Scientific Journal Impact Factor (SJIF) : 1.711
International Journal of Modern Trends in Engineering and Research
ISSN (ONLINE) : 2349 - 9745 ISSN (PRINT) : 2393 - 8161

A COMPARATIVE STUDY OF VARIOUS VEHICULAR ADHOC NETWORK TECHNIQUES

Sophia [1], Sandeep Kad[2]
[1] *M Tech Scholar, Department of Computer Science & Engineering,*
IKG Punjab Technical University, Regional Centre,
Amritsar College of Engineering &Technology, Amritsar
[2]*Associate Professor, Department of Computer Science and Engineering,*
Amritsar College of Engineering &Technology, Amritsar

Abstract—Vehicular Adhoc Network is specific class of MANETs. Inside a Vehicular Adhoc Network, conveyance is set up with wireless machines to enable them to exchange traffic information without the need of an infrastructure. The original focus of VANETs is to increase safety in the road. VANETs can support driver assistance systems they collect and distribute safety information to aid in car collisions prevention by monitorial trainers regarding potential risk before they really look it. This paper has reviewed multiple VANETs routing techniques. The major routing techniques for VANETs along with their respective characteristics are presented in this work. The comparison has clearly shown that each technique has its own features over the other but no one is said to be perfect in all circumstances.

Keywords—VANETs, Road side units, minimum headway distance, road safety

I. INTRODUCTION

VANET is specific class of MANET. VANET applications can be comprehensively isolated into two classifications: security applications and client applications. Other than lessening the measure of street mischance's, security applications epitomize cautioning messages concerning mishaps, crossing points, and street clog. Client applications exemplify electronic toll combination, scattering of travel and business undertaking data, advertisements, and entertainment [32]. In Intelligent Transportation System every transport tackles the part of source, sink, and switch to telecast data to VANETs. For correspondence to happen among transports and RSU transports ought to be equipped with some variety of radio interface or OBU that set up small range wireless adhoc Networks to be formed. In Intelligent Transportation System conveyance are provided with Global Positioning System (GPS) or a Differential Global Positioning System (DGPS) recipient for location prediction. Fixed Road Side Unit which is joined by backbone system ought to be in set to facilitate correspondence.. For instance few techniques need RSU to be distributed evenly throughout the full road network few need RSU only at intersections whereas others need road side units only at area borders. Though it is safe to assume that infrastructure exists to some extent and transports have access to it intermittently, it's unrealistic to need that transports always have wireless access to roadside units. Inter-vehicle, vehicle-to-roadside, and routing-based communications rely on very precise and up-to-date data about the nearby environment which in turn, needs the use of accurate positioning systems and smart communication protocols for exchanging data. The Building of Vehicular Adhoc Network shows three major classes in figure 1:

- **Inter vehicles communication -** It's called vehicle to vehicle communication. Transports correspond among others with no infrastructure support. One important data gathered from sensors on a transport are frequently send to neighbour transports.

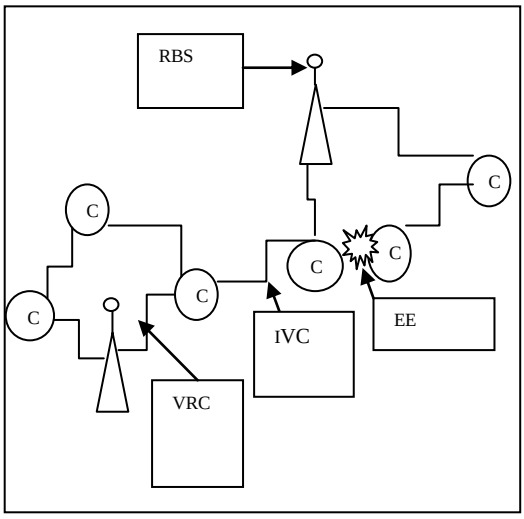
- **Vehicle to roadside communication -** It's called vehicle to infrastructure communication. Transports may utilize cellular gateways also WLAN access point to attach nearest network and facilitate vehicular functions.

Inter street side correspondence - It' also called hybrid vehicles to roadside communication. Transport may utilize framework to relate among other also share data gathered from framework among another transports in a peer to peer mode through adhoc communication. This building includes Vehicle to Vehicle communication also gives superior flexibility during substance sharing [18].

Components of VANETs

The component of VANET basically takes after the operation innovation of MANET inside of the feeling that the strategy for self-association, self-administration, low data measure and joint wireless communication criteria stay same. However solution obstacle working of Vehicular Adhoc Network originates from the fast also uncertain nature of the versatile hubs (transports) on the ways. In addition, VANETs have particular drawing in alternatives over Mobile Adhoc Network as takes after:

- **Higher transmission power and storage -** The network hubs (transports) inside Vehicular Adhoc Network is generally set up among higher power and storage than those in Mobile Adhoc Network.
- **Higher computational capability –** Operating transports may afford higher computing , communication and sensing capabilities than MANETs
- **Predictable Mobility -** As opposed to Mobile Adhoc Network movement of the network hubs inside a Vehicular Adhoc Network may be predicted because they move on a road network. If current velocity and road trajectory data are well-known then future position of the transport may be predicted [18].



RBS: Roadside Base Station
VRC: Vehicle to Roadside Communication
IVC: Inter-Vehicle Communication
EE: Emergency Event
C: Car

Figure 1 - VANETs Building

Vehicle Modelling Structure for Realistic Simulation of VANETS

They show during this phase a structure that catches each macroscopic and microscopic conduct components of vehicle networks to facilitate additional smart investigation of transport communications networks. They acknowledge two building sections: Mobility constraints and

vehicular traffic generation, for modelling real-world transport movements. The subsequent protion depict sections and elements.

- **Mobility Constraints** - It describe relative level of freedom of transport movements. Macroscopically transport is compelled by the road configuration, per-road components and obstacles (e.g. road capability, speed limits); whereas microscopically, it's influenced by near transports and also the trainer's conduct in regard to them

- **Road Network** - Movement of transport is proscribed to the pure mathematics of the road topology. It includes totally different categories of streets, multiple lanes, and each road phase is associated among a ordinance that restricts the rate of the leading transports and therefore the subsequent transports on the road. Additionally stoplight is placed at road junctions. These act as gates on the road and cause bunching of transports whereas at a similar time separating vehicles into clusters or platoons. Therefore a traffic light is also expected to possess a powerful impact on the node property of communication network.

- **Neighbouring Vehicle** - Unlike generic cell phone hubs in Mobile Network simulations real transports can't have a gap already engaged with other transport. Rather near vehicle pressure others by their inter-dependent motion being described with their individual driving behaviour**.**

- **Acceleration Models** - In acceleration model two categories area unit needed **Car Following Models** that depict the acceleration trainers apply in reaction to the behaviour of the transport in front. **General Acceleration Models** use once drivers don't nearly follow their leaders**.** In **Car Following Model** adjusts vehicular mobility according to a set of rules in order to maintain a safe distance and stay away from crash with the lead transports and various option definitions exist including Psycho- Physical Models, Linear Models, Cellular Automata, and Fuzzy Logic Models

- **Vehicular Traffic Generation** - This model is dependable at a macroscopic level to producing traffic flows comprising of distinctive sorts of transports. It's employed to describe the traffic flow and also transport density supported overall network concerns [8].

ROUTING PROTOCOLS

Five different classes of routing protocols are shown in Figure 2:

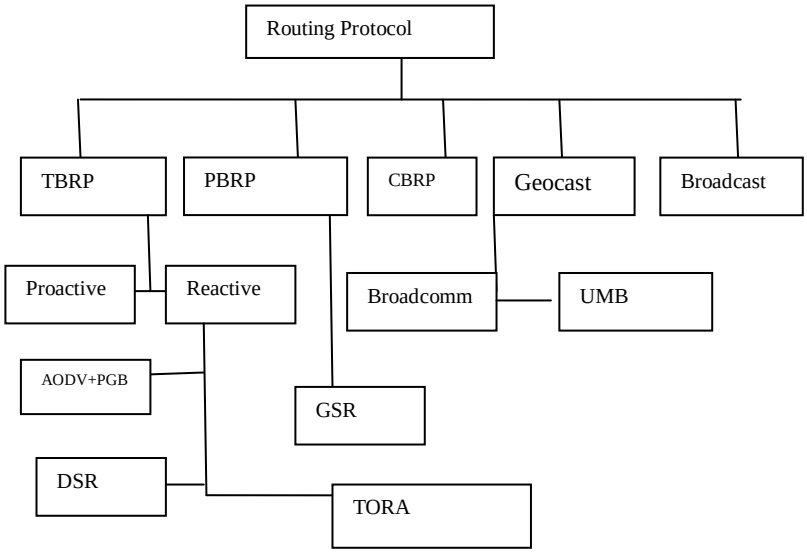


Figure 2 - Classification of routing protocols

(A) Topology based Routing Protocol

This protocol utilizes link data that exists within network to execute packet forwarding. Topology based routing protocol further classified into two protocols.

(i) Proactive Based Routing Protocol (Table Driven)

Proactive based routing protocol permit a network hop to utilize routing table to store routes data for all alternative hops every entry within the table comprises consecutive hop node employed in trail to destination no matter whether or not route is really required or not. The table should be updated often to replicate topology changes and will be broadcast sporadically to neighbours. This theme might cause a lot of overhead particularly within high quality network. However, routes to destinations can perpetually be out there once required. It sometimes rely upon shortest path algorithms to see that route are chosen they typically use two routing strategies: Link state strategy and distance vector strategy.

(ii) Reactive based Routing Protocol (On-Demand)

It just opens path it's required for a node to speak with one another. RRP retains path which is currently utilize as a result RRP shrink load within network.

(a) Ad hoc On-demand Distance Vector + PGB

The goal of Preferred Group Broadcasting is to decrease telecast overhead associated among Adhoc On-demand Distance Vector path discovery also gives path stability specially main in Vehicular Adhoc anywhere rapid moving transport is utilize for wireless hosts.

(B) Position based Routing Protocol

Data frame is transmitted without record information to one node neighbour that is nearest to goal. PBR is very helpful as without path from source hop to goal hop require to be developed also monitored. PBR is conquer into two classes - Position based greedy Vehicle to Vehicle techniques and Delay Tolerant techniques.

(C) Cluster based Routing Protocol

It's completed by source routing. CBR technique use path shortening. While hop receives respond of goal to source, CBR aims to locate the farthest hop inside path which is its neighbour. Path among source and goal may be compact. In figure 3 illustrate CBR. Source hop has to transmit information to goal hop Source hop transmits path requests to all neighbouring cluster head also only to Cluster-heads. While cluster head receives path request it checks if goal hop is in this cluster. In this case the cluster head transmits request directly to the goal, but when Destination isn't in the cluster, it sends the route request to all the adjacent cluster-heads. All cluster-head saves his address in the packet, so when a cluster-head receives a route request where his address is saved in the packet, it discards this packet. When the route request packet arrives at the destination, it replies back with the route that had been recorded in the request packet. When the source does not receive a reply from the goal within a time period, it tries to send a path request once more.

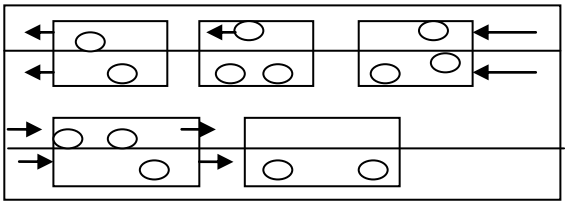


Figure 3 – Cluster Based Routing

(D) Broadcast Routing

It's often utilize to distributing, congestion, climate also urgent situation, street predicate between transports also advertisement in VANETs. It's utilize when message require to be distributed to vehicles beyond transmission range i.e. Multi nodes are utilize. This protocol executes good quality for a few number of hops.

(E) Geocast Routing

GR aims to send data frame from source hop to another hop in particular geographical area. GR illustrates in figure 4 transport outside Zone of Relevance aren't alerted to avoid needless rapid response. GR is designed for multicast service in a particular geographic area. Inside goal zone unicast routing may be utilize to send data frame[16].

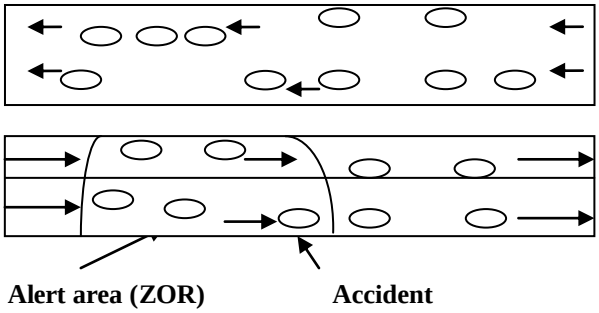


Figure 4 – Geocast Routing

Comparsion of routing protocols

Protocols	Forwarding Method	Routing Maintenance	Situation	Recovery Method	Infrastructure Requirements	Digital Map	Control dataframe Overhead	Number of Retransmission
DSDV	Multihop	Proactive	City	Multihop	Negative	Negative	Maximum	Fewer
OLSR	Multihop	Proactive	City	Multihop	Negative	Negative	Maximum	Fewer
FSR	Multihop	Proactive	City	Multihop	Negative	Negative	Maximum	Fewer
AODV	Multihop	Reactive	City	Store & Forward	Negative	Negative	Low	Fewer
TORA	Multihop	Reactive	City	Store & Forward	Negative	Negative	Low	Fewer
DSR	Multihop	Reactive	City	Store & Forward	Negative	Negative	Low	Fewer
MOVE	Multihop	Greedy Forwarding	City	Store & forward	Negative	Sure	Moderate	Fewer
GSR	Multihop	Greedy Forwarding	City	Store & forward	Negative	Sure	Moderate	Fewer

II. RELATED WORK

Kafsi M. *et al* [3] in their paper, they gave an exhaustive examination of the connectivity of such networks by leveraging on well-known results of percolation hypothesis. By method for reproduction they studied the influence of various parameters, including transport density, proportion of equipped transports, and radio communication range. Wang-Hei Ho I. *et al* [7] in their paper, they studied the connectivity of MANETs that comprised of buses moving in urban range also look at the implications for vehicle-related services. Kumar R. *et al* [8] in their paper the survey of routing protocols in VANET is main and required for smart Intelligent Transport System. Also discusses pros / cons and applications of different routing protocols for VANETs. Wang-Hei Ho I.*et al* [9] in

their paper a stochastic traffic model for Vehicle Adhoc Network in signalized city road systems. In their paper proposed model is a combined of the fluid model and stochastic model. Duddalwar P. *et al* [17] in their paper discussed the concept of VANET also explored the inspiration behind their aim also trace development of routing techniques analyzed also compared various type of existing routing techniques in vehicle Adhoc Network pros also limitation of various routing techniques and at last pointing out several open issues also possible track of upcoming research related to Vehicle Adhoc Network routing. Bhuvaneshwar S. *et al* [18] **i**n their paper many challenges to be addressed when employed VANET. In their paper gave an overview of the VANETs and the existing VANET routing protocols. Savita *et al* [19] in their paper displayed a standout

amongst the most related types of Ad-Hoc systems; the Vehicular Ad-Hoc Networks. Dhankhar S.*et al* [25] in their paper gave a review on VANET and the routing protocols that focuses on V2V communication. They compared reactive and proactive routing techniques based on pros and cons are discussed. Challenges and investigation related issues by routing techniques that exist in Vehicle Adhoc Network. Singla R. *et al* [26] in their paper future proposed a wayout for secure transmit of information from sender to receiver by using pretty good privacy security and get rid of the traffic congestion and disregard the needless load of network by selecting dynamic path for data transmission. They propsed a solution to enhance the performance of network by making the mishap free environment. Abuelenin S. *et al*. [32] has considered the distribution of vehicles in a single lane, taking into account that consecutive vehicles have to maintain a minimum safe distance between them. They studied how this minimum distance affects the connectivity probability in light traffic conditions. They showed that the headway distribution of single lane traffic in the free flow conditions is better modelled using a shifted exponential model which takes into account the safe distance between vehicles

Comparison study of various VANET techniques in shown in the below mention table:

Sr no	Author Name	Year	Advantage	Technique
1	Jiang H., Guo H., and Chen L.	2008	Consistent and well-organized alarm message broadcast routing for VANETs	Estimates the receipt probability of alarm messages for nodes
2	Abedi O., Fathy M., and Taghiloo J.	2008	Change on Ad hoc On-demand Distance Vector as MANETs routing procedure to create it adaptive for VANETs	Choose after that jump for the period of a way innovation period
3	Yan G., Rawat B., and Samy E.	2009	The stability of constancy, wait, and cost metrics	Inspired by ticket based probing, They proposed a scheme to selects a stable routing path in vehicular network environment.
4	Wang X., Yang Y., and An J.	2009	Fcar is better to AODV in several aspects	Fuzzy control based AODV routing
5	Ali S,and Bilal S.M.	2009	Improvement	Intelligent routing protocol that is particularly designed for city environments.
6	Gupta S., and Chaki R.	2011	Reliable and efficient routing	Speedy Routing protocol for vehicular Ad hoc Network
7	Yu X., Guo H., and Wong W.	2011	Achieve superior routing performances.	AODV
8	Gaikwad D., and Zaveri M.	2011	Active security and intelligent transportation	Mobility Model

9	Lee J., Lo C., Tang S., Horng M., and Kuo Y.	2011	The skill to keep away from choose an previously crowded path the skill to gather concurrent traffic data efficiently with only small manage slide	Hybrid traffic geographical routing
10	Duddalwar P., Deshmukh A., and DorleS	2012	It has presented the benefits of several routing protocol. The benefits of each protocols is also given	Multiple Protocols
11	Hu L., Ding Z., and Shi H.	2012	Improved routine on pack deliverance part, routing slide	A fresh routing scheme base on GPSR routing protocol
12	Shukla R., and Tyagi N.	2012	Secure communication	Realistic Vehicular Mobility Model
13	Chuan D.	2012	TGPSR is superior to GPSR	Security mechanism called TGPSR
14	Slavik M., and Mahgoub I.	2013	reach high accomplish capacity and small bandwidth spending within town	Distribution-Adaptive Distance through Channel Quality (DADCQ) protocol
15	Kalkundri R., and Kalkundri P.	2014	An efficient message authentication scheme	Elliptic Curve Digital Signature Algorithm (ECDSA)
16	Singla R., and Sharma N.	2014	To enhance the performance of network by making the mishap free environment.	Elliptic Curve Digital Signature Algorithm (ECDSA)
17	Wang L., Wang Y., and Wu C.	2014	Reduce routing overhead	AODV based routing algorithm for VANETs
18	Bohlooli A., and Jamshidi K.	2014	Reduces the links breakages and increases the link duration time	ROMSGP
19	Aravindhan K., Kavitha G, and Dhas C.	2014	Reduce packet loss and to improve throughput.	Position Based Routing Protocol
20	Kirtiga, R., O. S. GnanaPrakasi, D. Kavipriya, R. Anita, and P. Varalakshmi	2014	Minimizes link breakage and increasing the throughput in VANET	Reliable routing protocol
21	Lee S., and Seok S.	2014	The performance test of this system to be superior	GZTR Protocol
22	Bhattacharya I., Ghosh S., and Show D.	2015	Deals with security issues	New junction-based geographical routing protocol
23	Abuelenin S., and Adel Y.	2015	Safe distance between vehicles	Shifted exponential model

III. CONCLUSION AND FUTURE WORK

It has been observed that the effect of safe distance between cars on congested traffic phase is still unaddressed in the field of VANET. Also the use of

Dynamic communication range in VANETs is also open issue in VANET. The effect of abnormal environment condition might be a challenging issue in VANETs[31]. QOS might be a challenging issue both for network engineers and researchers to use the available bandwidth allocated for VANET to improve delivery of messages as well as to develop adaptive QoS routing protocols that will establish new routes quickly and efficiently. A scalability issue also expected that VANET ought to work in very low density areas for instance roads and highways, and in situations with very high traffic density areas for instance cities town areas where traffic jams are high and major intersections exist on road. Various active nodes (transports) and scalable protocol invent might be a big issue both for researchers and developers. One major issue is security in VANET for delivering

information among vehicles[25].This paper has presented various routing technique for VANETs. The overall objective based is to explore the advantages for each routing technique in order to find an optimistic technique which can behave better in every case for VANETs. The review has shown that no technique is better for every case. The effect of safe distance between cars on congested traffic phase is ignored in existing literature. The use of dynamic communication range in VANETs is also ignored. The effect of abnormal environment condition is also ignored by existing researches in VANETs. Therefore in near future we will proposed a new algorithm which will use optimistic headway distance based routing using dynamic path selection algorithm.

REFERENCES

[1] Jiang H., Guo H., and Chen L., "Reliable and Efficient Alarm Message Routing in VANET." IEEE 28th International Conference on Distributed Computing Systems Workshops, pp. 186-191, 2008.

[2] Abedi O., Fathy M., and Taghiloo J., "Enhancing AODV Routing Protocol Using Mobility Parameters in VANET." IEEE/ACS International Conference on Computer Systems and Applications, pp. 229-235, 2008.

[3] Kafsi M., Papadimitratos P., Dousse O., Alpcan T., and Hubaux J., "VANET Connectivity Analysis",arXiv on Nokia Research Center, Lausanne, Switzerland,2009.

[4] Yan G., Rawat B., and Samy E.,"Ticket-based reliable routing in vanet." IEEE 6th International Conference on Mobile Adhoc and Sensor Systems,, pp. 609-614, 2009.

[5] Wang X., Yang Y., and An J., "Multi-Metric Routing Decisions in VANET." IEEE Eighth International Conference on Dependable Autonomic and Secure Computing, PP. 551-556, 2009.

[6] Ali S,and Bilal S.M., "An Intelligent Routing Protocol for VANETs in city environments",IEEE 2nd International Conference on Control and Communication,PP.1-5 2009.

[7] Wang-Hei Ho I., North R, Polak. J., and Leung K.,"Impact of Transport Models on Connectivity of Vehicular Ad-hoc Networks", 12th WCTR on Lisbon, Portugal pp.11-15,2010.

[8] Kumar R.,Dave M.,"A Comparative Study of Various Routing Protocols in VANET",IJCSI,2011

[9] Wang-Hei Ho I., Polak. J., and Leung K., "Stochastic Model and connectivity Dynamics for VANETs in Signalized road System", IEEE/ACM Transactions on Networking, VOL. 19,2011.

[10] Gupta S., and Chaki R., "SRPV: A Speedy Routing Protocol for VANET." Springer Berlin Heidelberg on Advances in Computing, Communication and Control, pp. 275-284, 2011.

[11] Yu X., Guo H., and Wong W., "A reliable routing protocol for VANET communications", IEEE 7th International conference on Wireless Communications and Mobile Computing Conferenc, PP.1748-1753, 2011

[12] Gaikwad D., and Zaveri M., "Vanet Routing Protocols and Mobility Models: A Survey." Springer Berlin Heidelberg on Trends in Network and Communications, pp. 334-342, 2011

[13] Lee J., Lo C., Tang S., Horng M., and Kuo Y.,"A hybrid traffic geographic routing with cooperative traffic information collection scheme in VANET." IEEE 13th International conference on Advanced Communication Technology, pp. 1496-1501, 2011.

[14] Hu L., Ding Z., and Shi H. "An Improved GPSR routing strategy in VANET.", IEEE 8th International Conference on Wireless Communications, Networking and Mobile Computing, pp. 1-4, 2012.

[15] Shukla Ravi., and Tyagi N., "Performance of VANET Routing Protocols using Realistic Mobility Model." Springer India International Conference on Soft Computing for Problem Solving , pp. 549-555., 2012.

[16] Chuan D., "Towards a Trusted Vehicular Routing in VANET."Springer Netherlands on Information Technology Convergence, Secure and Trust Computing, and Data Management, pp. 103-117, 2012.

[17] Duddalwar P., Deshmukh A., and Dorle S.," A Comparative Study of Routing Protocol in Vehicular Ad Hoc Network", International Journal of Emerging Technology and Advanced Engineering,PP.71-76,2012.

[18] Bhuvaneshwari.S, Divya.G, Kirithika.K.B and Nithya S.,"A survey on Vehicular adhoc network", IJAREEIE,Vol.2,2013.

[19] Savita ,and Navpreet Kaur, "Headway based Model for Effective Broadcast in Vehicular Ad-Hoc Networks", International Journal of Computer Applications , Volume 66,2013.

[20] Slavik M., and Mahgoub I. ,"Spatial distribution and channel quality adaptive protocol for multihop wireless broadcast routing in VANET." IEEE Transactions on Mobile Computing, pp. 722-734, 2013

[21] Kalkundri R., and Kalkundri P., "AODV routing in VANET for message authentication using ECDSA.",IEEE International Conference on Communications and Signal Processing, pp. 1389-1393, 2014.

[22] Aravindhan K., Kavitha G, and Dhas C. , "Plummeting data loss for multihop wireless broadcast using position based routing in VANET." IEEE International Conference on Science Engineering and Management Research pp. 1-5,2014

[23] Kirtiga, R., O. S. GnanaPrakasi, D. Kavipriya, R. Anita, and P. Varalakshmi, "Reliable graph based routing in VANET environment.", IEEE International Conference on Recent Trends in Information Technology, pp. 1-6,2014

[24] Lee S., and Seok S., "A Two-Tier Routing Algorithm Based on Geographical Zone in VANET.", Springer Netherlands on Frontier and Innovation in Future Computing and Communications, , pp. 751-761,2014

[25] Dhankhar S.,and Agrawal S.,"A Survey on Routing Protocol and Issues", IJIRSET Vol-3, 2014.

[26] Singla R., and Sharma N., "Dynamic path selection with hybrid protocol and secure data transmission with PGP security in VANET." International Journal of Advanced Research in Computer Engineering & Technology Volume 3 ,Issue 11, 2014

[27] Wang L., Wang Y., and Wu C., "A Receiver-Based Routing Algorithm Using Competing Parameter for VANET in Urban Scenarios." Springer International Publishing on Internet of Vehicles–Technologies and Services, pp. 140-149., 2014.

[28] Bohlooli A., and Jamshidi K., "Profile based routing in vehicular ad-hoc networks." Science China Information Sciences, Volume 6, Issue 57, pp. 1-11, 2014

[29] Bhattacharya I., Ghosh S., and Show D., "An Efficient and Secured Routing Protocol for VANET." Springer International Publishing 3rd International Conference on Frontiers of Intelligent Computing Theory and Applications, pp. 775-783., 2015.

[30] Bian C., Zhao T.,Li X. and Yan W.," Boosting named data networking for efficient packet forwarding in urban VANET scenarios." IEEE International Workshop on Local and Metropolitan Area Networks,pp.1-6,2015.

[31] Joshi A., and Kaur R., "A novel multi-cast routing protocol for VANET." IEEE International on Advance Computing Conference , pp. 41-45, 2015

[32] Abuelenin S., and Adel Y., "Effect of Minimum Headway Distance on Connectivity of VANETs." AEU-International Journal of Electronics and Communications ,Volume 5, Issue 69 , pp. 867-871,2015.

