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An Efficient Packet Delivery Mechanism Using Secured Geo-cast Routing Approach for a VANET Network

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Abstract- In recent years, the innovation of Vehicular Ad-hoc Networks (VANET's) communication has become more prominent and provides a wide variety of services for effective communication, permitting individuals to impart the road information with one another. Vehicular Ad-hoc Networks are exceptional sort of Mobile Ad-hoc Networks (MANET's) in which nodes are profoundly motile, so the network topology changes very rapidly. Furthermore there is no limitation on the network size. All of these attributes have made VANET environment a challenge for developing routing protocols. For the better execution in networks, VANET requires a special support, which makes the network quick, secure and proficient. In order to frame the communication there are several routing protocols that provides optimal path for delivery of packets. In this paper, the Geo-cast routing protocols (GPRs) are applied on highways in view of on traffic environment. The two routing protocols i.e. Information Propagation Speed Analysis (IPSA) in Highway vehicular networks and Mobicast Routing (MR) for Highway Traffic Environment are examined. The path developments from the source node (vehicle) to the destination node based on different criteria are considered. The outcomes are dissected utilizing MATLAB simulation.

Index Terms- Vehicular Ad-hoc networks, CAGR, IPSA and MR.

I. Introduction

Vehicular ad hoc networks (VANETs) can provide adaptable and cost-effective solutions for applications such as traffic safety, dynamic route planning, and context-aware advertisement using short-extend wireless communication. To function appropriately, these applications require proficient routing protocols. On the other hand, existing mobile ad hoc network routing and forwarding approaches have constrained execution in VANETs. This exposition demonstrates that routing protocols which represents VANET particular attributes in their plans, such as high density and compelled portability, can provide great execution to a huge spectrum of applications. This work proposes a novel class of routing protocols as well as two forwarding optimizations for VANETs. Wireless ad hoc networks (i.e., decentralized networks created on the fly by hosts located in proximity of one another) are no more only an exploration concept. Due to their aptitude to require minimal effort to setup, ad hoc networks are suitable for a wide range of applications, including battlefields communication and disaster recovery operations. In August of 2008, researchers at the National Institute of Standards and Technology (NIST) exhibited and ad hoc network prototype for people on call in building fires and mines collapse [2] Unmanned vehicles (aerial, terrestrial, and aquatic) with autonomic operation of a couple of hours, as of now can be sent to districts where human vicinity is deemed hazardous [3, 4], and they can frame networks on the fly to report perceptions to command and control centers.

II. Vehicular Networks

In recent years, most new vehicles come officially outfitted with GPS receivers and navigation systems. Car manufacturers for example, Ford, GM, and BMW have already announced efforts to include significant computing power inside their cars [5, 6] and Chrysler became the first car manufacturer to incorporate Internet access in a couple of its 2009 line of vehicles [7]. This trend is relied upon to continue and in the near future, the number of vehicles equipped with processing advancements and remote network interfaces will increase dramatically. These vehicles will have the capacity to run network protocols that will exchange messages for safer, entertainment and more fluid traffic on the roads. Institutionalization is as of now in progress for correspondence to and from vehicles. The Federal Communication Commission (FCC) in the United States has allocated a bandwidth of 75MHz around the 5.9GHz band for vehicle to vehicles and vehicles to road side infrastructure communications through the Dedicated Short Range Communications (DSRC) [8] services. The emergence of vehicular networks would empower a few valuable applications, both wellbeing and non-safety related, such as automatic road traffic alerts dissemination, dynamic route planning, service queries (e.g.,parking availability), audio and video file sharing between moving vehicles, and context-aware advertisement (e.g., [9, 10, 11]). To deploy these services, three sorts of communications involving moving vehicles are considered, including cellular network, vehicle to roadside infrastructure and ad hoc vehicle communications. Brief descriptions of each of these sorts of communication are given beneath. Note that hybrids means of communication involving combinations of the methods described here can likewise be utilized [12, 13].

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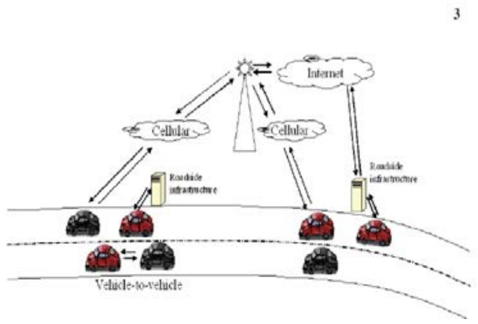

Figure1: Vehicular networks can be formed in three ways: using cellular network, roadside infrastructure/ vehicle-to-vehicle communications.

2. 1 Communications through Cellular Network

The first method connects vehicles to the Internet through cellular data networks using any of the accompanying technologies: EV-DO, 3G, GPRS, and so on [14, 15]. This service is now accessible from car manufacturers [7] and from other outsiders [16].In most commercially available solutions, the vehicle is transformed into a IEEE 802.11 (WIFI) hotspot and the Internet association can be shared by many PCs in the car. For the most part, a limit is set on the measure of information exchange (e.g., 1GB or 5GB greatest every month). The main advantage of this method of connection is that the vehicle will have Internet access wherever the cellular coverage is available. The main drawbacks are the reliance on the cellular operator coverage network and the restricted accessible data rates (rates may vary around 500Kbps-800Kpbs) [17].

2.2 Vehicle to Roadside Infrastructure Communications

The second technique utilizes roadside infrastructure. Here, vehicles interface with different vehicles or to the Internet through roadside access focused positioned along the roads. Two principle variants can be found in the literature: the access focuses could be introduced specifically for the purpose of providing Internet access to vehicles or the latter could make use of open 802.11 (Wi-Fi) access focuses encountered opportunistically along city streets [18].The benefit of this technique for association is that vehicles will have the capacity to connect to the Internet using much higher data rates (e.g., 11Mbps) than through the cellular network. The drawbacks incorporate the cost expense related to introducing access indicates along the roads to obtain reasonable coverage. Additionally, for the case where open access focuses are used, the access point's owners' consent would legitimately be needed before such a service is deployed [18].

2. 3 Vehicle-to-vehicle (ad-hoc) Communications

Utilizing Internet-based correspondences to and from vehicles will likely remain the method of choice for interchanges the length of the proportion of Wi-Fi empowered vehicles stays low. However, the predominance of Wi-Fi-prepared vehicles will open the route for ad hoc networks of moving vehicles [11, 19]. The point of interest here is the addition of a distinct, high data transmission network to the existing framework network. The fundamental drawback is that these networks could oblige new arrangement of protocols as the practicality of vehicular networks applications depicted above is molded by regardless of whether VANET routing protocols have the capacity to fulfill the throughput and delay requirements of these application.

III. EXISTING METHOD

In the existing method Coverage-aware Geo cast Routing (CAGR) is utilized as a part of Urban Vehicular Networks. Which first discovers a set of vehicles within the range and then along with the set of Coverage Area Vehicles (CAV). One among the CAV is chosen arbitrarily in order to move forward and the new vehicle turns into the originator and afterward CAV is computed for the new source vehicle. Now the Vehicle In Route (VIR) is figured and after that is compared with CAV and comparative vehicles between the two entities are evacuated and then one among new CAV is picked. The procedure is repeated until the Destination Vehicle is reached.

A. The CAGR algorithm can be described by the following flowchart

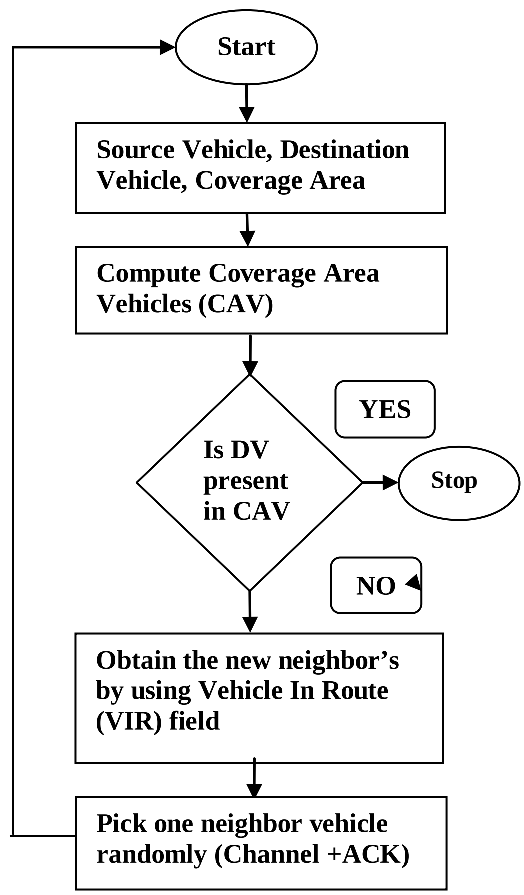

Figure 2: The CAGR Flow Chart

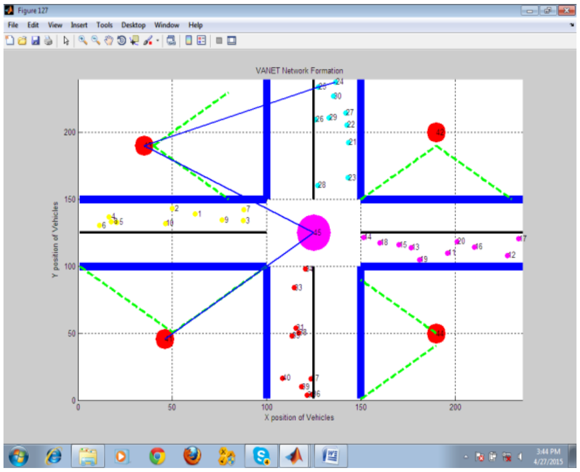

Figure 3: The CAGR Algorithm Simulation Result

The Source Vehicle, Destination Vehicle and Coverage Area acts like an input .First the CAV is computed for the Source Vehicle. If the Destination Vehicle is present in CAV then stop the process. If not then we need to pick up the new neighbors. The VIR lists are already traversed vehicle and then new vehicles are generated. Now one the vehicle is picked randomly from new neigbours and that vehicle acts like a new Source Node. The above steps are repeated until destination vehicle is reached.

The existing method CAGR has following drawbacks

- The CAGR algorithm needs computation of GPS based Vehicular Routing Tables (VRT) but the vehicles will contain vehicles ID which are in scope of both frauhoffer and Fresnel regions. Thus processing expense is high.
- The CAGR algorithm will have expensive overhead due to maintenance of vehicular routing tables for each of the node. Hence Overhead is more.
- The CAGR algorithm will take more time for conveying the packets . Source Vehicle to Destination Vehicle and back.
- The CAGR algorithm is not suitable for Highway Traffic conditions.
- CAGR requires retransmission of packets.

IV. PROPOSED METHOD

In the proposed strategy two algorithms are proposed specifically "*Information Propagation Speed Analysis (IPSA)*" and "*Mobicast Routing (MR) Protocol for Highway Traffic Environment*" are proposed.

4.1 Information Propagation Speed Analysis (IPSA)

IPSA algorithm does not require any vehicle routine table to identify the vehicle. IPSA algorithm mainly based on the density of the vehicles. The next forward vehicle will be choosed based on which neigbour vehicle has the maximum density. If multiple vehicles has the same maximum density then the vehicle is choosed which has low vehicle ID. This process is repeated until the destination vehicle is reached.

B. IPSA algorithm can be described by the following flowchart

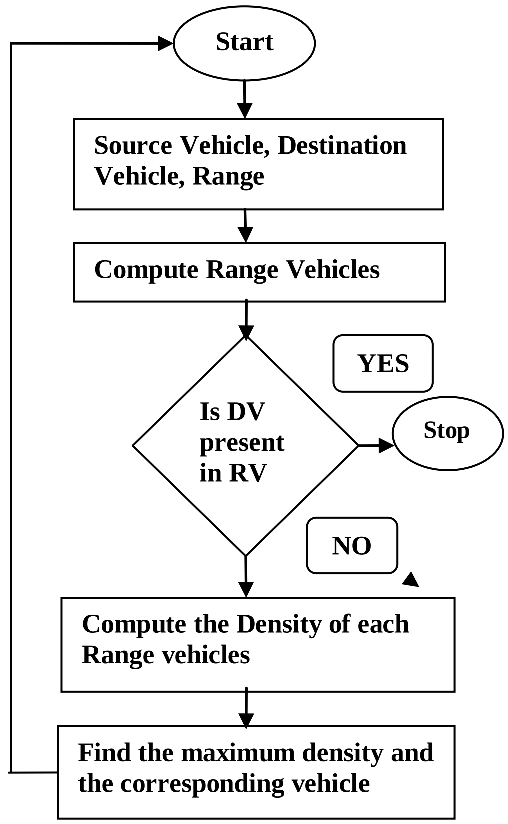

Figure 4: The IPSA Flow Chart

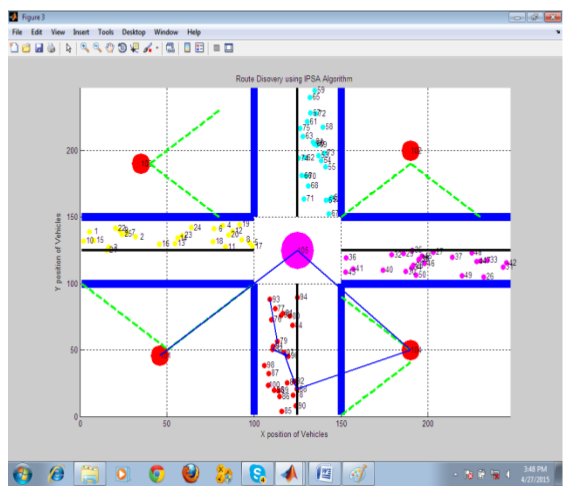

Figure 5: The IPSA Algorithm Simulation Result

4.2 Mobicast Routing (MR) Protocol for Highway Traffic Environment

Mobicast Routing is an algorithm which is in view of separating the area surrounding to every vehicle based on GPS Range and afterward the source Vehicle will discover the list of Neighbor vehicles which are within the GPS range. For every direction vehicle is picked i.e. EAST, WEST, NORTH & SOUTH and after that the data packet are forwarded in every direction of vehicle and pick a node which is closeness to destination vehicle. This procedure is repeated until the Destination Vehicle is reached.

C. The Mobicast can be described by the following flowchart

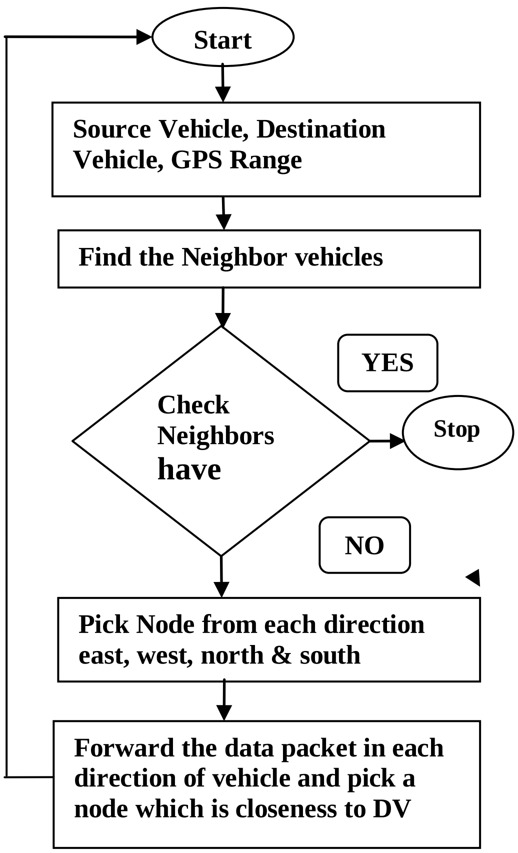

Figure 6: The MR Flow Chart

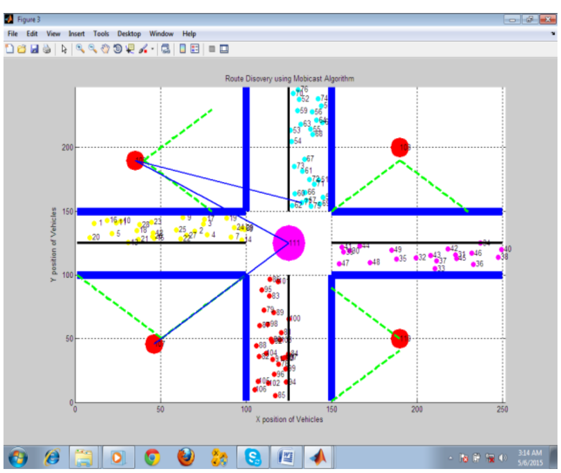

Figure 7:The MR Algorithm Simulation Result

V. Results

Vehicular Ad hoc Networks (VANETs) have become more popular in Intelligent Transportation Systems, they have been intended to provide road security and services for passengers comfort, given their significations related to the safety of human's lives. In this paper, diverse Geo-cast routing protocols in VANETs based on traffic environments are displayed. The execution result demonstrates the messages been sent over the network. The messages can be sent within lane and also between lanes utilizing distinctive routing protocols. The CAGR is for urban while IPSA and MR are for highway traffic environment.

VI. Conclusion and Future Scope

In this project 3 mechanisms or algorithms have been proposed for VANET network for different densities of vehicles and every algorithm has its own particular manner of setting up the path and sending the packets .CAGR finds the GPS vehicles, pick the vehicle ID which sends the reply first and has the most lowest channel noise and repeats until the destination is reached. In IPSA algorithm the forward node is chosen based on the density of the neighbor vehicles, the vehicle which has the highest density is chosen to move forward. In Mobicast routing a dedicated sensor is utilized which moves back and forth and delivers the packets to all other vehicles. The Algorithms can make utilization of Centralized Server and Security mechanisms to reduce the overhead and to keep away from the security attacks.

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