POSITION BASED ROUTING PROTOCOL BASED ON VANETS

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ABSTRACT

Position based routing protocol is related to greedy forwarding routing method and which is appropriate for the exceptionally powerful and rapidly changing topology of VANETs. Protocols categorize into two distinct classes that depend on the v2v and V2I of reproducing condition i.e. urban environment and highway environment. It is likewise called a hybrid routing protocol which is the correct decision for the urban and roadway condition in the event of VANETs. In a vanets, routing is one of the most challenging tasks because of network partitioning, high speed, and environmental characteristics. So hybrid communication is one of the better choices for communication either in the city or open environment.

Keywords: DSRC (Dedicated short-range communication), ZOR (Zone of relevance), GPS (Global positioning system).

1. Introduction

VANETs are a self-organized network which is utilized to give correspondences between vehicles. It is a sort of manets but vehicular networks related to so many applications in vehicles like vehicle traffic, traffic safety to infotainment. For the development of an intelligent transportation system, VANETs are the main element. Vanets use dedicated short-extend communication for the v2v communication and V2I communication. The principle point of intelligent transportation framework is to give data at an opportune time that is identified with road and traffic. Most of the accident occurs today because of the absence of legitimate data about the roads, vehicles and appropriate traffic conditions. Intelligent transportation system provides required information to the surrounding of drivers. Vehicles share necessary information with the other vehicles and make it useful for another temporary network. Through the multi-hop network, this information is communicated. Based on multi-hop communication there are lot algorithm proposed for the communication and these algorithms have characteristics for highly dynamic, high speed and change in network topologies. Here we study some of the well-known routing algorithms and its limitations and strength and also study simulating environment based on their communication mode i.e. V2V, V2I. Most of the study is about the V2V but not both of them but we study here both V2V and V2I communications.
Following are the highlights that separate VANETs from the other networks

1. In VANETs vehicles communicate with each other in and out of network so it is highly dynamic topology. As indicated by the 801.11p most extreme transmission of every vehicle is 1000m yet powerful range is 400m. Two vehicles established a communication link between two vehicles if vehicles are within that range otherwise the link will be disconnected out from this range.

2. VANETs are used in two environmental condition highways and urban. Vehicles are proceed in two different ways along the street and the conditions is extremely basic in case of the highway environment but more congested areas and more complex factors must be considered in case of the urban environment areas.

3. There are numerous vehicles in urban condition for wireless channels because of which result in real bandwidth value is far below as compare to the hypothetical value. So to fulfill the prerequisite for to manage the traffic, infotainment, and communication. The quality of network service ought to be expanded to diminish the instability of remote correspondence channel.

4. The global navigation satellite system is almost equipped with almost all vehicles such as GPS (Global positioning receiver). Vehicle’s present position can be recovered from GPS. So in the event that we think about the position, speed, vehicle street map are estimated then the whole route of the vehicle can be anticipated in all respects effectively as indicated by the mobility of the model.

5. There is a boundless number of energy and rich resources accessible for VANETs and then distinguish it with MANET in protocol design of key constraint there is limited energy and computing power is required because in case of vehicular ad-hoc networks vehicles required continuous power for communicating with the devices or GPS devices. To obtain velocity, direction and location of the vehicle digital map are to be installed.

6. A devoted short-range communication protocol in IEEE802.11p has been created but dynamic traffic dynamic data rate and channel access does not consider and for one-hop applications protocol is proposed to limit the communication delay in the dynamic traffic environment multiple-hop communication is required.

2. Different strategies for forwarding vehicular networks

Because of the variable idea of vehicular communication, portability and fast vehicles result debased in execution because of the utilization of traditional protocols. Traditional protocols issued for the VANETs are reasonable for VANETs yet they endure in VANETs because of the dynamic of vehicles. Position based routing protocols are generally reasonable to profoundly powerful as well as versatile routing networks. There are part of different strategies utilized for the position-based routing protocols and keep up neighbor table which includes speed, geographic location, and movement of a vehicle. In light of this neighbor table source, vehicle transfer or execute forward procedures and select its next hop to forward its packets.

2.1 Greedy forwarding: In greedy forwarding procedure is utilized when they began with starting element ‘S’ transmit the data to its goal node ‘D’.

2.2 Improved greedy forwarding: In the neighboring table from source element is counseled above all else and after that process, the situation of all it’s neighbor’s direction based on velocity and the node which is closest to its goal is selected.

2.3 Directional greedy forwarding: Only those nodes considered for this situation which are moving forward to the goal and it chooses a element which is nearest to its goal.
2.4 Predictive directional greedy forwarding: Before transferring the packet to the most suitable next hop, node counsel its neighbor table helps and process anticipated the situation of its whole neighbor before sending the packet. Packet forwarding node checks the neighbor table from its neighbor and calculates the anticipated location of its whole neighbor i.e. one hop or two hops and after that chooses a next node whose one-hop neighbor is nearest to the destination.

3. Architecture

Internet of vehicle architecture consists of three layers and it is a very complex system. These three layers are

3.1 Sensor layer: vehicles use on-board units and various gadgets to recognize conditions of the vehicles, furthermore to acquire vehicle velocity, direction, and location with the assistance of expansive mobile sensor node. OBU is an electronic gadget which is installed in the vehicle to send messages, sense, process and RSU (roadside unit) help to forward the packet.

3.2 Communication layer: It is a hybrid network which incorporates the Vehicular adhoc network network and the internet. Vehicular adhoc networks transform each and every vehicle into a wireless network and ready to associate with different vehicles inside 100 to 300 meter and make a network as the vehicle out of the signal or network drop out and next vehicle participates and make a network.

3.3 Data process layer: It consist two sections i.e. data process storage sublayer and data analysis sublayer. Traffic data, vehicle information and other data required proper storage mechanism. So Google’s product is the best answer to that. It is partitioned into bottoms up three levels i.e. programming models (Map Reduce), management databases (Big Table), and basic file system (Google file system)

Data analysis sublayer is likewise standout amongst the most critical layers which offer such as vehicular monitoring services and vehicle location-based services.

4. Protocol Stacks

4.1 IEEE802 characterizes wireless communication standard. IEEE802.11p for the assignment of the dedicated short-range communication band in the United States.

4.2 IEEE1609 likewise characterizes a few higher layer standard i.e. 1609.1, 1609.2, 1609.3, 1609.4, 1609.11 and 1609.12 which depends on IEEE 1609.x IEEE 802.11p and standard establishes a complete scope of access in a wireless vehicular network condition.

4.3 IEEE802.11p federal communication commission has distributed 75MHz bandwidth which is worked at 5.9GHz utilizes orthogonal frequency division multiplexing for small-distance communication between V2I and v2v.

4.4 IEEE 1609.1 is one of the applications that remotely interference the OBU with a reduced number of computing gadgets to give increasingly difficult preparing to the application that is executing on the OBU.

4.5 IEEE1609.2 characterizes the wireless access in vehicular environment security ideas and characterizes secure message communication and message handling where messages exchange are required.

4.6 IEEE 1609.3 WAVE arrange network layer gives routing and addressing services. Wave short message services protocol and group addressing traffic safety and productivity application.
4.7 IEEE 1609.4 It is utilized to provide multi-channel operation and a control channel for vehicular communication and furthermore support for the upgrade of IEEE 802.11 MAC and IEEE 802.2 LLC, 802.11 PHY communicates due to the channel coordination.

4.8 IEEE1609.11 It help to describe the secure electronic payments and also describes the various services with secure secure service management.

4.9 IEEE1609.12 it is additionally called as an identifier allocation. It is utilized to determine identifier values for use by WAVE system incorporates service provider identifier designations with ISO, CEN, and ETSI.

5. Vehicle to vehicle routing

Here we center just around position based routing. There is a lot of research papers which are the attention on vehicular ad hoc networks just yet we center just around the position based routing algorithm. A lot of research also finds the position based routing also but these researches are focus only on V2V communication only but they don’t consider routing on V2I. Routing protocols are differentiate into v2v and V2I communications. In present current vehicles position based routing algorithm are awakened by GPS recipients, computerized maps, and route frameworks for vehicular systems. Position based routing protocol acknowledged that every vehicle is furnished with global positioning system to locate its position. In the past research demonstrate that various position based protocols have been proposed for the position-based routing protocols to discover the goal vehicle e.g. grid location service or hierarchal location service however they are extremely troublesome for sending vehicle to find the situation of the objective vehicle. Ad hoc routing protocol like AODV alike demonstrates poor performance showing on the ground in light of the fact that these protocols are not prepared to find, save and update routes quickly.

As of now, GNSS is used for situating the vehicles. GNSS is carefully level in a flat open zone where the viewable pathway is possible yet it may flop in the entry and in downtown regions where blockage of the satellite sign occurs. A portion of the specialist expects to improve the positioning accuracy so we talk about three techniques here.

5.1 Received signal strength indicator (RSSI) positioning: This algorithm utilizes signal strength dependent on between inter-vehicle distance estimations, kinematics, and advisers for assess the circumstance of the vehicle in the gathering. Ryan Parker et al. presented Cooperative position based estimation calculation can aquire more exactness and higher solid as compare to the previous overall situating arrangement estimation taken by radio ranging techniques.

5.2. Doppler-based cooperative positioning: To improve the GPS Nima Alam et al. suggested a location based solution to enhance GPS gauges utilizing internodes range go dependent on Doppler move of the carrier for DSRC signals. Doppler Effect is utilized for the relative probability of nodes which is commonly trying for radio ranging techniques is an increasingly reasonable condition for the vehicular application.

5.3 Markov-based lane positioning: The principle thought of Markov based methodology is to keep up probability thickness according to the space of overall way position of the vehicle on the road. The technique require not any earlier information about vehicle beginning path position and it all inclusive positions the vehicle without earlier introduction and to recuperate from confinement dissatisfactions or GPS where the conditions of the vehicle are lost.

5.4 GPS+RFID positioning: This framework employs a vehicle without GPS to choose its location definitely from single point vehicle experience. Radiofrequency global positioning system enhance global positioning system position by misusing portable reference hubs out and about. A vehicle experiences a roadside unit it gets precise direction position and makes sense of the blunder rate by utilizing its very own GPS directions positions together with got unmistakable mastermind position.
5.5 GPS/DR/MM positioning: This positioning system is used to reduce the drawbacks where the global positioning system sign is shutdown or impacted by the multipath way. The main principle for the positioning system is that the organize coordinated global positioning system and DR positioning framework gives key positioning data which will be reviewed with the assiatnace of guide coordinating to enhance exactness and reliability of incorporated situation however more as could reasonably be expected.

6. Greedy parameter stateless routing (GPSR): Shows improved performance contrasted with conventional ad hoc protocols because in greedy parameter stateless routing there isn’t any path divulgence system before to information transmission and nodes are just known through the geological position of their neighbors.

GPSR utilizes two procedures to forward packets towards the goal.

6.1 Greedy forwarding

6.2 Perimeter forwarding or face routing.

This routing protocol finds a vehicle which is most appropriate neighbor along the most constrained path by then greedy parameter stateless routing utilize greedy forwarding method and if the sending vehicle is nearest one to arrive objective vehicle at that point greedy parameter stateless routing moved to perimeter forwarding. Presently we show the face routing where to starting node $S$ need to synchronize with goal node $D$ and it transfer a data to vehicle $A$. At that point when the packets reach to source node $A$ transfer the packet to next node through the most optimal way to the goal node. If the forwarding vehicle $A$ can’t locate some other nearest vehicle to its limit aside from itself then LOCAL MAXIMUM happens. At that point when local maximum occurs greedy parameter stateless routing moved towards face routing. In face routing sending packets from source $A$ to goal $D$ by utilizing right-hand rule.

The significant preferred standpoint of GPSR is to decide the geographic area through beaconing to its neighbor node. Sending vehicle chooses next node based on nearby local area optimally selected which is globally nearest to its goal node.

The recuperation technique of GPSR is wasteful and very tedious because of the dynamic idea of the ad-hoc network. It is appropriate for the open condition yet it experiences nearness snags. At the point when connected to city condition it indicates poor performance.

Geographic source routing (GSR) is planned by city condition to defeat the confinement of GPSR. There is a portion of the issues that limit the performance of GPSR performance i.e. too many delays, network disconnection, routing iterations, incorrect paths. Vanets is very unique in nature and furthermore highlights like routing iterations and navigating the excessive number of hops to reach the goal node. In GSR source $S$ utilizes the advance guide to locate the shortest route towards goal node $D$ via Dijkstra algorithm. The downside of Geographic source routing is that the smallest route isn’t the best route since it doesn’t consider vehicular traffic in the city and it uses static intersection strategy in which the starting node $S$ transfer to the junction selected and the packet must reach to goal node $D$. This isn’t useful for in all respects exceedingly unique system networks.

6.3 Anchor-based street traffic-aware routing: It evacuates the disadvantage of GSR routing and works in a city situation. A-STAR performs superior to the GSR and GPSR in the city condition. It is traffic mindful which accounts for various transport lines yet it doesn’t consider towards vehicular traffic heaviness. A large portion of the traffic in the network is moved forward significant roads which instigates bandwidth congestion. Vehicular traffic in lanes relies upon the quantity of the transport lines that street forces and assign weights to each street as needed be. More is the bus lines a street groups and less is the weight relegated and another way around.
6.4 Directional greedy routing (DGR): It is V2V and position-based routing conventions appropriate in a reasonable domain, for example, there is no requirement for intersection determination system for parkways or anchor focuses estimation which is performed by all position-based routing conventions. The utilization of a worldwide situating framework and static guide are significant for the situation of the vehicle. Directional greedy routing expects the nearness of area administration to find the area of the objective.

6.5 Predictive directional greedy routing: It is an all-inclusive form of DGR which depends on the presumption of DGR. Each vehicle communicates its geographic position as well as its one-hop neighbors. It is utilized to transfer packets towards the goal node. The vital obstacle of predictive directional greedy routing is figuring and dispersal two-hop neighbors. Both Directional greedy routing and predictive directional greedy routing protocols are realized in a highway situation yet both are not fitted towards city situation so few adjustments are required to fit in a city domain.

6.6 Improved greedy traffic-aware routing protocol GyTAR: In a city domain this sort of geographic routing protocol plays out their activities great. Dynamic junction determination mechanism is champion amongst the most basic part of this routing protocol. This routing protocol is intricate into two sections one mechanism is dynamic junction selection and another one is forwarding strategy between two junctions. In this routing protocol next junction is chosen and after that later on forwarding strategy is connected to the selected junction. To discover the junction and furthermore to locate the shortest way towards the goal advanced maps are utilized.

Distributed mechanism infrastructure free traffic information system (IFTIS) is utilized to compute the thickness between two intersection in vehicular traffic. In perspective on the curve metric separation to the goal and vehicular traffic thickness score is given to each crossing point. The junction with the most astounding criteria is choosen as the next goal work.

GyTAR indicates additional normal execution improvement however it likewise has few downsides moreover. GyTAR doesn't consider the developments of vehicles during the intersection choice component and the development of the vehicle is likewise basic since it sense and recognizes the road having most extraordinary vehicular traffic in the goal and it additionally helps in staying away from the local maxima issue.

Enhanced GyTAR is utilized for to plan a city domain and is additionally an altered form of GyTAR. It is additionally founded on some presumption of GPS device, digital map and location services like a past rendition of GyTAR.

In E-GyTAR intersection choice component depends on vehicular traffic density and curve metric distance in the goal. Every one of the constraints and downside GyTAR is evacuated by this intersection selection mechanism by thinking about the direction of vehicles before choosing the following goal intersection.

7. Vehicle to infrastructure routing

Vehicular networks combine both V2V and V2I to produce the desired output so that the hybrid kind of network gives considerably more productive outcome. Performance of the whole vehicular network system relies on the density of the vehicle just as on the quantity of the vehicles in the network. Vehicular routing protocol indicates huge performance under the inadequate and dense network. MDDV and VADD indicate extremely poor performance under scantly network because of them as often as a possible separated system yet it performs very well under dense network.

In the vanets, the Static hub helped versatile information scattering is proposed for the spread of information in a monstrous scale arrange. Static hub helped versatile information dispersal is a geologically based routing protocol
that chooses static hub at the intersection point. At the point when a local maxima issue happens SADV forward packets to these static nodes. Exactly when the perfect or most ideal way is available, these static nodes storage the information bundles and transfer it. SADV forward packet along the best ideal way and furthermore the way comprising of the minimum delay which improves the delivery ratio of packets. It consists of three sections i.e. links delay update, static node assisted routing and multipath information scattering. SNAR chooses the ideal way with static nodes and furthermore conveyed the packet towards goal along the ideal way. Let at each intersection static nodes are sent. Consider a static node with two intersections Sa and Sb respectively. On delay matrix d Sa will calculate the best path towards Sb and after calculating optimal path Sa advances packet towards next static node along the ideal way. In SNAR data forwarding is separated into different parts: in static node mode, in road mode and intersection. All the sending vehicle has a bundle to send it and besides moving inside the open transmission extent of the static node. Sa processes the best least ideal way towards goal static node St and answers with the best intersection in the path Sn. In the event that such vehicle is accessible in an ideal way then the packet is sent to it generally sending F vehicle forward the packet towards Si.

A node Si functions as a static node when data is additionally accessible in the static node Si.

In the event that vehicle is accessible at that point, Si advances packets along with with the ideal else it stores and hold the packet in the buffer. The accurate location, velocity, and movements of the vehicles known by static nodes.

An idea of multipath is progressively ideal for a situation where the payload isn’t extremely high in light of the fact that vehicular network is exceedingly unique network system and the packets are conveyed to the goal through different-way only at the intersection.

8. Infrastructure assisted geo routing:

Such sort of infrastructure is intended to take the advantage of fixed framework where vehicular communication is to be progressively solid and pointless delays are to be decreased in security applications in the vehicular network where road units are deployed and these road units are connected and fixed with each other through the high bandwidth.

All the locations of the servers and the digital maps are identified through the routing algorithms. To locate the shortest route between the two adjacent nodes just as the distance between the two back to back nodes is determined by the Dijkstra algorithm

To reduce the limitation of fixed infrastructure or roadside units (RSU) mobile infrastructure based vehicular ad-hoc network is used. SADV protocol uses static nodes as a roadside unit. These nodes do not participate in transferring information from one static node to other yet these static nodes used similarly as a capacity unit.

9. Drawback:

The drawbacks of using roadside unit are the requirement and distribution of the roadside units.

Advantage:

1. Where fixed infrastructure exists roadside units are restricted to the region.

2 Estimating real-time vehicular traffic: Infrastructure free traffic data system (IFTIS) is the strategies that are used to process the veritable vehicular thickness between abutting crossing points. In IFTIS every street is isolated into little squares of fixed size and the degree of each square is about 250m and in some circumstances, it would be 266m. Each square focus is spoken to by a little circle and the vehicle closest to within is called bunch pioneer. Each bunch poineer is in charge of sending the determined traffic density of block to the group leader of the last block.
As a result of thusly, traffic thickness of the street will be resolved and the data is available to a vehicle which allows the distinctive routing algorithms and routes the data to the goal effectively. GyTAR utilizes IFTIS method to locate the ideal and vigorous paths inside the city, however, E-GyTAR changed IFTIS has the impact among directional and non-directional vehicular traffic thickness which helps in calculating the data with respect to accidents happens on the specific side of the street. In case a setback happens on one side of the street, by then it should square only that side of the street yet not the different sides of the street.

**Drawback:**

The genuine weakness of IFTIS is thought of fixed block size length of every street which is to be counter-intuitive or unreasonable. IFTIS consider roads of length 500m or various and IFTIS can’t give data in a legitimate way if distinctive road lengths are considered.

**10. Discussion:** A Greater part of position routing based protocol utilizes greedy based forwarding method. Present pattern is to create routing protocol considering V2I and v2v and this correspondence protocol able to accomplish the most extreme packet delivery ratio at the minimum deferral. We talk about a few routing standards of routing design.

10.1 Position routing based protocols have preference with the topology routing based protocols however local maxima issue may happen

10.2 Greedy forwarding is absolutely reliant on Dijkstra algorithm and can’t fulfill the necessity of vanets because of NLOS limitation of radio engendering signals.

10.3 Position based routing protocols utilizes improved greedy forwarding or greedy forwarding along the roadway or road. The protocol may utilize store and forward procedures to cache the packets when the road detachment or sparse network system has happened until the network recuperate the errors.

10.4 To gain data from continuous nodes for example traffic density, direction and speed a beacon message can be utilized.

10.5 As the majority of the vehicle outfitted with GPS route and beneficiary so GNSS essential for the advanced guide. The routing protocol will lose its reasonableness if essential is badly arranged with the real condition.

**11. Open issues and challenges:** There are few research difficulties happen in position based routing protocol which is most broadly utilized in VANETs over every various application.

11.1 **General simulator:** There are numerous simulators accessible yet none of the simulators can give a total answer for simulating VANETs. NS2 or OPNET is for the network simulator and vehicular ad-hoc networks MobiSim is utilized for traffic simulator. There are the at present accessible simulator to reproduce VANETs.

11.2 **Accurate positioning:** For position-based routing protocols position usefulness is critical one however explicit provisioning technique ought not to be depicted here since not all terminals might almost certainly incorporate a GPS positioning system for monetary reasons. GNSS gives exact result in the level open regions where a viewable pathway to different satellites is possible. Regardless, it may flop in the section and in downtown territorials where satellite sign blockages are visited so an exact circumstance will improve the vehicular application.

11.3 **Robustness, pervasiveness, the similarity of directing conventions:** Existing routing protocols are not spreading extensively rather they are planned for explicit system condition and application. Some convention has scarcely any preconditions anyway in the certifiable condition, there are various botches.
11.4. **Data privacy:** The principal obstacle to the sending of the internet of vehicle advancement around there is the open dread of a reconnaissance society.

11.5. **Security:** Security support is essential in VANETs. A few security provokes still should be tended to. A great deal secure, profoundly adaptable, lightweight and verified system is required to shielding the vehicular nodes from within and the outside assailants and furthermore irritating the entire network by utilizing or giving a false identity. Because of this appropriate comment is required for productive message exchange and authentication to keep away from the deferrals into the vehicular network.

11.6. **Delay constraint:** The fundamental challenging task in designing of vehicular communication protocol is to lessen the postponement under the requirement of vehicular speed, problematic network, and dynamic topology. Because of the high vehicular versatility, it is a provoking undertaking to designing routing protocol with defer bound and postpone ensure qualities.

**Conclusion:**

Because of the high portability highlights of VANETs, the utilization of the right directing routing is of extraordinary concern. The data in the system send from v2v that is moving with speed and furthermore the thickness of the vehicles is likewise expanding and diminishing the moves identified with the routing protocol.

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