IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.-7, Issue-5, May 2019 E-ISSN: 2347-2693

Enhancing Performance of Vehicular Adhoc Network by reducing Delay with MC-ERDV Algorithm

Shiva Katara[1*], Rakesh Rathi[2]

[1] Department of CS, Govt. Engineering College, Ajmer, India
[2]Department of Computer Science, Govt. Engineering College, Ajmer, India

[*]*Corresponding Author: shivakatara@gmail.com, Tel.: +91-93513-36334*

DOI: https://doi.org/10.26438/ijcse/v7i5.11271130 | Available online at: www.ijcseonline.org

Accepted: 20/May/2019, Published: 31/May/2019

***Abstract*—** Vehicular Ad-hoc Networks (VANETs) are special type of networks which are having wireless mobile vehicle nodes that are establish temporarily network connectivity. These vehicle nodes perform routing functions under the self-organization. Delay Tolerant Network (DTN) follows the approach to store and forward the message. DTN are the networks do not require the immediate data delivery and these type of networks can wait for a specific time period before transferring of data. Different kind of routing protocols have been designed and presented by the researchers after considering the major challenges that are involved in DTN enabled VANETs. In this paper an algorithm is proposed called Multi Category ERDV (MC ERDV) Algorithm. This proposed algorithm gives the low delay and network area is enhanced.

***Keywords*—**VANET, DTN, ERDV-FS, Multi Category ERDV, MCE Algorithm.

I. INTRODUCTION

Today the wireless communication has established a valuable position in the field of data transfer. It not only allows the users to move during the communication but also provide the high quality of services parameters. Wireless networks have enabled number of devices to be connected over the vast distances [1]. Ad hoc networks are infrastructure free wireless networks, wirelessly distributed systems in which no central administration or monitoring is available for controlling the different operations in network. Each network node has capabilities of a router that helps to providing the multi node communication among the mobile nodes which do not have the direct link to each other. There are some constraints in the ad hoc networks like limited battery power backup, limited radio range, and heterogeneity of devices in network [2].

Vehicular ad hoc network (VANET) is a network of moving vehicles, in this network moving vehicles can communicate and share information between others moving vehicles. Vehicular ad hoc networks (VANETs) are different from the normal wireless network because these are having the high mobility, variable density of traffic and the predictable mobility patterns [2] [3]. The architecture of VANET is defined in the IEEE 1471-2000 and ISO/IEC 42010.This system architecture has three domains: in-vehicle, ad hoc, and infrastructure domain [4]. The in-vehicle domain is composed of an on-board unit (OBU) and one or multiple application units (AUs).The connections between these are usually wired or wireless. The ad hoc domain is composed of vehicles equipped with OBUs and roadside units (RSUs) or Road Side Spot [5]. An OBU can be considered as a mobile node of an ad hoc network and RSU is a static node. An RSU connected to the Internet via the gateway. RSUs can communicate with each other directly [3].

Delay Tolerant Networks (DTNs) are the networks where continuous end-to-end connectivity cannot be assumed. DTN protocols generally follow a store-and-carry forwarding strategy. Using such a strategy, any vehicles do not drop the data packets when the connection is broken [6]. It will be stored in memory. Delay tolerant networks (DTNs) represent a special class of wireless systems that virtually need minimum to none infrastructure. DTNs are intended to deal with scenarios involving heterogeneity of standards, intermittent connectivity between adjacent nodes, lack of contemporaneous end-to-end links and exceptionally high delays and error-rates. The mobile nodes available in challenged environments can be extremely limited in their resources; such as power, memory, network capacity and CPU processing [7].

This paper is divided in five sections. Section I contains the basic introduction of the VANETs and DTN. The Section II gives the literature survey. The Section III describes about the proposed work. Section IV contains the results and their comparison with existing work. Section V describes the conclusion of work with future work

II. Literature Survey

Many authors performed lot of work to improve the routing algorithm of VANET. In [8] authors proposed MaxProp (Maximum Priority) algorithm that enables nodes to assign the priority to the packets. In [9] authors proposed a PBRS (Probabilistic Bundle Relaying Scheme) which is a decision based scheme. It makes RSUs to determine whether or not to release its data to a vehicle on the basis of certain criterion. In [10] authors proposed the ASCF (Adaptive Carry – Store - Forward) for reducing the outage time for vehicles. In [11] authors proposed the FFRDV (Fastest-Ferry Routing in DTN-Enabled VANET) protocol for sparse ad hoc networks. In [12] authors proposed the DARCC (Distance-Aware Routing with Copy Control) which provides routing decision. In [13] authors proposed the Density Adaptive Routing with Node Awareness (DAWN) assumes an urban sensing application. The DAWN assumes an urban sensing application. In [14] authors proposed the Geographical Opportunistic Routing (GeOpps). It includes the location information of the vehicle into account. In [15] authors proposed the GeoSpray (Geographical Spray in VDTN) algorithm. GeoSpray algorithm uses the principles of single-copy single-path GeOpps to perform multi copy multipath bundle routing approach. In [16] authors proposed the Location and Direction Aware Opportunistic Routing (LDAOR). The LDAOR method proposed for the opportunistic VANET to improve the performance of routing. In [17], authors proposed a novel routing protocol for the sparse environment in VANET. In [18] author proposed the Efficient Routing in DTN Enabled VANETS (ERDV). It is the modified version of the FFRDV.

In [19] authors proposed a link reliability-based clustering algorithm (LRCA). It provides efficient and reliable data transmission in the VANETs. In [20] authors proposed a novel SDN-based geographic directing (SDGR) convention for VANET, in view of hub area, vehicles thickness and computerized delineate. In [21] authors talk about an improved procedure in Vehicular Adhoc Network (VANET) situation for the urban areas. In [22] authors propose a half breed hand-off hub determination system that joins two run of the mill choice techniques: one is to pick a handoff hub which is nearest to the goal. In [23] authors have been discussed about the clusters in VANETs. The versatility in VANETs causes high topology changes due to node movement. In [24] authors introduced TROPHY (Trustworthy VANET Routing with group authentication keys), an arrangement of conventions to deal with the confirmation of steering messages in a VANET. In [25] authors introduced an itemized audit of remote gauges utilized as a part of VANET with various trials in VANET and its sending in a considerable lot of the created nations. In [26] authors proposed a new idea for selection of a proper ferry to forward the information is developed which takes into account the type of ferries & current speed of ferries and is based on fastest ferry. In [27] the authors worked on the VANET security. In [28] authors worked on the mobility.

III. Proposed Work

New algorithm is proposed, called Multi Category ERDV algorithm. MC-ERDV algorithm is using the vehicle node. These nodes having the parameters like Location (x, y), speed, and category of vehicle. If the vehicle speed is greater than 90 kph than it is considered as category 1 otherwise it is 0. These are also included in the Hello message.

In the destination ferry selection process the direction and speed category of vehicles are considered. For the purpose of block size calculation, the new formula is designed. The base algorithm uses the following formula for the block size –

Block size = (K*1000) / Speed

In the proposed algorithm the K value is taken as 5 instead of 6 in the base algorithm. Also it uses the three categories and category value. Cat1=1, Cat2=3 and Cat3=5 for the vehicle node speed (30 <= Speed <= 60), (60 < Speed <= 90) and (90 < Speed <= 120) respectively. Now the new formula for calculating the block size is as following –

Block Size = (K * Cat***i*** * 1000)/Speed Where ***i*** = 1, 2, 3.

New formula does not provides the large number of blocks. This reduces the transfer of the packets and ultimately delay reduces.

IV. Simulation and Result Analysis

Multi Category ERDV Algorithm (MCE Algorithm) is simulated. The vehicle node values are taken 10, 20, 30, 40, and 50 for the packet values 10 and 50. The different experiments are performed with the Multi Category ERDV Algorithm (MCE Algorithm) and results were obtained.

A. Multi Category ERDV Algorithm (MCE Algorithm)

Delay Analysis for Packet = 10 & Packet = 50

The delay graph is shown in the fig 1 and fig 2. It is clear that increase in number of node in network creates variations in the delay. Delay varies from 35.6352 ms to 37.497 ms for 10 packets and from 188.0436 ms to 198.4698 ms for 50 packets. As the number of node increases, there is variation in the delay. First it decreases, than increases as the number of node increases.

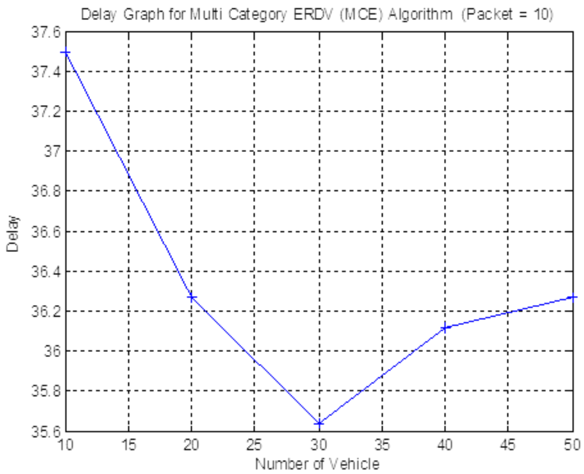

Fig. 1 Delay Graph for MCE Algorithm (Packet=10)

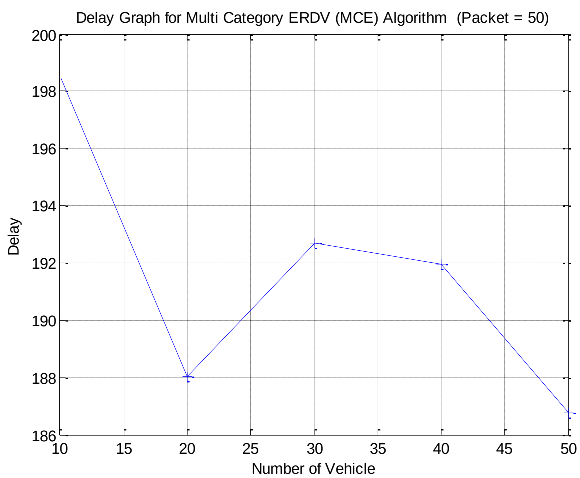

Fig. 2 Delay Graph for MCE Algorithm (Packet=50)

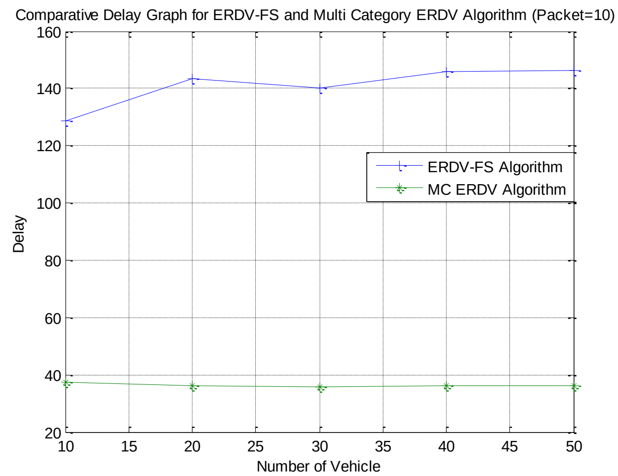

Fig. 3 Comparative Delay Graph (Packet=10)

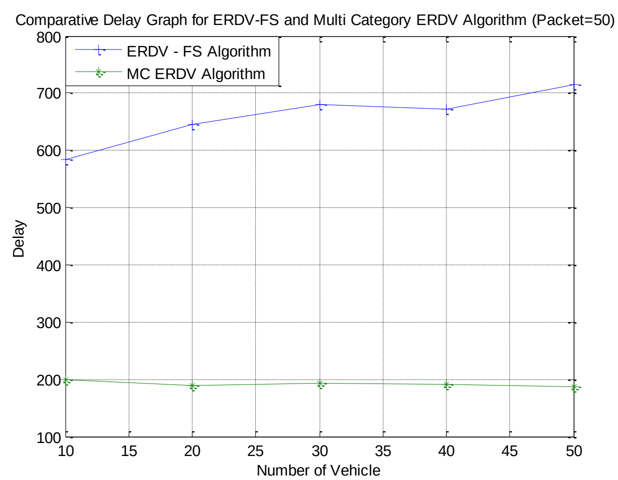

Fig. 4 Comparative Delay Graph (Packet=50)

B Comparative Result

Results compare for Packet =10 and Packet =50

The ERDV-FS and Multi Category ERDV Algorithm (MCE Algorithm) are analysed for the packet = 10 and packet = 50. There are reduction in the delay in Multi Category ERDV Algorithm than the ERDV-FS algorithm at packet value 10 and packet value 50. This is occurred due to the less number of calculations of the block size which reduces the number of packets transfer. The comparative Delay Graph for ERDV-FS and Multi Category ERDV Algorithm (MCE Algorithm) at Packet =10 is shown in fig. 3 and Packet = 50 is shown in fig. 4.

V. Conclusion and Future Scope

The high mobility in the VANETs causes sudden topology changes which leads to excessive control overhead messages and frequent link failures. The ERDV-FS algorithm has some limitations that degrade the performance of the VANET. To improve the ERDV-FS algorithm, the Multi Category ERDV algorithm is proposed in this work. The results reflect that the Multi Category ERDV algorithm gives the less delay in comparison with the ERDV-FS algorithm. The improvement is occurred due to the improvement in the block size formula. Ultimately the reduction in delay improves the quality of services. In future the VANET can be further improved by improving the throughput, packet loss ratio, high load traffic transfer.

REFERENCES

[1] Manjunath P S, Narayana Reddy, "*A Review on Security and Challenges for Vehicular Ad Hoc Networks*", International Journal of Emerging Technology and Advanced Engineering, Volume 4, Issue 5, May 2014.

[2] Arun Kumar, "*Enhanced Routing in Delay Tolerant Enabled Vehicular Ad Hoc Networks*", International Journal of Scientific and Research Publications, Volume 2, Issue 9, September 2012.

[3] Anas Abu Taleb, "*VANET Routing Protocols and Architectures: An Overview*", Journal of Computer Science, Journal of Computer Science 2018, 14 (3): 423.434, DOI: 10.3844/jcssp.2018.423.434.

[4] Wenshuang Liang, Zhuorong Li, Hongyang Zhang, Shenling Wang, and Rongfang Bie, "*Vehicular Ad Hoc Networks: Architectures, Research Issues, Methodologies, Challenges, and Trends*", Hindawi Publishing Corporation, International Journal of Distributed Sensor Networks, Volume 2015.

[5] Gurpreet Singh, Seema, "*Malicious Data Detection in VANET*", International Journal of Advanced Research in Computer and Communication Engineering, Vol. 1, Issue 7, September 2012

[6] Vijander Singh, "*Minimize End-To-End Delay in Delay Tolerant Enabled Vehicular Ad-Hoc Networks Using Ferry Selection Approach*", International Journal for Research in Applied Science & Engineering, Technology (IJRASET), Volume 5, Issue V, May 2017.

[7] Harshad S. Modi, Nikhil Kumar Singh, "Survey *of Routing in Delay Tolerant Networks*", International Journal of Computer Applications (0975 – 8887), Volume 158, No 5, January 2017.

[8] J. Burgess, B. Gallagher, D. Jensen, and B. N. Levine, "*MaxProp: routing for vehicle-based disruption-tolerant networks*", Proceedings of the 25th IEEE International Conference on Computer Communications (INFOCOM '06), vol. 6, pp. 1–11, Barcelona, Spain, April 2006.

[9] M. J. Khabbaz, W. F. Fawaz, and C. M. Assi, "*Probabilistic bundle relaying schemes in two-hop vehicular delay tolerant networks*," IEEE Communications Letters, vol. 15, no. 3, pp. 281– 283, 2011.

[10] D. Wu, G. Zhu, and D. Zhao, "*Adaptive carry-store forward scheme in two-hop vehicular delay tolerant networks*," IEEE Communications Letters, vol. 17, no. 4, pp. 721–24, 2013.

[11] D. Yu and Y.-B. Ko, "*FFRDV: fastest-ferry routing in DTN enabled vehicular Ad Hoc networks*," Proceedings of the 11th International Conference on Advanced Communication Technology (ICACT '09), pp. 1410–1414, February 2009.

[12] W. Z. Lo, J. S. Gao, and S.C. Lo, "*Distance-aware routing with copy control in vehicle-based DTNs*," in Proceedings of the IEEE 75th Vehicular Technology Conference (VTC '12), pp. 1–5, IEEE, June 2012.

[13] Q. Fu, L. Zhang, W. Feng, and Y. Zheng, "*DAWN: a density adaptive routing algorithm for vehicular delay tolerant sensor networks*," Proceedings of the 49thAnnualAllerton Conference on Communication, Control, and Computing, pp. 1250–1257, Monticello, Ill, USA, 2011.

[14] I. Leontiadis and C. Mascolo, "*GeOpps: geographical opportunistic routing for vehicular networks*," Proceedings of the IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WOWMOM'07), pp. 1–6, June 2007.

[15] F. Warthman, "*Delay-Tolerant Networks (DTNs) A Tutorial*", DTN Research Group Internet Draft, 2003.

[16] Marziyeh Barootkar, Akbar Ghaarpour Rahbar, and Masoud Sabaei, "*LDAOR Location and Direction Aware Opportunistic Routing in Vehicular Ad hoc Networks*", Journal of Telecommunication and Information Technology, 1, 2016.

[17] Moath Muayad Al-Doori, Francois Siewe, and Ali Hilal Al-Bayatti, "Moath Muayad Al-Doori, Francois Siewe, and Ali Hilal Al-Bayatti", International Journal of Machine Learning and Computing, Vol. 1, No. 5, December 2017.

[18] Vijander Singh, "*Efficient Routing by Minimizing End to End Delay in Delay Tolerant Enabled VANETs*", International Bulletin of Mathematical Research, Volume 2, Issue 1, March 2015.

[19] Xiang Ji, Huiqun Yu , Guisheng Fan, Huaiying Sun, and Liqiong Chen , "*Efficient and Reliable Cluster-Based Data Transmission for Vehicular Ad Hoc Networks*", Hindawi Mobile Information Systems, Volume 2018, Article ID 9826782, 15 pages, 2018.

[20] Ji, Xiang, HuiQun Yu, GuiSheng Fan, and WenHao Fu, "*SDGR: An SDN-based Geographic Routing Protocol for VANET*" In Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData), 2016 IEEE International Conference on, pp. 276-281. IEEE, 2016.

[21] Datta, Atreyee, "*Modified Ant-AODV-VANET routing protocol for Vehicular Adhoc Network*." In Electronics, Materials Engineering and Nano-Technology (IEMENTech), 2017 1st International Conference on, pp. 1-6. IEEE, 2017.

[22] Motlagh, Naser Hossein, Tarik Taleb, and Osama Arouk, "*Low-altitude unmanned aerial vehicles-based internet of things services: Comprehensive survey and future perspectives*", IEEE Internet of Things Journal 3, no. 6, 899-922.2016.

[23] Abuashour, Ahmad, and Michel Kadoch, "*Control Overhead Reduction in Cluster-Based VANET Routing Protocol*", In Ad Hoc Networks, pp. 106-115, Springer, Cham, 2018.

[24] Cirne, Pedro, André Zúquete, and Susana Sargento, "*TROPHY: Trustworthy VANET routing with group authentication keys*", Ad Hoc Networks 71, 45-67, 2018.

[25] Singh, Gagan Deep, Ravi Tomar, Hanumat G. Sastry, and Manish Prateek, "*A Review on VANET Routing Protocols and Wireless Standards*", In Smart Computing and Informatics, pp. 329-340, Springer, Singapore, 2018.

[26] Vijander Singh, Reena Dadhich, "*Routing Optimization by Minimizing One-Way Delay in Delay Tolerant Enabled Vehicular Ad-hoc Networks using Ferry Selection Approach*", International Conference on Infocom Technologies and Unmanned Systems (ICTUS'2017), Dec. 18-20, 2017, ADET, Amity University Dubai, UAE, IEEE , 2017.

[27] Kanwalprit Singh1, Harmanpreet kaur, "*Evaluation of proposed technique for detection of Sybil attack in VANET*", International Journal of Scientific Research in Computer Science and Engineering Vol.6, Issue.5, pp.11-15, October 2018.

[28] R. Kumari, P. Nand, "*Performance Analysis for MANETs using certain realistic mobility models: NS-2*", International Journal of Scientific Research in. Computer Science and Engineering Vol.6, Issue.1, pp.70-77, February 2018.

Authors Profile

Mr. Shiva Katara is pursuing his M.Tech in Computer Science and Engineering from Govt. Engineering College, Ajmer. He completed his B.E. in Computer Science & Engineering from Rajasthan University, Jaipur. His area of interest in VANET, Computer Network and Algorithms.

Dr Rakesh Rathi presently working as Assistant Professor and Head of Dept. of Computer Science in Govt. Engineering College, Ajmer. His area of interest in Computer Network, Cloud Computing and Wireless Network etc.