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A Survey on Relevant Routing Protocol for Non line of Sight Condition in VANET

[1]Urvashi P. Chauhan, [2]Naren V. Tada

[1]*Research Scholar, Master in Computer Engineering (M.E.-C.E.), V.V.P. Engineering College, Rajkot-360001*
[2]*Assistant Professor, Computer Engineering Department, V.V.P. Engineering College, Rajkot-360001*

Abstract — *In vehicular Ad-hoc networks (VANET), applications like safety message is require of exchanging event location information. There is an exchange of data among vehicles which are each other's respective communication range. But, Obstacles like truck, buildings and other environmental objects that can create a state of non line-of-sight (NLOS) condition between two vehicles, which restricts direct communication even when corresponding vehicles exist within each other's physical communication range, thus preventing them from exchanging proper data and affecting the performance and reliability. Handling with such obstacles is a challenge in vehicular ad hoc network. In Vehicular Ad hoc network there is two types of routing protocol geographic routing protocol and topology-based routing protocol. In this paper we focused on when Non line of Sight condition is possible then periodically beacon packets checks for the neighbouring vehicle and through neighbourhood communication between V2V is possible.*

Keywords- *VANET, Line of Sight, Non Line of Sight, VANET routing protocols, beaconing, GPSR+AGF*

I. INTRODUCTION

Vehicular Ad-hoc Networks (VANETs) are special forms of Mobile Ad-Hoc Networks. A Vehicular Ad-Hoc Network or **VANET** is a technology that has moving vehicles as nodes in a network for creating a mobile network. We can say that VANET turns each and every vehicle into a wireless node, allowing cars to connect to each other which are 100-300 meters apart and, in turn, create a wide range of network. In vehicular Ad-hoc networks (VANET), applications like safety message is require of exchange of vehicles and event location information. There is an exchange of data among vehicles which are each other's respective radio communication range. But, Obstacles can create a state of non line-of-sight (NLOS) between two vehicles, which restricts direct communication even when corresponding vehicles exist within each other's physical communication range.

II. PROBLEM DEFINITION

In VANETs, objects such as buildings, trees, and other feature that exist on roadsides that can interfere in communication. In a VANET environment, consideration should be given not only to fixed obstacles and buildings but also to moving objects on the road that can cause block of communication. Vehicles also need to have information about events in their surroundings and proximal vehicles. This type of information can be exchanged between network members using beaconing, direct messaging, or group updates. Security threats can compromise and disturb the applications functionality and may increase the chances of road accidents.

III. MOTIVATION

Road crashes are a leading cause of deaths worldwide. It is estimated that 1.2 million people are killed, and over 50 million are injured each year as a result of road crashes. The World Health Organization predicts that by 2020, road traffic injuries will increase in total number by 65% and will be the third highest cause of disability-adjusted life years. Worldwide, injuries due to road crashes result in an economic cost typically ranging between 1% and 2% of GDP, a global total that exceeds $145 billion per annum.[6] Creating a Non Line-of-sight (NLOS) state, which can lead drivers to make poor judgments when changing lanes or merging onto a highway.

IV. NLOS SCENARIOS

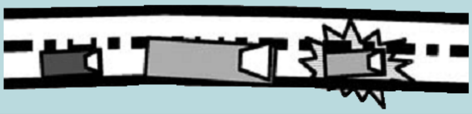
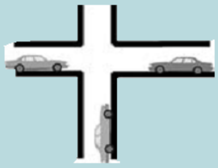
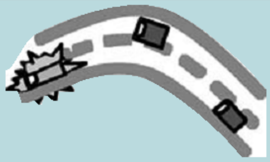
Example	Description	Image
Obstacle Warning	Stopped/skidding/slowing down vehicle warning, road obstacle/object-on-road warning	
Lane Merge/Lane Change Assistance	Merging/lane-changing vehicle communicates with vehicles in lane to safely and smoothly merge	
Adaptive Cruise/Cooperative Driving	Automatically stop and go smoothly, when vehicles are in heavy roadway traffic; cooperative driving by exchanging cruising data among vehicles	
Intersection/Hidden Driveway Collision Warning	Vehicles communicate to avoid collision at intersection without traffic light or hidden driveway	
Roadway Condition Awareness	Vehicles communicate to extend vision beyond line of sight (e.g., beyond a big turn or over a hill)	

Table.1 Examples of vehicle safety communication[6]

The above table summarizes that non Line-of –sight condition leads to the road accidents. Examples of vehicle-to-vehicle safety communication may include collision warning, road obstacle warning, cooperative driving, intersection collision warning, and lane change assistance (Table1). Examples of vehicle to infrastructure safety communication may include hidden drive way warning, electronic road signs, intersection collision warning, railroad crossing warning, work zone warning, highway merge assistance, and automated driving.

V. VANET ROUTING PROTOCOLS

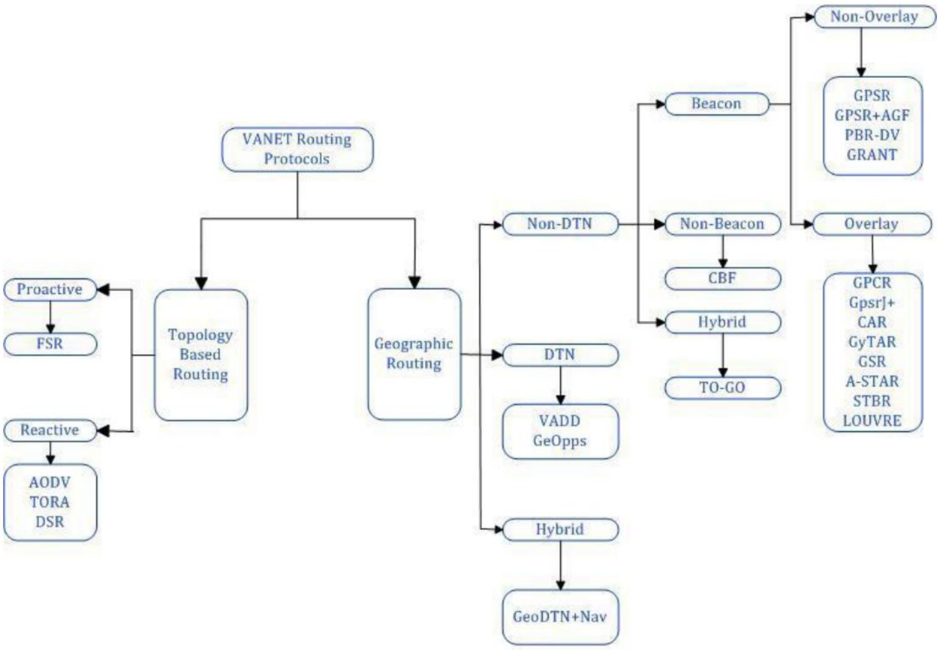


Figure. 1 VANET Routing Protocol[5]

The characteristic of highly dynamic topology makes the design of efficient routing protocols for VANET is challenging. The routing protocol of VANET can be classified into two categories such as Topology based routing protocols & Position based routing protocols. Overall classification of VANET routing protocols has been shown in the figure 1. Topology based routing protocols use link's information within the network to send the data packets from source to destination. Topology based routing approach can be further categorized into proactive (table-driven) and reactive (on-demand) routing.

VI. V2V BEACONING APPROACH

In such networks, ''beaconing" is the means used by vehicles to find the nodes in their neighborhoods, this mechanism is provided by periodic exchange of "beaconing" messages containing the speed, direction and position of a car.[3] Neighbor detection is performed by the periodic exchange of beacon message, after finding that this neighborhood is changing with the movement of vehicles. The below algorithm is based on beaconing updates.

Algorithm

```
NLOS:VS send_msg ->VD
If Msg_blocked(detected)
// Obstacle detection
            If obstacle detected
// Position verification
      If neighbour(N[1,2,…n]) == within_beaconing_range;
//choose neighbour(N[1,2,…n])
      Select neighbor(NV)
      NV = Min_Dist(VS->VD through N[1,2,…n]);
      Send_msg,VS->NV(GPSR+AGF)||Verify sender;
      Then VS VD(GPSR+AGF) ||Verify sender;
Else
             Stop_connection
   Else
            Network_Issue;
 Else
            Send_msg,VS->VD(GPSR+AGF) ||Verify sender;
```


Terminology

VS-Source Vehicle
VD-Destination Vehicle
N[1,2…n]->All neighbouring Vehicle
NV-Selected neighbor
GPSR-Greedy Perimeter Stateless Routing Protocol + Advanced Greedy Forwarding

VII. CONCLUSION

In this paper, we have investigate that NLOS situation can lead to make poor judgments when changing lane or merging on to highway. To reduce this situation proper communication between Vehicles is necessary. The proposed algorithm is based on Position based routing which is relevant for Non line of sight condition. In GPSR due to mobile nature of VANETs, a node's neighbor table often contains outdated information of neighbor's position the problem can be solved by increasing beacon's frequency. So that Advanced Greedy Forwarding(AGF) that incorporates the speed and direction of a node in the beacon packet and the total travel time, including the time to process the packet, up to the current forwarding node within the data packet. Thus improvement in packet delivery ratio GPSR+AGF is better then GPSR alone.

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