Analysis of Enhanced Hybrid Approach Using Greedy Perimeter Stateless Routing in VANET

Ashish Kr. Luhach[1(✉)], Isha[2], Neha[2], and X. Z. Gao[3]

[1] Maharshi Dayanand University, Rohtak, Haryana, India
ashishluhach@acm.org
[2] Lovely Professional University, Phagwara, India
[3] University of Eastern Finland, Kuopio, Finland

Abstract. With the advent in VANET (Vehicular Adhoc Network) technology, the need of innovation in social issues is demanding at high pace. VANET correspondence as of late turned into an undeniably prominent research point in the zone of wireless networking. Routing in VANET is an essential subject. Position based routing protocols are more reasonable for VANET when contrasted with every other protocol. GPSR is a standout amongst most appropriate routing protocol that works as position based. Here a hybrid PHRHLS (A Movement Prediction based Joint Routing and Hierarchal Location Based Service) approach collaborating HLS area advantage and GPSR protocol is utilized. In this GPSR protocol has been improved and our model gives enhanced outcome regarding parcel average latency and packet delivery ratio (PDR).

Keywords: VANET · RSU · Routing protocols · GPSR

1 Introduction

VANET is one of the applicative branches of MANET. VANET has a place with wireless communication network in which correspondence among means of transportations happens. Here automobile go about as hubs in system. The message categories are Vehicle to Infrastructure (V2I), Vehicle to Vehicle (V2V), and Vehicle to Roadside (V2R). VANET is designated as the most crucial division of intelligent transportation system (ITS) wherein automobile are outfitted through various small area and several medium-extend remote communication. A VANET transform all associated automobile into a remote switch or hub enabling means of transportation to interface plus thus make system with a broad diversity. Essential VANET objective is to build street wellbeing, enhancing transportation framework and expanding vehicle security. To carry out this, automobile go about as sensors as well as interchange threatening that empower the drivers to respond ahead of schedule to strange and conceivably risky circumstances like accidents, congested roads. Rather than wellbeing applications it likewise gives comfort applications to street clients. For instance web access, internet business and interactive media applications. Through web access clients can download song, fire messages and take part in recreations. Different applications which were produced in mutual attempt of different administration and vehicle maker several of them are ADASE2, CAMP.

P. K. Singh et al. (Eds.): FTNCT 2018, CCIS 958, pp. 464–471, 2019.
https://doi.org/10.1007/978-981-13-3804-5_34

In Fig. 1, VANET architecture is shown along with its communication types.

Vehicle to Vehicle (V2V) – Considering this Vehicle to Vehicle communication as appropriate for the favor of small collection vehicular system. It gives immediate security, quick and trustworthy. It needn't bother with any roadside foundation. It isn't extremely helpful in the event of meagerly associated system or little thickness vehicular system. In V2V cautioning significances be communicated from automobile to automobile.

Vehicle to Roadside (V2R) – Vehicle to Roadside gives correspondence amongst automobile and the wayside entities. It composes utilization of prior system framework, for example, remote access hub. In V2R cautioning communication are send to wayside entities and afterward from that wayside entities cautioning communication send to the automobile.

Vehicle to Infrastructure (V2I) – In VANET, Vehicle to infrastructure communication gives long operating vehicular systems.

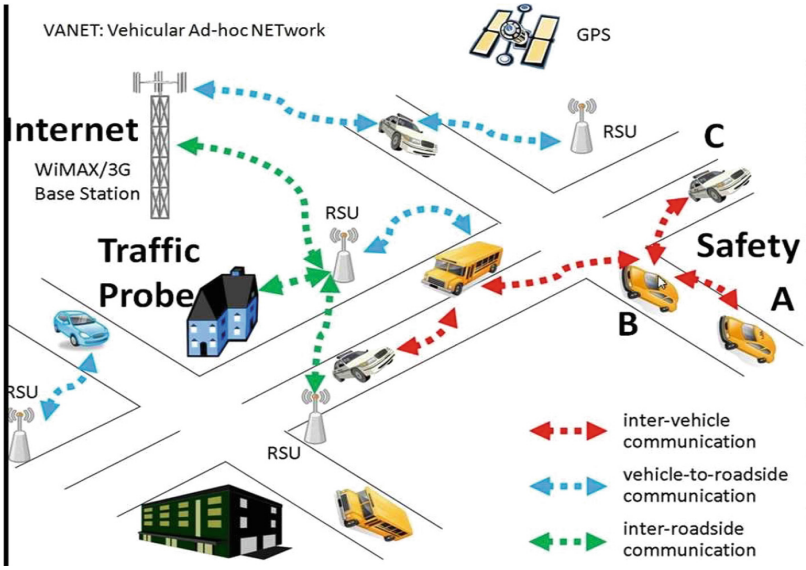


Fig. 1. VANET architecture

2 Routing Protocols in VANET

The existing routing protocols in VANET are classified into numerous groups such as Position based routing, Topology based routing, Geographic routing, Geocast routing, Cluster based routing, and Broadcast routing.

- Topology based routing do package sending through utilizes the connections be present in the system. Different sort of routing based on topology are Reactive, Proactive, and Hybrid. Proactive protocols are generally based on table driven routing e.g. OLSR, FSR, and TBRPF. Receptive protocols are examples of routing protocols that are on demand and may diminish operating cost originated by proactive type routing protocols. It utilizes way toward flooding e.g. DSR, AODV, and TORA. Hybrid protocols will try to minimize manage operating cost of proactive type routing protocol and it is blend of receptive and proactive routing protocols e.g. HARP and ZRP.
- In position based routing protocols each hub be familiar with it's neighbor by utilizing GPS data. It doesn't keep up any direction-finding chart. These protocols need learning as regards neighbor hubs and target hubs to propel small package effectively. Hi post or reference point post is utilized to refresh the data. A supply hub utilizes hi post to discover area of the neighbors. Situation data of all hubs and automobiles are distinguished by region services. Different position categorized routing protocols are GSR, GPSR, A-STAR, BMFR, GYTAR, BMAR, and AMAR.
- In Cluster oriented routing protocols, means of transportation near every node frame a cluster. Accordingly, there can be two kinds of correspondences intra-cluster and inter-cluster. In intra-cluster means of transportation speak with each other means of transportation by means of the immediate connections and in inter-cluster means of transportation speak with each node utilizing cluster leader.
- Broadcast oriented routing protocols otherwise called flooding based routing protocols that broadcast data toward the most extreme hubs while a mischance happens.
- Geocast routing protocols otherwise called the area type routing protocols that may be utilized to propel messages present in the chose zone referred as Zone of Relevance. The referred protocols are isolated into beaconless and beacon based conventions. Beaconless are Cached Geocast, Abiding Geocast, ROVER, DG-Castor, DTSG, Mobicast routing, and Constrained Geocast. Beacon based are DRG and IVG.

3 Related Work

Authors in [1] worked upon examined regarding different uses of VANETs like smart transportation appliances, ease functions, crash shirking, agreeable driving, traffic enhancements, instalment services and area based services every one of these functions enable vehicle drivers, to stay away from blockage on street, and keep up security and any more. At that point in the given paper, they talked on the subject of the advantages as well as disadvantage of different routing protocols.

Authors in [2] evaluated different place based routing protocols specifically GSR, GPSR, A-STAR, BMFR, AMAR, GYTAR and BMAR. Routing protocols based on position utilizes the GPS data to pick following sending step. The referred protocols have need of learning regarding neighbor hubs along with goal hubs to forward the

packets effectively. Hi post or beacon post are utilized to refresh data. A supply hub utilizes hi communication to discover area of the neighbors. The situation data of every single one hub and automobiles are distinguished by their location services. The authors simulated protocols EBGR, GyTAR, B-MFR on two parameter bundle conveyance proportion and end-to-end defer.

Authors in [3] matched up to execution factors related to three distinctive VANET based routing protocols which are DSDV, DSR, and AODV. In adhoc network, on request distance vector routing protocol is used to set up a path while information packet remit by the hub it keeps up directing table moreover inside assured time stage if hub isn't utilized then it gets erased from the existing table. On the other hand, in destination sequenced based distance vector it utilizes the bellman ford algorithm where each hub keeps up a routing table. It utilizes two way sorted renew packages incremental packets and full dump. In dynamic source based routing the source hub remit RREQ package through assistance of different hubs to a specific target moreover while package achieves target then it remits RREP bundle to goal. At that point in this, they thought about every one of these protocol on different parameters which demonstrate no protocol carry out fit.

Authors in [4] has worked upon the two blends first one is GPSR having grid location service (GLS) known as HRGLS hybrid routing and grid location service furthermore second one works with hierarchical location service referred as HRHLS hybrid routing and hierarchical location service. This research works for directing packet GPSR utilized locality data. Further, to locate correct target place, package is remit to the old target location and as of that previous location nearby area ask for send to get back the correct place. Here the GLS and HLS calculations are adjusted by HRGLS and HRHLS where previous place is utilized to onward information bundle At that point middle hub send location appeal to locate the new target.

Authors in [5] examined planned routing method that is blending of Hierarchical location service and geographic routing protocol greedy perimeter stateless routing. All routing packets are dealt with by the GPSR protocol and hierarchical place service. Further benefit is utilized to discover object location. Major issue that emerges here is place operating cost considering the resource and object are far away. Thus mix of HLS service and GPSR protocol will diminish operating cost and enhance system exhibitions.

Authors in [5] projected a hybrid approach where, mixture of HLS location based service and GPSR protocol is used. With the help of predictable position, location based service and movement prediction based joint routing, route to destination is originated. Therefore, to accomplish expected object place unit with assistance of middle hubs, it utilizes older route yet it carries a downside that if moderate hub have been displaced or changing their current speed then it can't utilize older route to come to evaluated cell for spreading and at whatever point packet comes to at halfway hubs these hubs needs to check the course to the object causes moderate information exchange issue. They additionally clarified proposed modifications in algorithm in these two algorithm may be utilized initially Location based services HLS where two functions are utilized Predictposn and Poslookup. Secondly, the GPSR protocol wherein two functions are forward packet and GPSRemit The issue may be settled by picking vehicles having comparative speed to source hub working as transitional hubs.

4 Problem Definitions and Objective

In vehicular ad hoc network, the vehicles exchange information with every one utilizing dedicated short range communication (DSRC). Data that is traded among vehicles is typically identified with traffic related monitoring services, visitor directing data, common risks and so forth. The vehicles move indiscriminately speeds when contrasted with the hubs in portable specially appointed systems where versatility of hubs is generally less. The data must be agreed to the target automobile precisely without influencing it i.e. that ought not rely on the speed of the automobiles. At whatever point the target automobile moves starting with one place then onto the next, the supply automobile needs to communicate the path appeal keeping in mind the end target to discover a appropriate route to target. Hence, there emerges requirement for routing protocol which have to be intended for the vehicular ad hoc systems so as to directing operating cost is limited. In the existing research work the authors proposed a technique so as to discover a route amongst source and goal vehicle utilizing hierarchical location service and hybrid routing that makes utilization of the greedy perimeter stateless routing along with location services and mobility guess. As indicated by PHRHLS, at whatsoever point the source hub needs to transfer information to goal automobile. GPSR protocol may refer the location services with a specific end object to locate the crisp route to the end. It gauges the new region of the object utilizing movement angle and speed i.e. track of automobile. Subsequently starting place advances the information significance toward the hubs with the aim of has past track to the goal and when information achieves the transitional hub which is situated close to the assessed position of the goal at that point path request message is communicated to discover correct place of the object. The weakness in the given approach is that intermediary vehicular hubs may have changed the speed i.e. may turn out to be slower or speedier. Therefore sending the information through the middle hub before communicating the route request message might cause issue if moderate hubs have shifted their speed constraint so the accompanying purpose have to meet up to beat the issue of time-consuming information transmit.

5 Research Methodology

The entire system can be organized into specific cells. It is expected that automobiles in a specific cell will approach street side entity. The street side entities will follow the speed of the automobiles traveling in its area. As the automobile be in motion at more prominent velocity in vehicular ad hoc networks, connection splintering among those circumstances is normal. Keeping in view the ultimate goal to diminish system overhead that is caused by connection breakage, utilization of idea for choosing way from source and to goal automobile comprising of hubs that are moving generally at an indistinguishable speed from source vehicle with the goal that connection splintering may be narrowed. Each time source hub needs to transfer information to goal automobile, source hub will send inquiry reminder to street side unit alongside its speed. Street area entity on accepting question give answer reverse to supply automobile with

automobiles traveling at moderately similar rate as the resource automobile. The supply automobile will drive information to the goal utilizing the data gave by the street side units.

6 Proposed Algorithm

Procedure 1

1. Start to send data packet from vehicle s to vehicle d.
2. Request send to RSU unit within the cell where vehicles is located.
3. If RSU has information of vehicle d then receive the data packet from vehicle s otherwise follow Procedure 2.
4. Send the data packet received from vehicle s to vehicle d using intermediate RSUs.
5. Finally the packet received by RSU of the destination vehicle's cell zone RSU.
6. Locate the actual position of vehicle d using HLS and then transfer the data packet.
7. Update the actual position and speed of the vehicle d to source cell RSU.

Procedure 2

1. Request neighbor vehicle for speed update and request for further update of other vehicles in the network.
2. Accept the request for path creation from those neighbors whose speed is relative to the source vehicle node s.
3. When path created, start to send the data packet to the neighbor's vehicles.
4. Update the destination position and speed to cell zone RSU for further successful communication setup via intermediate RSUs.

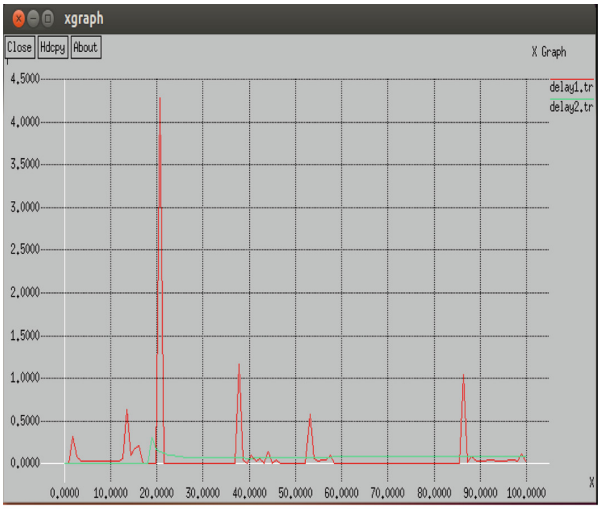
7 Performance Evaluations

The simulation parameters that have been taken are listed below (Table 1).

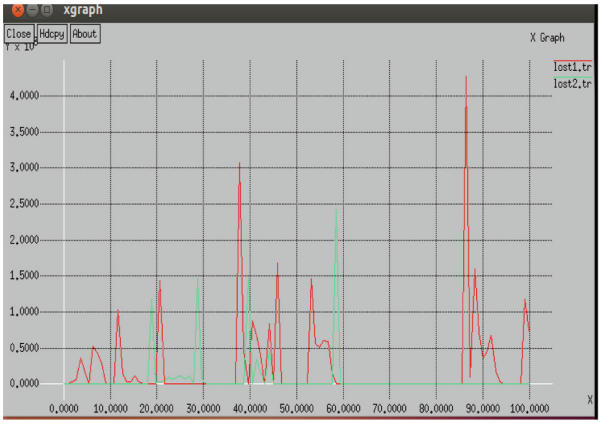
Table 1. Simulation parameters

S. No	Parameter	Value
1	No. of lanes	4
2	Transmission range	250 m
3	Wireless medium	IEEE 802.11
4	Simulation time	100 s
5	Grid Size	4 × 4

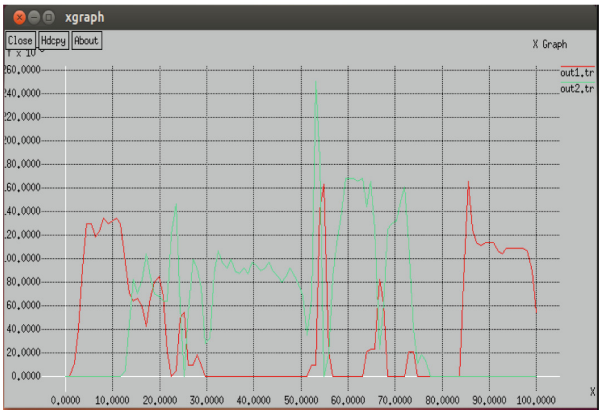
In this graph the red line represents the old delay and green line represents the new delay. This graph shows the RGPSR have less delay as compared to the GPSR. The enhanced protocol gives better result in terms of delay as compared to previous protocol (Fig. 2).



(a) Delay



(b) Packet loss



(c) Throughput

Fig. 2. (a)–(c) The performance of enhanced protocol (Color figure online)

8 Conclusion

The framework is better as far as execution measures when contrasted with the current framework. The framework gives more proficient way to broadcasting route request message when contrasted with the current framework. To decrease the overhead originated by connection breakage we capture relative velocity of automobiles as for source hub as the middle of the road hubs and discover the way from source to goal. This will offer the more solid way when contrasted with past one. This work tends to expand packet delivery ratio and works on minimizing the average latency when contrasted with the current framework. This planned and proposed approach offers better performance as compared to literature.

References

1. Singh, S., Agrawal, S.: VANET routing protocols: issues and challenges. In: 2014 Recent Advances in Engineering and Computational Sciences (RAECS), pp. 1–5. IEEE, March 2014
2. Raw, R.S., Das, S.: Performance comparison of position based routing protocols in vehicle-to-vehicle (V2V) communication. Int. J. Eng. Sci. Technol. **3**(1), 435–444 (2011)
3. Monika, S.B., Singh, A.: Border-node based movement aware routing protocol. Int. J. Comput. Sci. Inf. **1**(4), 121–124 (2012). ISSN (PRINT): 2231-5292
4. Rani, P., Sharma, N., Singh, P.K.: Performance comparison of VANET routing protocols. In: 2011 7th International Conference on Wireless Communications, Networking and Mobile Computing (WiCOM), pp. 1–4. IEEE, September 2011
5. Karp, B., Kung, H.T.: GPSR: Greedy perimeter stateless routing for wireless networks. In: Proceedings of the 6th Annual International Conference on Mobile Computing and Networking, pp. 243–254. ACM, August 2000
6. Hu, L., Ding, Z., Shi, H.: An improved GPSR routing strategy in VANET. In: 2012 8th International Conference on Wireless Communications, Networking and Mobile Computing (WiCOM), pp. 1–4. IEEE, September 2012
7. Xiang, Y., Liu, Z., Liu, R., Sun, W., Wang, W.: GeoSVR: a map-based stateless VANET routing. Ad Hoc Netw. **11**(7), 2125–2135 (2013)
8. Lin, Q., Li, C., Wang, X., Zhu, L.: A three-dimensional scenario oriented routing protocol in vehicular ad hoc networks. In: 2013 IEEE 77th Vehicular Technology Conference (VTC Spring), pp. 1–5. IEEE, June 2013
9. Ayaida, M., Barhoumi, M., Fouchal, H., Ghamri-Doudane, Y., Afilal, L.: HHLS: a hybrid routing technique for VANETs. In: Global Communications Conference (GLOBECOM), 2012 IEEE, pp. 44–48. IEEE, December 2012
10. Ayaida, M., Barhoumi, M., Fouchal, H., Ghamri-Doudane, Y., Afilal, L.: Joint routing and location-based service in VANETs. J. Parallel Distrib. Comput. **74**(2), 2077–2087 (2014)
11. Ayaida, M., Fouchal, H., Afilal, L., Ghamri-Doudane, Y.: A comparison of reactive, grid and hierarchical location-based services for vanets. In: Vehicular Technology Conference (VTC Fall), 2012 IEEE, pp. 1–5. IEEE, September 2012
12. Ayaida, M., Barhoumi, M., Fouchal, H., Ghamri-Doudane, Y., Afilal, L.: PHRHLS: A movement-prediction-based joint routing and hierarchical location service for VANETs. In: 2013 IEEE International Conference on Communications (ICC), pp. 1424–1428. IEEE, June 2013
13. Neha, Isha: Analysis of hybrid GPSR and location based routing protocol in VANET. Int. J. Comput. Sci. Inf. Technol. (2015)