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A Study on Optimizing the Efficiency of Location Aided Protocol

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Abstract: ***VANETs is the recently developed technique to achieve traffic safety and efficiency through inter vehicle communication, where the routing protocols in VANETs plays a vital role. Inefficient path establishment and network congestion both bring severe degradation to network throughput and performance. As in previous works shown, routing throughput and performance is largely dependent on the availability and stability of the wireless link, which makes it a very pivotal parameter that shouldn't be ignored in order to obtain proper performance and throughput measurement in VANET. This paper presents a class of routing protocol called Location Aided Protocol (LAR), which outperforms existing protocols on routing. LAR protocol leverage real time vehicular information to create path between source and destination, with high probability of network connectivity among them. This will reduce the delay in transmission and improve the throughput of the network.***

Keywords: Road Side Unit (RSU), Location Aided Protocol (LAR), Internet Service Provider (ISP), Intelligent Transport Service (ITS).

1. Introduction

VANETs present a rapidly emerging, challenging class of MANETs. VANET is characterized by a very high node mobility and limited degree of freedom in the mobility pattern. Hence, Ad-hoc protocol adapt continuously to the unreliable conditions, whence growing effort in the development of communication protocols which are specific to vehicular networks [1]. VANETs are conducted with moving vehicles and roadside infrastructure because of high mobility and continuous topological changes happen. VANETS is a self-directed and self composable wireless communication network, where vertices include themselves either as client or server for communication [8]. Author explained packet drop ratio increases due to low success ratio at destination side [21]. VANETs are expected to support a large ordered array of components of nomadic distributed application that range from alert dissemination of traffic and distribution of files [22].

Table 1: Layered View of Vehicular networks

Vehicular Network	Application Type	• Safety • Intelligent transportation • Comfort applications
	QoS	• Non real time • Soft real time • Hard real time
	Scope	• Wide area • Local
	Network Type	• Ad-hoc • Infrastructure based
	Communication Type	• V2V • V2I

Based on unique characteristics, the vehicular communication has been categorized into two parts:
1) Vehicle to Vehicle communication (V2V)
2) Vehicle to Infrastructure communication (V2I) [8].

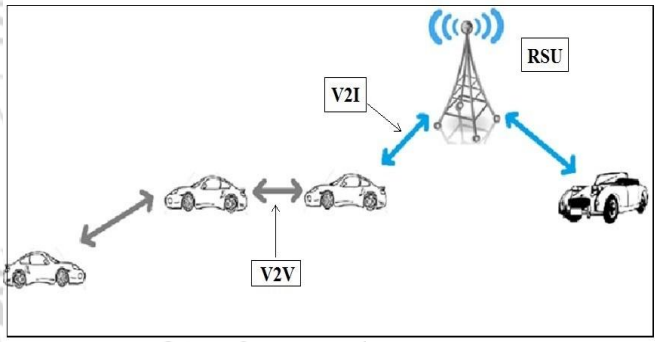


Figure 1: Vehicular Communication

In the above described diagram when the vehicles are communicating with the road side unit (RSU) or transmitting the messages with the side infrastructure then this process is known as V2I. On the other hand when vehicles are transmitting data with each other are known as V2V. This V2V communication requires some special hardware in the cars like actuator.

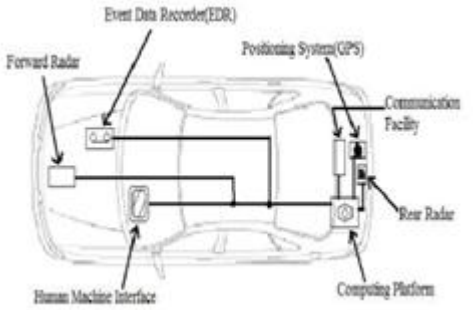


Figure 2: Modern Vehicle Network of Actuators on Wheels

In this paper, we have discussed about the LAR protocol, its shortcomings and proposed a novel technique to overcome the problem of Broadcasting in LAR protocol. After that we compare the novel technique with the existing LAR protocol graphically and observe the throughput of the network and delay in transmitting a message.

The rest of the paper follows the process like this. In section II we describe LAR protocol. In Section III literature survey

is reviewed. In section IV Problem Formulation is being defined. In section V Research methodology is being defined and in section VI Conclusion is presented followed by the references in section VII.

A. Challenges

It is vital to specify the important challenges in VANET:

- **Signal fading and distortions**: Objects like other vehicles or buildings act as obstacles between two communicating vehicles which is one of the challenge that can affect the efficiency of VANET.
- **Bandwidth limitations**: Absence of a central coordinator that controls the communications between nodes, and which has the responsibility of managing the bandwidth and contention operation.
- **Connectivity**: Owing to the high mobility and rapid changes of topology, which lead to a frequent fragmentation in networks, the time duration required to elongate the life of the link communication should be as long as possible.
- **Small effective diameter**: Owing to the small effective network diameter of a VANET, that leads to a weak connectivity in the communication between nodes.
- **Routing protocol**: Because of the high mobility of nodes and rapid changes of topology, designing an efficient routing protocol that can deliver a packet in a minimum period of time with few dropped packets is considered to be a critical challenge in VANET.

2. LAR Protocol

Location based routing protocols have characteristics along with deign architecture which make vehicular communication more challenging. There are three broad categories of networks as cellular, hybrid and Ad-hoc. Cellular network supports infotainment, for example, latest news, information of locality. This cellular network depends on the epitome of vehicle to infrastructure. As the alive infrastructure is there which support the large orbit of vehicular applications. But the disadvantage is that the need of rigid infrastructure deployment. It is figured out by improvised network where there is no need of earlier infrastructure. This is more suitable for vehicle to vehicle communication. But it also faces problems due to network partitioning and routing link failures and rapid topology changes. The solution of this problem is the deployment of the access points on the side of the road and in case there is no issue regarding energy consumption. In hybrid communication, mobile network is based on architecture which is centralized and also collects traffic information from the access points on the road side. Access point processes acquired information and make available to drivers[2, 5, 6, 7]. It has been proved that for highly mobile and dynamic network, routing protocols based on position are highly feasiblewhich decrease overloaded route discovery. LAR is an idea which is used by utilizing the mobile host‟s location information. Such information about location may be known by using Global Positioning System. Two flooded sections are used by LAR, the expected section and forwarded section. LAR protocol reduce the search space by using location information for an expected route. By limiting the search space we decreases the number of route finding messages [9]. When an origin vertex needs to transfer data packets to a location, the origin vertex first find the position of the destination mobile vertex by communicating with a location service responsible for the mobile vertices position. This creates a tracking problem and connection problems [4, 13].

The two LAR algorithms had developed LAR scheme 1 and scheme 2. Scheme 1 use predicted location of the destination also known as predicted zone which is require to decide the request zone at the time of discovering the route. On the other hand, LAR scheme 2 uses distance from the previous location of the destination as a parameter for defining the request zone. Thus, any intermediate node receiving the route request forwards it if it is closer to or not much farther from the destination's previous location than node transfers the request packet. Therefore, the implicit request zone of LAR scheme 2 becomes adapted as the route request packet is broadcasted to various nodes. Following are the forwarding strategies:

- **Forwarding in Greedy manner**
  Agreeing to the scenario represented in Figure 3, if forwarding strategy is used in greedy manner then, source node forwards the packets to a node closest to thedestination „D‟. In this case „S‟ sends packet to „A‟.
- **Improved forwarding in greedy manner**
  In this scenario, source node first refers to its neighbour table and then computes new expected position of all its neighbours based on direction and velocity and then selects a node which is closest to the destination. „S‟ computes new expected position of its neighbours and suppose at time t2, vehicle „B‟ over takes the vehicle „A‟, then „S‟ selects „B‟ as its next hop instead of „A‟.
- **Directional forwarding in Greedy manner**
  Greedy approach can be used directionally by considering only those nodes which are moving towards destination. It picks a node which is moving towards destination and is nearest to the destination. Thus, it selects vehicle „B‟ as its next hop.
- **Greedy forwarding Predictive directional**
  In this strategy, forwarding node keeps the information of its 2-hop neighbours. Before forwarding the packet, forwarding node refers to its neighbour table and calculates expected position of all its neighbours (1-hop and 2-hop neighbours) and then chooses a node whose one-hop neighbour is moving towards the destination and is nearest to the destination. In this case, „S‟ selects vehicle „A‟ because its one-hop neighbour „C‟ is moving towards destination „D‟.

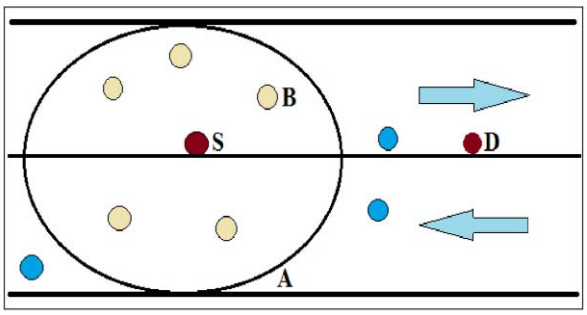


Figure 3: Forwarding Strategies

3. Literature Review

To optimize the efficiency of the LAR protocol first of all we need to know some of the things that is being reviewed:

- **Performance of AODV and OLSR**: It is proposed that vehicular improvised network is taxonomy category of MANETs that legitimate wireless communication among all the various vehicles. In the VANET routing protocol and other proficiency must be accommodated to vehicular specific capabilities and needs. In the preceding research routing performance is highly rely on the availability and stability of the wireless links. In the routing algorithm that have been analysed already are compared in the preceding feigning with the comparison that are done by stochastic motion.In the research they measure the performance of AODV and OLSR in a citified schema. It also study the different protocols under the diverse metrics like vertex mobility and vehicle compactness with different traffic [1].
- **Vertex Mobility:**By assets and analysis the main instance of algorithm on network routing from bottom-up proposal has been encouraged by combined behaviour of cultural insects such as bees and ants. This session of bio-inspired routing algorithms comprises a comparatively huge number of algorithms commonly developed in last year and mainly encouraged by ant colony behaviour. It explains the widely held off instance of swarm intelligence algorithm for routing [5].The vehicles are the vertices of the network. VANETs provides the applicative as an ITS. In propellant network architecture and vertex mobility feature differentiate VANET from rest of the improvised network. The propellant alteration in topology decrease the routing efficacious period. Routing is the perplex task in improvised network [11].
- **Locating the Destination:**In VANETs to start the communication location based service, the positioning vertex should be located. It had been designed for citified area topology which employ vertices information like distance of intersection central point and speed in choosing stable server for location, in this the creation of quorum location server will be performed by main server of that location by appointing other located vertices at the intersection depending on their mobility direction. The quorum is being used to spread load on multiple servers for the purpose of fault tolerance. Also the prediction algorithm is used to percolate the noise data and bring for the accurate location of destination and overcome the problem of non-current data stored in grouped system. It reduces the overhead and end to end delay of routing packet [13].
- **Overcrowded Traffic:**Here all the devices transmit the data with the usage of radio devices. Vehicle overcrowding is ruminate as delay while journey. Overcrowding of traffic can be calculated using various conventions like broadcasting of data packets, proportion of packet supplied and proportion of traffic hive off. The feigning show case the domain of vehicle overcrowding [12].
- **Packet Delivery Ratio:** Scrimpy forwarding nodes and overcrowding network both demean the working of routing in VANETs. So an accommodative approach based on the collection of two situation and utilize the method to the LAR protocol to prevent it from degradation has been developed. In this adaptive strategy MADM scheme has been proposed to accommodate control functions for message transmission. Experimental analysis and simulation working demonstrate that this method can advance the packet delivery ratio (PDR) of LAR protocol efficiently [14]. OLSR uses the proficiency of flooding for searching the destination which create the overheads. To subdue the problem we use the MPR (Multi Point Relay) which helps to decrease the number of messages broadcasted during this proficiency [18].

4. Problem Formulation

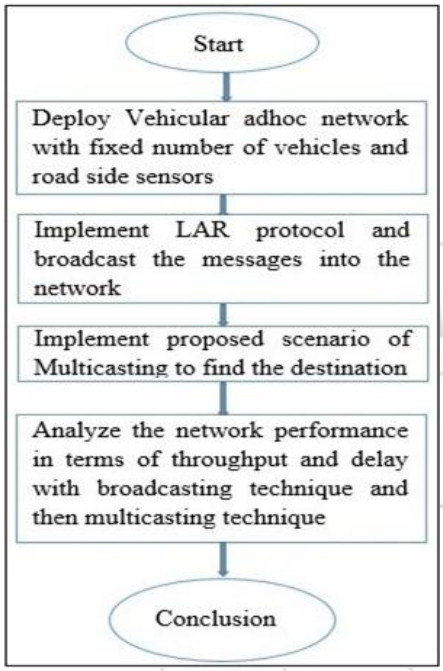
From the literature review, VANETs work upon real time scenarios where all the automobiles are flaring vertices which travels with lofty speed on the roads. There are various kind of protection problems like verification, communication system strategy, collision discovery, congestion avoidance and intelligent system. In existing scenario, Packets are broadcast in the network. Due to broadcast nature network resources are wasted and network becomes inefficient. Inefficient network decrease the performance and throughput of the network respectively. To overwhelm this problem a nominate proficiency will be used which will be based upon multicasting and improve efficiency of the network. In proposed methodology tree based multicasting scheme will be used to increase the performance of the network. The path will be used on the basis of minimum hop count of reply packet. The canonical approach comprises of group of routing vertices which will together form a routing tree. After the formation of routing tree of vertices group, a packet is transmitted to all the vertices. Only one time the message will travel at every link and routers present in the tree. For multicast routing we use multicast tree very often in improvised network. It also get appointed for wireless multi hop network. As a multicast tree reduces a unique path among two stochastic vertices into the tree, the least number of transcript per message is used to distribute the packets to every node present in the multicast group.

In place of Brute force technique, routing trees are distinctly effective to send the same data to other vertices from the source. The extra benefit gained from multicast routing is that at each router the routing choices will become easy into the multicast tree. Router gets a multicast packet in a multicast tree for the interfaces present in the tree. On the other hand, multicast trees accomplish the simplicity and efficiency described above by tracing a unique path among the couple of routers. In summation, trees offers marginal connectivity midst the participant of a multicast group, if any link fails in the tree then it divides the group and needs the participated router to rearrange the trees. In this work our main concern is to convert broadcast to multicast to reduce packet overhead and time consumption.

5. Research Methodology

In the feigning, we show that the delay will occur due to the packet loss in the selected route between source and

destination. To overwhelm the problem of delay, the multicast technique is been used. In the multifariousness technique, the source selects the disjunctive paths between source and destination. When the network performance degrades to a threshold value other feasible path is selected for communication. In this paper, we will raise the efficiency of the multifariousness technique in which while selected the feasible path, the technique of neural network is applied where source learns from the past experiences and on the basis of path route records and other feasible paths are selected between source and destination.



Flow Chart 1: Basic Scenario

6. Conclusion

The expected outcomes of this research is to reduce path establishment time and improve network throughput. As explained due to higher node mobility LAR algorithm take long time to establish path between source and destination. To overwhelm this problem a nominate proficiency will be used which will be based upon multicasting, and improve efficiency of the network. In proposed methodology tree based multicasting scheme will be used to increase the performance of the network. The path will be used on the basis of minimum hop count of reply packet. The proposed improvement will reduce delay and improve network throughput.

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