IJRD International Journal of Research & Development Organisation

ISSN-4567-7860

JOURNAL OF ELECTRICAL AND ELECTRONINS ENGINEERING

Improved Connectivity Aware Geographical Routing Protocol in VANETs

D.Priyanga[1], T.V.P.Sundararajan[2]

PG Student [CO], Dept. of ECE, Bannari Amman Institute of Technology, Sathy, Tamilnadu, India [1]

Professor, Dept. of ECE, Bannari Amman Institute of Technology, Sathy, Tamilnadu, India [2]

Abstract

In recent years, rapid growth in the number of vehicles on the road has increased demands for communication. The design of routing protocols in VANETs is an important and necessary issue for supporting VANET-based applications. However, due to link disconnection, high mobility and uneven distribution of vehicles, it has been considered as a challenging issue to establish a robust route for delivering packets between source vehicles to destination vehicle. This paper presents an improved connectivity-aware intersection based routing (ICAIR) protocol to address these problems by selecting an optimal route with higher probability of connectivity and lower end to end delay; then, location forwarding based on position prediction is used to transfer packets among any three intersections along the best route. In simulation result, the proposed protocol outperforms existing routing protocols in terms of throughput and average transmission delay in an urban environment.

Keywords: VANETs; Connectivity; Delay estimation; Geographic routing; Position-based prediction

I. INTRODUCTION

Geographic routing is a routing principle which implies on geographic position information. It is based on the idea that the source vehicle sends information to the destination vehicle based on its location instead of using network IP address. Geographical routing consists of single path, multi path and flooding based communication. Greedy forwarding tries to bring the message nearer to the destination in each step using only local information. The suitable neighbor can be the one who minimizes the distance to the destination vehicle in every step. Greedy forwarding can lead into a dead end, where there is no neighbor nearer to the destination. Face routing helps to regret the packets from that situation and find a path to another vehicle, where greedy forwarding can be utilized. A recovery scheme such as face routing is essential to assure that the information can be delivered to the destination.

There are several prerequisites on the availability of position information in VANET environments, such as position awareness of each participating vehicle, e.g., a GPS receiver installed on every vehicle. However, this assumption of using location systems is possible due the multiplication of Global Position System (GPS) and the progress on self-configuring localization mechanisms in urban environment. Thus, it is significant that every vehicle be aware of each neighbour position. A way to perform the position updates is sending beacon messages that indicate the current position of the vehicle. The Greedy Perimeter Stateless Routing (GPSR) protocol is one of the most important algorithms to demonstrate the basic concepts of geographic routing in vehicular ad hoc networks. In [11] and [12], there are several proposals that use GPSR models to offer new geographic protocols in VANET environment. Since there is no route setup or maintenance is required, GPSR is a local decision strategy. Instead, forwarding vehicles are determined 'on the fly' [2]. It applies both greedy forwarding to send packets using position information and a void-handling technique through the perimeter mode as a recover strategy when the greedy forwarding fails to recover the packets. In such a case, position information points in the right direction but is not correlated with available paths to the destination.

II. DESCRIPTION OF IMPROVED CONNECTIVITY-AWARE INTERSECTION BASED ROUTING PROTOCOL

ICAIR is an intersection-based geographical routing protocol that is capable of finding the robust route to the destination vehicle in urban environments. The ICAIR scheme is mainly separated into three steps: (i) dynamic selection of the intersections through which a packet could reach its destination, (ii) a prediction-based greedy forwarding strategy between two intersections, and (iii) a recovery strategy when routing failure occurs.

A. Intersection selection mechanism

In this section, a rectangle restricted area searching method [13] is used to find the optimal route in urban environment of VANETs. Foci are formed by considering the position of source vehicle and destination vehicle and the line connecting between source and destination are assumed as the axis, an ellipse could be obtained. Therefore, the rectangle can be obtained by forming the ellipse. Therefore, each intersection involved in the optimal path could be determined whether it is in or out of the rectangle area. The road segment within or beyond the rectangular area can be determined through connected intersection. In this mechanism, two rules have to be followed: First, the segment has been considered as a part of searching area only if any of the start or end intersection of a segment is within the restricted searching area. Otherwise, diagonal length and the centre coordinator of the restricted searching area have to be calculated. If the distance between the intermediate point and the centre coordinator of this road segment is probably larger than half of the diagonal length, then the segment has not been considered as the searching area and vice versa. Thus the routing overhead will be greatly reduced by using this mechanism which is essential for controlling the delay and also to avoid packet collision.

B. Next hop selection mechanism

Due to the frequent topology change and different mobility patterns in VANETs, greedy forwarding algorithm may lead to inaccurate neighboring list and therefore some of the relay vehicles are not comes into location. Thus, a location-based prediction algorithm is needed in urban environment. In our work, by using GPS a source vehicle can identify its own location and its neighbors location by periodically exchanging information. With the information broadcasted by all vehicles, each and every vehicle can forward its own neighboring list and identify whether it is the intersection vehicle or not. When a vehicle knows it is located at an intersection, it will broadcast information to inform its neighboring vehicle. Thus, based to the speed and location information obtained from the forwarded message, the relay vehicle first to find the future position of each neighbor when forwarding data packets and then selects neighbor vehicle nearest to the next intersection based on the predicted location.

C. Routing recovery

In VANETs, the movement of vehicle is confined by the street layout, and it deals with problems like obstacles due to high buildings, which will limit the connectivity between vehicles. Thus, the information may not be forwarded if the source vehicle does not have a connection to its neighbor which is geographically

IJRD International Journal of Research & Development Organisation
ISSN-4567-7860
JOURNAL OF ELECTRICAL AND ELECTRONINS ENGINEERING

nearer to the destination than itself; the problem is also known as a local optimum or local maximum issue. Although the selected route with better quality of link, local optimum also occurs frequently [14]. As a result, the performance of geographical routing protocols in VANETs will be greatly reduced. Therefore, a recovery strategy is necessary. The recovery strategy of ICAIR is based on the idea of store-carry-forward. Unlike the original store-carry-forward algorithm, the current vehicle will carry the information along the current selected road segment and forward packets when it moves into another vehicle's communication range. The process will not stop until the packets reach the destination vehicle.

III. METRICS FOR PERFORMANCE EVALUATION

Packet Delivery Ratio: The average ratio between the number of packets received by a destination vehicle to the number of packets transmitted by a source vehicle.

Average End to End Delay: The end-to-end delay is defined as the average amount of time spent by the transmission of a packet that is successfully delivered from the source to the destination.

IV. SIMULATION RESULTS AND EVALUATION

In this section, the performance of ICAIR which is a Geographical routing protocol has been compared with GPSR. ICAIR and GPSR are the most fundamental types of geographical routing protocols which are most widely used in VANET's scenario. To analyse the QOS parameters by measuring packet delivery ratio and average end-end delay based on varying number of vehicles.

A. Simulation Setup:

Simulation environment has been taken as intersection of urban area and the environment has various obstacles. Therefore, two-ray model has been used with the frequency range of 2.4GHz. VANET scenario for urban environment has been shown for 5 and 25 vehicles with Wi-Fi connectivity and protocols have been chosen as ICAIR and GPSR.

B. Results:

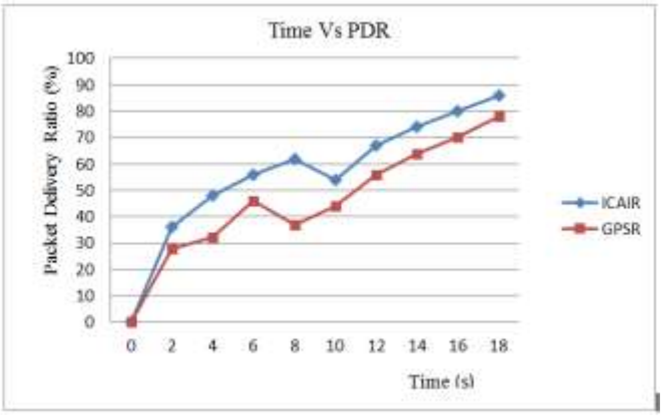

Fig.1 Time Vs PDR for ICAIR and GPSR in Urban Environment

In fig 1, it shows the performance of the ICAIR in terms of packet delivery ratio, it has been compared with GPSR. In ICAIR, the rectangle area has been chosen for identifying the neighboring vehicles with the help of GPS and therefore it has increased in PDR when compared to GPSR.

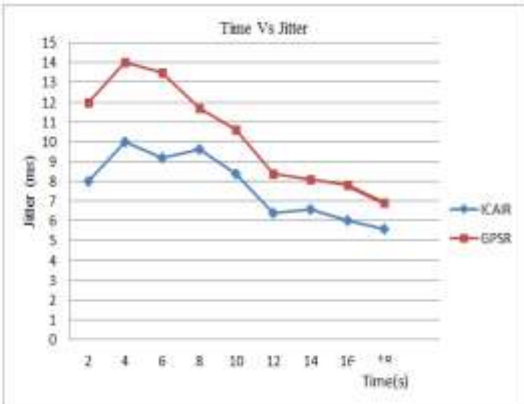

Fig. 2 Time Vs Jitter for ICAIR and GPSR in Urban Environment

In fig 2, it shows the performance of the transmission delay for ICAIR and GPSR. It has been measured in seconds. The average end to end delay is decreased for ICAIR and this is due to the reason that ICAIR significantly reduces the bandwidth consumed by packet and achieves network transmission reliability.

V. CONCLUSION

Thus the ICAIR protocol has designed with optimal route by using rectangle restricted area and its simulation results shows that ICAIR has better packet delivery ratio and also low average end to end delay when compared to GPSR. The disconnectivity and delay problem are considered to obtain the better connection in intersection with large number of vehicles in urban environment. The delay is reduced by using directional forwarding of packets from source to destination.

REFERENCES

[1] Christian L, Martin M, Holger Fuller. Hannes H. Geographic Routing in City Scenarios. Proceedings of ACM SIGMOBILE Mobile Computing and Communications Review, January 2005, pp. 69-72.

[2] Casteigts A, A. Nayak, and I. Stojmenovic, "Communication protocols for vehicular ad hoc networks," Wirel. Commun. Mob. Comput., vol. 11, no. 5, pp. 567-582, 2011.

[3] David B. Johnson and David A. Maltz "Dynamic Source Routing in Ad Hoc Wireless Networks" Computer Science Department Carnegie Mellon University 5000 Forbes Avenue Pittsburgh, PA 15213-389.

[4] Fan Li and Yu Wang; "Routing in Vehicular Ad Hoc Networks: A Survey", IEEE Vehicular Technology Magazine, Volume 2, Issue 2, June 2007; Pages: 12-22.

[5] He Tong-Zhou, Shen Yan-Jun, "The Topology Stability of Vehicular Ad Hoc Network" in Advanced Engineering Forum, vol.6-7, 2012, pp.1004-1009.

[6] Haas, Zygmunt J., Pearlman, Marc R., Samar, P.: Intra zone Routing Protocol (IARP), June 2001, IETF Internet Draft, draft-ietf-manet-iarp-01.txt.

[7] Johnson D.B and XMaltz D.V, "DSR : The Dynamic Source Routing Protocol for Multi-Hop Wireless Ad Hoc Networks," Discovery, vol. 5, pp. 1–25, 2010.

[8] Kleinrock L and Stevens K, "Fisheye: A Lens like Computer Display Transformation," Computer Science Department, UCLA, CA Tech. Report,1991.

[9] B. Karp and H.T. Kung, "GPSR: Greedy Perimeter Stateless Routing for Wireless Networks", In Proceedings of the 6th annual international conference on Mobile computing and networking, 2000, pp.243-254.

[10] Lochert C, Hartenstein H, Tian J, Fussler H, Hermann D, Mauve M, A Routing Strategy for Vehicular Ad Hoc Networks in City Environments, IEEE Intelligent Vehicles Symposium, 2003,pp. 156-161.

[11] Marwane, A., et al. HHLS: A Hybrid Routing Technique for VANETs. In IEEE Global Communications Conference, IEEEGLOBECOM'12. 2012.

[12] Naumov V, Gross T.R. Connectivity-Aware Routing (CAR) in vehicular Ad-hoc Networks. In Proceedings of 26th IEEE International Conference on Computer Communications (INFOCOM'07), Anchorage, Alaska, USA, May 2007, pp. 1919-1927.

[13] Perkins CE, Royer EM, Ad-hoc on-demand distance vector routing, in Proceedings of the Second IEEE Workshop on Mobile Computing Systems and Applications (WMCSA'99), New Orleans, February 1999, pp. 90–100.

[14] Qing Yang, Alvin Lim, Shuang Li. ACAR: Adaptive Connectivity Aware Routing Protocol for Vehicular Ad Hoc Networks. Proceedings of 17th International Conference on Computer Communications and Networks, 2008. pp. 1-6.

[15] Rabayah M, Malaney R, A new scalable hybrid routing protocol for VANETs. IEEE Trans. Veh. Technol. 61(6), 2625–2635 (2012).