or existing routes break before constructing new routes, it has higher probability that the vehicular networks are disconnected. So, the routing protocols in MANET are not suitable for VANETs.

According to the vehicular communication perspective, VANET can be categorized into various parts, as:

1) Road Vehicle Communication System (RVC)
2) Inter Vehicle Communication System (IVC)

A. Network Architecture of VANET

VANETs system architecture is divided into five layers: Physical Layer, MAC Layer, Network Layer, Transport Layer, and Application Layer. VANETs indicate its potential with regard to safety, traffic efficiency, and comfort. The prospective applications of VANETs are categorized into two groups as comfort and safety applications:

B. Safety service

This group of research focuses on enabling the delivery of messages and files in a vehicular network to the target receivers with acceptable performance. A group of applications, such as accident and road construction warning systems, require the network protocols to forward messages from a sender to only relevant receivers based on the location and driving direction. Also, safety applications are time sensitive and should be given priority over non-safety applications. Comfort service: Another kind of applications focuses on connecting the vehicles to the Internet using roadside beacons and inter-vehicles communications.

C. Categories of VANET

In the VANET, routing protocols are classified into five categories. These protocols are characterized on the basis of area application where they are most suitable. These categories are as follows.

D. Topology Based Routing Protocols

These routing protocols use links information that exists in the network to perform packet forwarding. They are further divided into Proactive, Reactive & Hybrid Protocols. Proactive routing protocols: The proactive routing means that the routing information, like next forwarding hop is maintained in the background irrespective of communication requests. The advantage of proactive routing protocol is that there is no route discovery since the destination route is stored in the background, but the disadvantage of this protocol is that it provides low latency for real time application. The various types of proactive routing protocols are: FSR, DSDV, OLSR, CGSR, WRP, and TBRPF.

E. Reactive/Ad hoc based routing

Reactive routing opens the route only when it is necessary for a node to communicate each other. Reactive routing consists of route discovery phase in which the query packets are flooded into the network for the path search and this phase completes when route is found. The various types of reactive routing protocols are AODV, PGB, DSR, TORA, and JARR.

II. V2V COMMUNICATION

Possible Deployment regarding the C2C-CC reference architecture together with the advances in heterogeneous communication technologies, vehicular networks potentially have two main types of communication scenarios: car-to-car (C2C) communication scenario and car-to-infrastructure (C2I) communication scenario.

These types of communication scenarios allow a number of deployment options for vehicular networks. Vehicular network deployment can be integrated into wireless hot spots along the road. Such hot spots can be operated individually at home or at office, or by wireless Internet service providers or an integrated operator. On the other hand, vehicular network deployment can be integrated into the existing cellular systems.

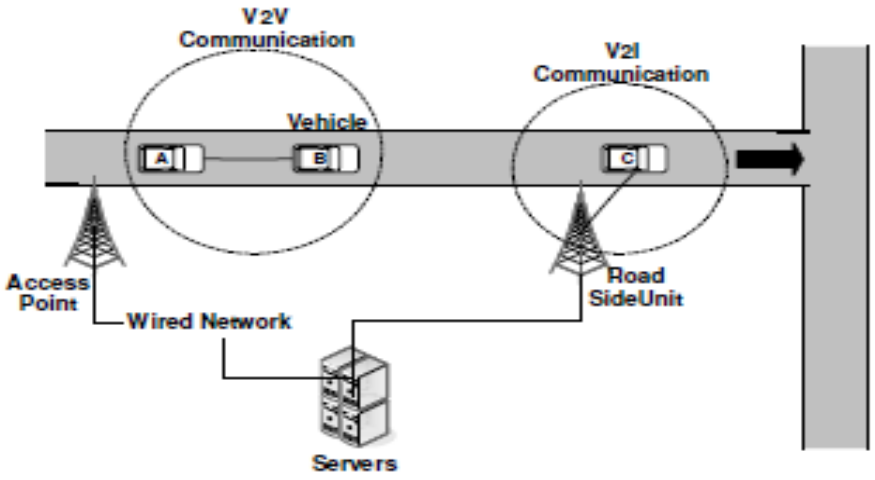

Fig 1: communication architecture

Vehicles can even communicate with other vehicles directly without a communication infrastructure, where vehicles can cooperate and forward information on behalf of each other. We notice that combination of these deployment cases is also possible. Moreover, future architecture for intelligent transportation systems (ITS) considers vehicles as active nodes that are responsible for collecting and forwarding critical information.[7] Consequently, vehicular network coexistence with sensor network would potentially take place, where vehicles would be able to collect and process information by means of intelligent sensors and to exchange information with other nodes (fixed or mobile) in a global communication system.

Based on their specific characteristics, the technologies for vehicular communication

can be classified in the following three categories:

1) In-vehicle communication

2) Vehicle-to-roadside/vehicle-to-infrastructure communication

3) Inter-vehicle communication (single- and multi-hop)

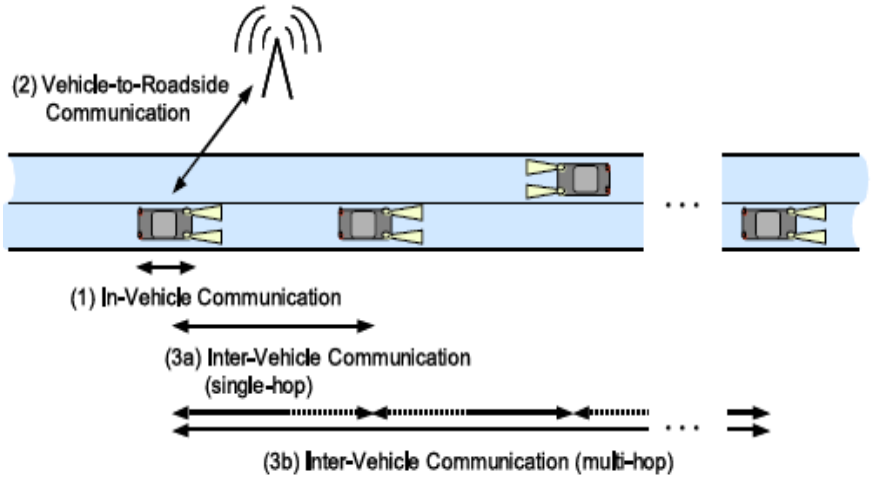

Fig 2: Domains of vehicular communication

III. ANT COLONY OPTIMIZATION

Ant Communication is accomplished primarily through chemicals called pheromones. Ants communicate[8] to one another by laying down pheromones along their trails. Other ants perceive the presence of pheromone and tend to follow paths where pheromone concentration is higher. Over time, however, the pheromone trail starts to evaporate, thus reducing its attractive strength. The more time it takes for an ant to travel down the path and back again, the more time the pheromones have to evaporate. A short path gets marched over faster, and thus the pheromone density remains high as it is laid on the path as fast as it can evaporate.

IV. LITERATURE SURVEY

In year **2012, R.K.Chauhan1 , Arzoo Dahiya** On demand set up, fault tolerance and unconstrained connectivity are the major advantages of mobile computing, that's why it continues to enjoy rapid growth. In last three decades, tremendous improvement is made in the area of wireless adhoc network. Now a days ,one of the most attractive research topic is inter vehicle communication i.e. realization of mobile adhoc network VANETs have been attracting an increasing attention from both industry as well as research communities .It requires reliable packet transmission, but rapid topology changing and frequent disconnection makes it difficult to design an efficient routing protocol. To disseminate the warning messages among vehicles to avoid accidents are sometimes a mission critical problem at some level. Therefore, this paper proposes a scheme that avoids the delay of communication that occurs due to frequent disconnection in routing. For this, the meta heuristic search i.e. ant colony optimization is combined with AODV and route repair strategy is applied to ACO[2].

In year **2012, Miguel Sepulchre** performed a work work on V2V communication based on cooperative safety applications. The work is about the study of network respective to time and space analysis between the vehicle movement. The work includes the driver based analysis in real world with effect of cooperative system to achieve the network security[3].

In same year the light of sight based analysis is been done to perform the safe communication in V2V network. The work is based on sensor specification in which traffic violation is been analyzed along with location, speed and time analysis. The work is micro traffic analysis based work to identify the dangerous situations and to pe perform reliable communication over the network

Aswathy M and Tripti represent a paper in (2012) on vehicular ad-hoc network are special kind of mobile ad-hoc network (MANET). This paper defines the vehicles on road as nodes of network. With the help of VANET give us many applications as an intelligent transportation system. In the dynamic network architectures and node movement characteristics differentiates VANETs from other kind of ad-hoc networks. The dynamic change in topology shortens the effective time of routing. Routing in the VANET is quite complicated task. AODV (ad-hoc on demand distance vector) mostly used in the topology based routing protocol for VANET. During the process of route discovery process AODV broadcast route message (RREQ). It creates many unused routes between a source and destination node. This paper main aim to improving the performance of AODV by enhancing the existing protocol by creating stable clusters and performing routing by cluster head and gateway nodes [4].

Josiane Nzouonta, Neeraj Rajgure (2009) represents a paper on classes of routing protocols which is used in VANET it also called the road based using vehicular traffic routing. In this paper use the scenario which is based on the road paths consisting of successions of road intersections that have with high probability network connectivity among them. Geographical forwarding is used to transfer packets between intersection on the path and reducing the path sensitivity to individual node movements. In the network with high concentration optimize the forwarding using a distributed reciver –based election of next hops based on the multi criterion prioritization function that takes non uniform propagation into account. According to this paper designed and implemented reactive protocols RBVT-P and compare them with protocol representative of mobile ad-hoc networks and VANETs. In the simulation of urban setting show up to a 40% increase compared with some existing protocols. In terms of average delay, RBVT-P performs best with a such as an 85% decrease compared with the other protocols [1].

V. PURPOSED WORK

VANETS is the most popular network which is called Vehicular Ad Hoc Network. The researchers make a lot of work in this network. From the Literature review, VANETs works on the basis of real time system where the vehicles are moving nodes and travel with a very high speed on the roads in the urban areas. There are many security issues like authentication, tunnel attacks, intelligent system approach, collision detection, congestion avoidance, communication system approach etc. In this present work we are presenting an intelligent route identification approach in case of accident occurrence for V2V communication. The intelligent vehicles are been defined respective to distance, direction and speed analysis. If some accident over the network occurs, the neighbor node information flow will be performed to perform the route analysis. In this work a bio inspired V2V communication approach is been suggested to identify the safe path over the network.

VI. RESEARCH DESIGN

In this proposed work we have defined the network with a new intelligent algorithm to perform the vehicle to vehicle communication. Each vehicle can pass the information to other regarding the path, speed etc. This information also includes the accident status also. In this proposed work, as a vehicle get some collisions it will inform to the follower vehicles about its status so that they can perform the decision regarding the route change at earlier stage. The intelligent bio inspired algorithm is suggested in this work to identify the new route.

Here we did work on security, collision broadcasting delay time and by enhancing them we did some improvement in throughput, and reduce the delay and congestion over network. For authentication when a new vehicle enters in that particular area it will share his some credentials like vehicle number, license number in some secure form so that any attacker can't disclose them. We did security here because sometime some malicious vehicles can transmit fake message over network so to avoid these activates we did this module into VANET. And to broadcast signal and to avoid delay we integrate the concept of ant colony optimization and wi-max. here RSU detects the collision and will pass the message to database. The database contain wi-max and with that it will broadcast the message to all RSUs and all RSUs forward message o all vehicles in there vicinity. By the whole process the message will broadcast in small amount of time and by this procedure we can avoid traffic jam etc.

In this section we are describing the City area in vehicular network. As we know tin the city area the roads are connected at some intersection point. Generally the intersection point is having the traffic lights to control the traffic and to avoid the accident over the network. Such network can be one lane or two lane network. The road sides are having the intelligent road side units to control the network.

VII. RESULTS AND DISCUSSIONS

Here we did two implementations of VANET in which one is having delay problem in VANET and another is having our proposed solution.

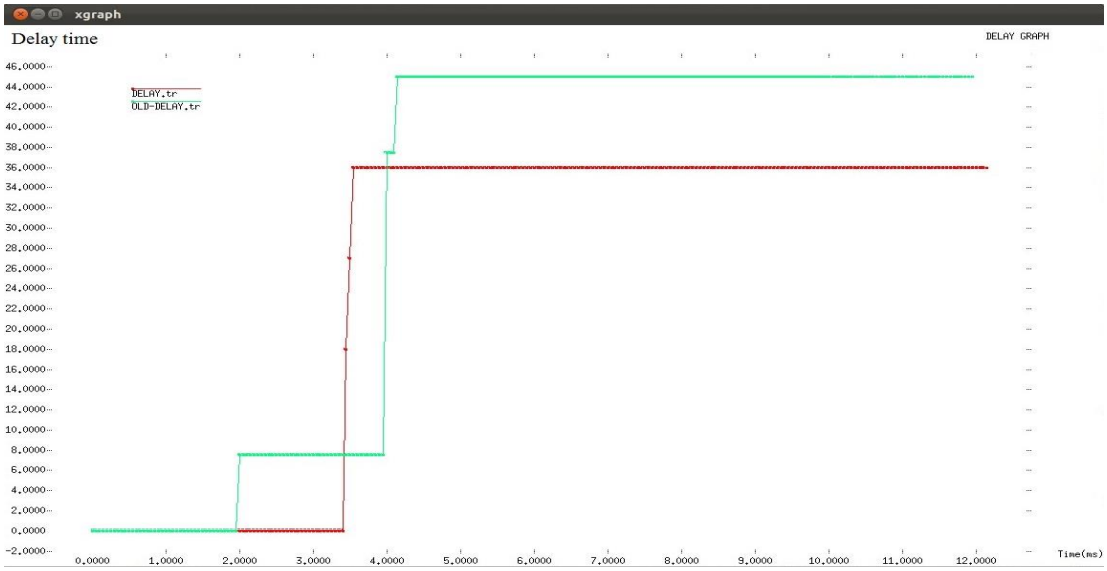

Fig 3: delay graph

This graph represents the delay in both cases. Here green curve shows the delay in old case and red line shows the delay in new case. We delay means how much time it will take to broadcast collision message over all network.

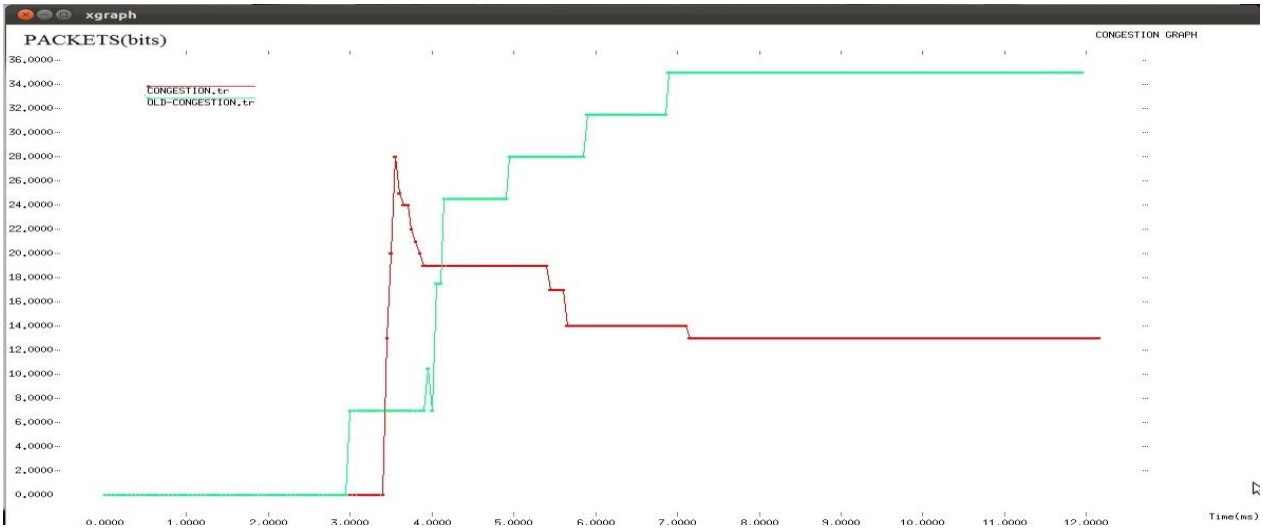

Fig 4: congestion graph

This graph represents the congestion over network while broadcasting collision message. Here green curve shows the congestion for old scenario and red curve shows the congestion for our proposed scenario.

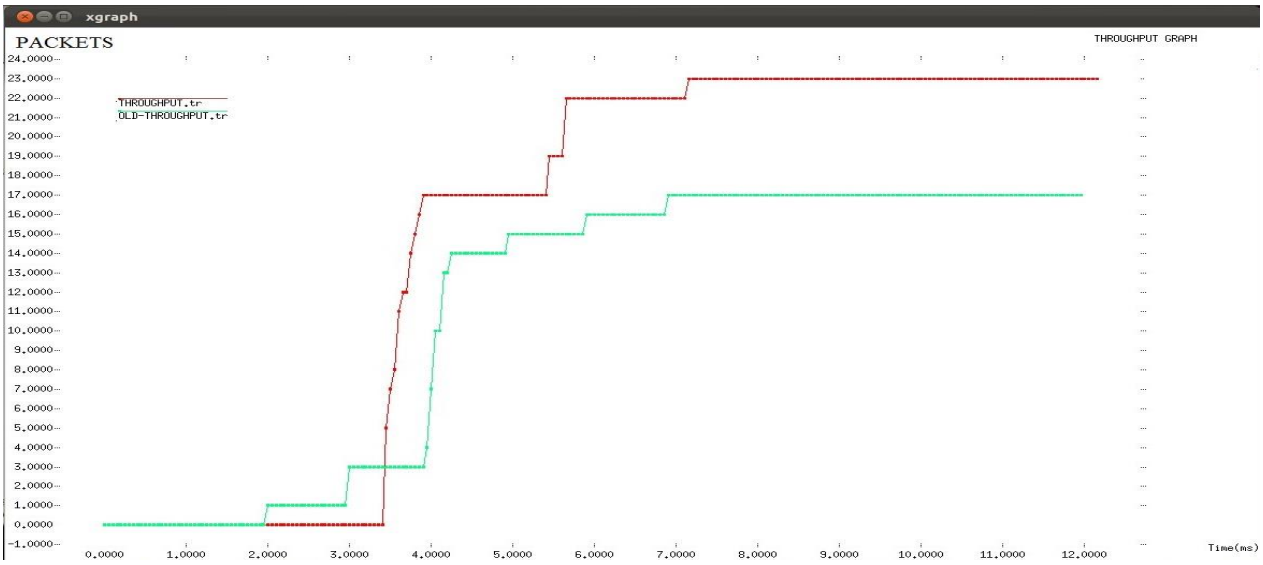

Fig 5: Throughput graph

This graph represents the throughput comparison between old scenario and our proposed scenario. Here green curve shows the number of packets successfully broadcast in old case and red curve shows same for new case in VANET.

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