Review of Routing Techniques in Vehicular Ad Hoc Networks

Baljeet Singh[1], Er. Harpal Singh[2]

[1]*M.tech (CSE), Guru Kashi University, Talwandi Sabo, Bathinda, Punjab, India*
[2]*Assistant Professor & Head, Deptt. of UCCA, Guru Kashi University, Talwandi Sabo, Bathinda, Punjab, India*

Abstract: **Vehicular ad hoc networks (VANETs) are advanced class of mobile ad hoc networks where the nodes are replaced by moving vehicles. The objective of such networks is with the emergency information distribution applications. Nevertheless, these networks come with the issues of the link stability due to their inherent high mobility scenarios. This paper examines various techniques related to the routing of the data in vehicular ad hoc networks.**

Keywords: **VANETs, link stability, mobility**

I. INTRODUCTION

The Vehicular Ad-hoc Networks (VANETs) field has generated the interest in researchers due to the wide variety of services that they can provide in the context of Intelligent Transportation System (ITS). VANETs is a special class of MANETs that allow communication between high speed moving vehicles and road side units [4]. In VANETs every vehicle behaves as a mobile node. Here each node acts as host and the router.

Here, the nodes within the communication range can directly communicate with each other. The communications (sending/receiving data packets) among the out- of- range nodes are facilitated via intermediate nodes, which are outside of its communication range. The immediate node is most important in this case as each data packet has to pass through it. The high dynamic network with high speed and mobility makes the routing more difficult in VANETs and shows the variation from MANETs. Figure 1 presents the vehicular ad hoc network scenarios.

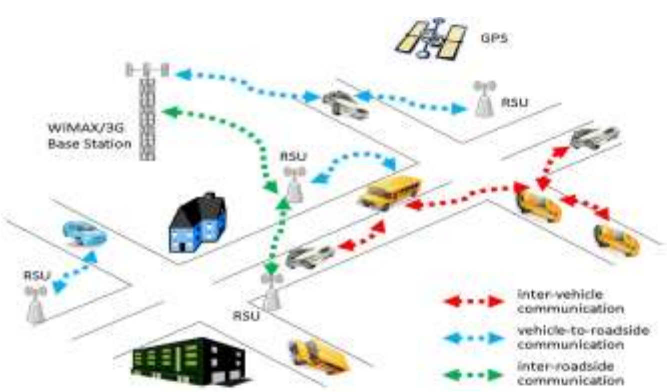

Fig-1 Vehicular Ad hoc Network Scenario [5]

The main objective of VANET is to help a group of vehicles to set up and maintain a communication network among them without using any central base station or any controller. One of the major applications of VANET is in the critical medical emergency situations where there is no infrastructure while it is critical to pass on the information for saving human lives. Every vehicle becomes part of the network and also manages and controls the communication on this network along with its own communication requirements. Vehicular ad-hoc networks are responsible for the communication between moving vehicles in a certain environment. A vehicle can communicate with another vehicle directly which is called Vehicle to Vehicle (V2V) communication, or a vehicle can communicate to an infrastructure such as a Road Side Unit (RSU), known as Vehicle-to-Infrastructure (V2I).

VANET environment has a continually changing topology because of high portability of the vehicles. In vehicular ad hoc networks, the movement of the vehicles at higher speeds compared to the other networks like mobile ad hoc networks, pose a great challenge to the stability of the routes formed in the network. Thus the stability of the routes, if not maintained, will defeat the purpose of the network. This paper presents the survey of different routing techniques proposed by various investigators in the past. Finally, the paper has been concluded in section III.

II. LITERATURE SURVEY

This section represents various techniques used in vehicular ad hoc networks for routing the data effectively.

1. MOZO

The investigators in [1] have designed a moving-zone based design in which vehicles cooperate with one another to form dynamic moving zones with the intention of simplifying data distribution. They have proposed a new method that presents moving object demonstrating and indexing methods from the concept of huge moving object databanks into the design of VANET routing procedures.

A captain vehicle is elected for each zone and is responsible for managing information about other member vehicles as well as the message dissemination. Moving zone construction starts from a vehicle logging onto the VANET. The vehicle will execute the joining protocol to find a nearby moving zone or form its own zone. The zone forming criteria is configured based on the similarity of vehicle movement. The captain vehicle of each zone maintains a moving object index that manages up-to-date information about all its member vehicles. The moving object modeling and indexing techniques have been leveraged in various tasks including zone construction and maintenance as well as information dissemination.

The proposed approach greatly reduces communication overhead and improves message delivery rate compared to other existing approaches. The outcomes of extensive simulation trainings carried out on actual road maps validate the dominance of their method equated with both clustering and non-clustering based routing procedures.

2. ACO

In [2], the writers have suggested a bio-inspired meta-heuristic and mathematically probabilistic method of the Ant Colony Optimization (ACO) where proficient route formation and data transmission can be attained.

The ants normally travel along the path having the highest pheromone concentration, where pheromones are the hormones secreted by the ants when they are moving along a path and can be sensed by other ants. The pheromone trials can be updated after each iteration after the ants have successfully finished a proper solution. Every time when the ants move from one path to the next one, the pheromone associated with that path will surely change.

Route obtainability and the delay time have been used for the assessment of discovered routes. Nevertheless, here the actual time environmental variations were taken into account and the performance was measured in harmony with ACO. The methodical software for VANET application using amendments in the ACO was applied in the Matrix Laboratory (MATLAB)-2015b simulator besides the diverse randomized variations in environmental circumstances. The unsystematic movements of the ants have showed an effective means for the distribution of packets to the maximum quantity of accessible nodes/vehicles in the network with very little latency. So that although unintentional failure of any node arises, the adjacent ant neighbors will convey the obligatory data to the preferred nodes resulting in enhancement of the throughput.

3. MDORA

The paper [3] offered a MDORA, an effective and simple procedure allowing quick wireless vehicular communications. As a position-based routing method, the MDORA procedure, vehicles' exact positions are used to create the best path by which the vehicles might reach their anticipated destinations.

It estimates a sequence of intersections. In addition, it is considered that every node in the network easily obtains its accurate position and direction with the help of real time GPS information. Moreover, in order to make a routing decision the source node needs to be aware of destination's real-time geographical location. Two phases constitute the algorithm that is proposed: route discovery phase and the route setup phase. First phase starts by broadcasting a Hello message to one the nodes of the hop neighbors. After receiving Hello message by the nearby nodes. Each node checks if it's same to direction stored in Hello message. If the direction is same, neighbor node then acknowledges with unicast Response message to source node. Otherwise, if neighbor node is moving in different direction, then node discards the received Hello message. When information is received from all the neighbor nodes by the source node, a table is constructed; the table contains information from which information about the subsequent hop node may be discerned. In second phase, the data packets are transmitted from the source node to that node whose location is furthest from the source in the same direction as the sender.

By defining the path encompassing the maximum distance with the least number of hops, MDORA reduces the control overhead.

Technique Name	**Operation**
MOZO	• Data Distribution is done by using dynamic moving zones which are formed on the basis on similarity of vehicle movement. • Each zone has captain vehicle that relays information for each zone. • Improves the control overhead and delivery rate.
ACO	• Focuses on deciding the path between source and destination node using pheromone value. • The path having maximum pheromone value is selected. • Improves the throughput.
MDORA	• Considers only those nodes in forwarding the RREQ packets which are moving in similar direction. • Uses the exact position of the nodes via GPS to construct the shortest route. • Improves the control overhead.

III. CONCLUSION

This paper describes the various algorithms and techniques related to information transmission in vehicular ad hoc networks in a best possible way. The authors have also defined ant colony optimization technique which optimizes the path in comparison to other traditional routing protocols using the concept of pheromone value. However, as the vehicles continue to move at higher speeds the link breakage is quite often in the network. This link breakage will not let the packets reach the destination node properly resulting in loss of information (throughput) as well as packet delivery ratio. In future we would like to enhance the basic ant colony optimization technique for vehicular ad hoc networks.

REFERENCES

[1]. Dan Lin, Jian Kang, Anna Squicciarini, Yingjie Wu, Sashi Gurung, Ozan Tonguz, “MoZo: A Moving Zone Based Routing Protocol Using Pure V2V Communication in VANETs”, IEEE Transactions on Mobile Computing (Volume: 16, Issue: 5, May 1 2017).

[2]. Santanu Majumdar, Shivashankar, Rajendra Prasad P, Santosh Kumar S, Sunil Kumar K N, “An Efficient Routing Algorithm based on Ant Colony Optimization for VANETs,” IEEE International Conference On Recent Trends in Electronics Information Communication Technology, May 20-21, 2016.

[3]. Yusor Rafid Bahar Al-Mayouf, Nor Fadzilah Abdullah, Mahamod Ismail, Ainuddin Wahid Abdul Wahab, Omar Adil Mahdi, “Efficient routing algorithm for VANETs based on distance factor”, International Conference on Advances in Electrical, Electronic and Systems Engineering (ICAEES), 14-16 Nov. 2016, IEEE.

[4]. Ramesh C Poonia, Deepshikha Bhargava, B. Suresh Kumar, “CDRA: Cluster-based Dynamic Routing Approach as a development of the AODV in Vehicular Ad-hoc Networks, SPACES-2015, Department of ECE, K L University.

[5]. Aruna Sharma and Simar Preetsingh, “Node Selection Algorithm for Routing Protocols in VANET “, International Journal of Advanced Science and Technology Vol.96 (2016), pp.43-54.