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Multicast Arti-Q System In Vanet

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----------Abstract----------
The emerging needs of the wireless communication increase the researches in the wireless communication area. Ad hoc network is used for the wireless communication. MANET is one of the self-organizing, self-healing networks in the Ad hoc network. VANET is a subclass of the MANET which provides comfort and safety to the users of VANET. VANET is a collection of vehicular mobile nodes which forms the vehicular Ad hoc networks. In VANET there are many challenges wanted to solved, in order to provide efficient and stable services. This paper represents the Artigence techniques which will solve the challenges in the VANET and improve the efficiency. Artigence uses Arti-Q techniques, which is one type of efficient queuing technique. The VANET and Artigence are using in the call taxi management systems in order to provide efficient service to the customers.

Keywords *– Wireless communication, MANET, VANET, Artigence, Arti-Q, Queuing techniques, Call Taxi***.**

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I. INTRODUCTION

The increasing demand of need of new wireless devices and wireless communication without the interference of centralized or pre-established infrastructure/authority has tended to research on self-healing and self-organizing networks. Ad hoc networks are the networks with the absence of any centralized or pre-established infrastructure. Ad hoc Networks are collection of self-controlling mobile nodes [1]. A MANET is a self-organizing, self-healing network, which can function without need of centralized control.

Each node in an Ad hoc network can acts as both a router and a data terminal. The nodes in the network then use the wireless medium communicate with other nodes in their radio range. Vehicular Ad hoc Networks (VANET) is one of the types of Mobile Ad Hoc Networks (MANETs). VANET is one of the influencing areas used for the improvement of Intelligent Transportation System (ITS) means to provide comfort and safety to the users. In order to avoid critical situations, VANET guides vehicle drivers to communicate and to coordinate among themselves through Vehicle to Vehicle communication e.g. traffic jams, road side accidents, free passage of emergency vehicles, speed control, and unseen obstacles etc. Besides comfort applications VANET also provide safety to the VANET users.

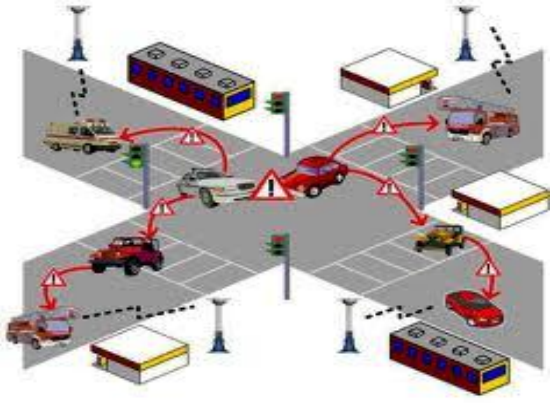

Fig.1.1 Vehicular Ad hoc Network

VANET is a part of wireless communication networks. VANET is the developing area of MANETs in which consists of vehicles act as the mobile nodes within the vehicular network. The basic goal of VANET is improving safety as well as the comfort of the road users. VANET is the wireless network in which communication carried out in the place through wireless links supported on each vehicular node [2]. Each node in the Vehicular Ad hoc Network act as the participant as well as router of the network as the nodes communicates through other intermediate node that lies within their own transmission range of area. VANET does not rely on any fixed network infrastructure. Although some nodes are fixed, this can act as the roadside units to simplify the vehicular networks for serving gateway to internet. The main characteristics of VANET like higher node mobility, node speed and rapid pattern movement causes rapid changes in network topology [4]. VANET has many challenges that are needed to be solved in order to provide reliable services to users.

- Reliable and stable routing.
- Dynamic behavior.
- High speed of mobile nodes.
- Mobility.
- Dynamic topology.

The above challenges can be efficiently handled by the proposed method called Artigence technique. Artigence means that Artificial intelligence which can be used in the Vehicular ad hoc networks. The VANET and Artigence technique both can be used in the call taxi application in order to provide rapid and efficient service to the users and also it can provide benefits to the management and drivers.

II. TRANSMISSION IN VANET

Vehicular communication enables the direct exchange of information among vehicles. Such Vehicular Ad-Hoc Networks (VANETs) can support infotainment, traffic efficiency and, most important, safety-related applications. For example, vehicles can warn each other of dangerous locations like an icy road or the end of a traffic jam. Hence, saving life and preventing injury in road traffic is the driving force behind the development of inters vehicle communication. For these applications it is essential that the inter vehicle communication is reliable and robust. Regarding the communication aspects, VANETs are confronted with diverse situations, ranging from very low vehicle densities up to very high vehicle densities. A lonely rural road, high speed autobahn as well as a congested metropolitan area is typical examples. In all of these situations, VANETs have to operate reliably.

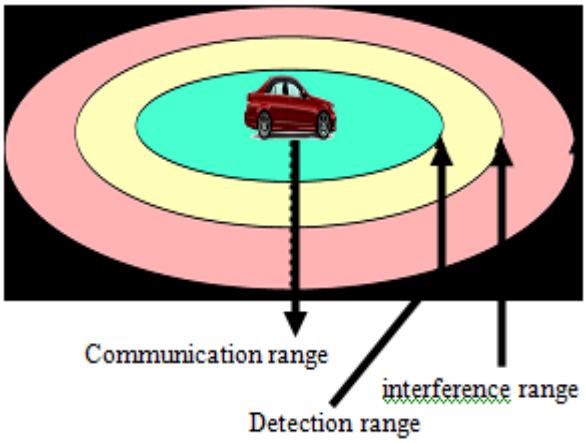

Fig 2 Transmission Range in VANET

Since inter vehicle communication in VANETs is similar to communication in mobile ad-hoc networks (MANETs) the protocols are also similar. It is envisioned [1] to basically apply ad-hoc communication according to IEEE 802.11 but without the need to form a basic service set in order to improve the ad-hoc capabilities. The respective amendment, IEEE P802.11p [5] is currently under development. In this kind of communication, i.e. wireless ad-hoc broadcast, the commonly known mechanisms of IEEE 802.11 aiming at reliability of communication do not apply. Acknowledgments or even multi-stage handshakes like RTS/CTS are not realistic for VANETs to support successful message distribution.

- Besides signal attenuation due to air propagation there are other important attenuation influences:
- **Reflection:** The electromagnetic is reflected a large surface with a comparably higher dimension than the wavelength.
- **Shadowing:** Particular objects reflect the wave into the opposite direction or strongly attenuate the signal so that behind these object only a weak signal remains.
- **Diffraction:** The wave is bent behind a sharp edge of an object. Thus the wave is able to propagate beyond shadowing objects.
- **Scattering:** In contrast to reflection where the surface must be relatively large, scattering occurs at small dimension surfaces compared to the wavelength. Rough surfaces like plants or trees scatter the wave to multiple directions.
- In VANETs we assume that reflection and shadowing are more important than diffraction or scattering. A huge surface for reflection effects is of course the surface of Earth. Regarding shadowing, large vehicles like trucks will strongly contribute to signal attenuation.

2.1 ROUTING IN VANET

Vehicular Ad Hoc Network Routing

VANET has same characteristics as MANET. Because of some characteristics like high mobility, dynamic topology and limited life time make routing decisions more critical and challenging task [6]. Other factors such as road layout, different external environments like city and highway making routing more challenging in VANET. As opposed to topology based routing of MANET, VANET uses position information of the participating nodes within the network to take routing decisions.

2.2 Position Based Routing

In VANET due to the dynamic and highly mobile nature of VANET, where nodes behave very rapid changes its location frequently demands such routing method that can participate with the environment of such network. It tends to the researchers to use positions of nodes means to provide efficient communication between source and a destination. Such method in which geographical positions of nodes are used to perform data routing from source to destination is called position based routing.

Position based routing assumes that each node have knowledge about its physical/ geographic position by GPS or by some other position determining services. As compared to topology based routing, position based routing uses the additional information of each participating node to applicable in VANET, that additional information is gathered through GPS. Position based routing provides hop-by-hop communication to vehicular networks. A position based routing protocol consists of many major components.

- **Beaconing:** In it a node forwards packet with the current physical position and the unique id i.e., IP address. If node receives beacon from its neighbor's then it updates its information in location table. Thus beaconing is used to gather information of node's one- hop neighbor or node's next hop neighbor.

- **Location service and servers:** When a node does not contain current physical position of a specific node in its location table or want to know current physical position of any specific node then location service assisted to find current position of a specific node [7]. To trace the current physical position of desired node, the requesting node sends location query with the unique ID of the desired node, sequence number and total number of hops. The neighbor's reply this message until desired node found and if desired node lies among near neighbors of the requested node then it replied with its current physical position message. In this way originating node updates desired node physical position information in the location table.

- **Forwarding and Recovery strategy:** Forwarding and recovery strategy are used to forward data from source to destination node.

2.3Greedy Perimeter Stateless Routing-GPSR

Greedy Perimeter Stateless Routing (GPSR) [8] is one of the best examples of position based routing. GPSR uses closest neighbor's information of destination in order to forward packet. This method is also known as greedy forwarding. In GPSR each node has knowledge of its current physical position and also the

neighboring nodes. The knowledge about node positions provides better routing and also provides knowledge about the destination. On the other hand neighboring nodes also assists to make forwarding decisions more correctly without the interference of topology information. All information about nodes position gathered through GPS devices. GPSR protocol normally devised in to two groups:

- **Greedy forwarding:** This is used to send data to the closest nodes to destination.[6]

- **Perimeter forwarding:** This is used to such regions where there is no closer node to destination [8]. In other words we can say it is used where greedy forwarding fails.

IV. LOAD BALANCING IN VANET

Another important issue which is not considering in recent investigation is the problem of load balancing in VANET. Proper traffic distribution between all potential connected paths of the network will reduce the packet drops caused by congestion, and so throughput will be increased. Sensing the lack of load balancing in VANETs, VLBR adaptive routing protocol is used. VLBR finds the shortest paths between each source and destination willing to have a communication. When forwarding packets, VLBR distributes the load between all intermediate nodes by choosing the next hop according to road conditions, either to nodes with the same moving direction or those with lower collision probability. During the connections, the protocol warns about path congestions when confronting prior congestion threshold. In such cases, related connections could switch to less congested paths. As a result, the traffic load will be balanced throughout the entire network and VLBR will gain higher packet delivery ratio and throughput. There are three phases in the VLBR.

- **Finding the Path between a Source and a Destination:** VLBR is a source routing protocol in which each vehicle wishing to send a packet should define the route in the header of the packet prior to sending.

- **Routing Between Intersections:** After the sequence of intersections is determined, packets are routed between intersections.

- **Balancing Traffic using k-Shortest Paths:** The k-Shortest Paths algorithm lists the loop less k minimum cost shortest paths for a given source-destination in a directed graph. Applying the k-Shortest Paths here means despite having the path with most density and least distance cost, we will have the second, third… k best routes too. Our proposed Arti-Q technique will work in the above VANET functionalities in order to improve the VANET services to the road users. It is particularly very much valuable in vehicular applications like call taxi management systems, tourist management systems and so on. It used to provide valuable and efficient services to the users.

V. ARTI-Q IN ARTIGENCE

Artigence means that artificial intelligent, i.e., the capacity of a computer to perform operations analogous to learning and decision making in humans, as by an expert system. From the name itself we can know that the Artigence system can perform tasks without the man power. Artigence is the technique which uses the concept called Arti-Q. The Arti-Q consists of two types of control units, they are,

- Arti-Q main
- Arti-Q proxy

The functionalities of the above two control units are described in the working strategy of the Arti-Q technique. The technique uses the data structure, Queue which follows the strategy first in first out. The parallel processing will be carried out in the time of finding the response for the respective request. The Arti-Q technique works as follows,

- The data are received for the process from external proxy to internal proxy.
- In the first time, the Arti-Q main server will receive the requests. And receiving of request in Arti-Q main will be stopped after 0.5 seconds timer. The timer can be varying based on the nature of the application and requirement of the user.
- At the time of processing in the Arti-Q main server, the requests are received by the Arti-Q proxy.
- The requests are stored in the Queue data structure, in both Arti-Q main and Arti-Q proxy.
- In Arti-Q main, the first request is processed and the response is found. Then Arti-Q main will analysis that the same request of the first process is repeated by another processes in the queue.
- If so, the same response will be sent to another process whose requests are same like the processed request.

- Then served requests are removed from the queue.
- Arti-Q proxy will load the requests in the Arti-Q main for next iteration.

VI. ARTIGENCE IN VANET

Artigence can be combined with VANET in the call taxi management systems, to manage the vehicle reservation more efficient. For that externally one mobile is connected with the system. This mobile device is used for GSM communication and to increase the baud rate of the system. The system consists of the information about the vehicle and drivers. And by using GPRS the system will identify the geographical position of the Vehicle. And also the information will store in the vehicle information. The customer who needs vehicle will send message to the toll free number in the syntax of "taxi space area name". At the same time many number of users can send the requests to get the vehicle. In the server the Artigence is running to handle multiple requests.

The system finds the vehicle which is near to the user's location. The driver name, vehicle number and his mobile number will send to the user's mobile number. The selection of vehicle near the city will consists of some constraints that,

- The driver who is free at that time
- The driver who is having low workload.

Advantages of the Artigence

- It reduces waiting time of the requests in the queue.
- In the existing strategy, if any file or information needs to be transfer means we need web connection. But while using the Arti-Q we can transfer the information by using GSM communication.
- In the existing systems, the information can be hack by the unauthorized users. But in the Arti-Q system, because of GSM communication the information are secured while transferring it.

VII. CONCLUSION

The communication is highly related to Ad hoc network. In that VANET (Vehicular Ad hoc Network) is the collection of vehicles mobile nodes. It is the subclass of MANET (Mobile Ad hoc Network). This paper represents the Artigence technique. Artigence means that artificial intelligence technique, which uses the data structure Queue. It uses the technique called Arti-Q. The requests are stored in the queue, in that same requests are handled simultaneously in order to reduce the waiting time and increase the response time. VANET is combined with the Artigence and it will use in the application call taxi management systems. The request of reserving the vehicle will send to the toll free number. The response will be received by the user that contains the information about vehicle number, driver mobile number based on some constraints. Then the user can utilize the information to reserve the vehicle.

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