Improved Vehicle Adhoc Networking Protocol for Efficient Routing

Iffat Neshat, Rahul Dekar
Computer Science and Engineering,
Bansal Institute of Engineering and Technology, Lucknow, India

Abstract: This work is focused on routing protocols that basically refers to road-based using vehicular traffic (RBVT) routing which generally based on a class of routing mechanism and it has outperformed over existing routing protocols in city-based high probability, vehicular network connectivity among them. We are demonstrating results for Vehicular ad hoc network (VANET) which are suffering from intermittent connectivity problems due to vehicles mobility, which challenge routing protocols. To address the issue, we propose a novel strategy that consists of a composite scheme having applications of Reactive Pseudo-suboptimal-path Selection routing protocol (RPS) in the RBVT routing protocol during the intersection mode route selection problems. It is different from existing solutions which rely on vehicles physical movement to carry packets in intermittent connectivity scenarios. RPS gives the recently passed intersection a chance to select a new path from suboptimal-path unilaterally determined by local knowledge and its intersection mode is helpful during the case when there is more than supporting connected paths at an intersection.

Keywords: RBVT, RPS, VANET, MANET

1. Introduction:

Vehicular adhoc networks (VANETs) have recently received significant interest for improving road safety and drive convenience. For example, a vehicular network can propagate warnings to drivers behind a traffic accident to avoid multiple vehicle collision. In another example, VANETs can prevent traffic jam by coordinating real-time traffic flow. As more and more vehicles are equipped with wireless communication devices, VANETs can be envisioned in foreseeable future. Although being a subclass of mobile ad hoc networks (MANETs), VANETs have distinguished features from other ad hoc networks, such as wireless sensor networks (WSNs) and delay tolerant networks (DTNs). VANETs manifest dynamic topology and intermittent connectivity due to high mobility of vehicles. For instance, network structure changes in the way of vehicle groups birth (E), growth (A), combination (B), contraction (D), split (C), and death (F), illustrated in Fig. 1.

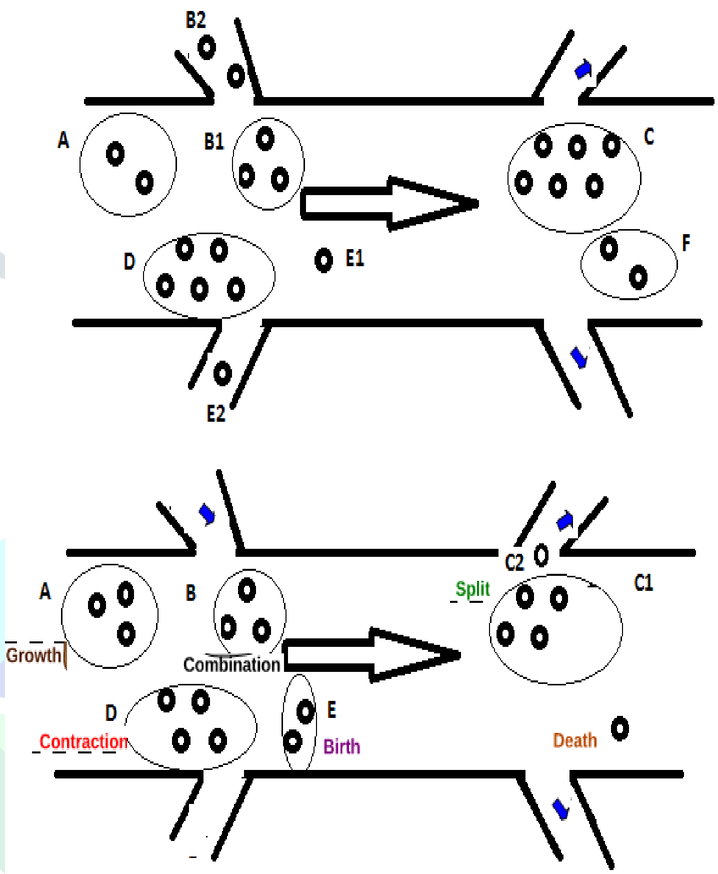

Figure 1: Intermittent connected vehicle-to-vehicle networks ,top at t=t1 and bottom at t=t2.

That means that links frequently break or establish and network topology evolves dramatically over time. In addition, in Fig. 1(a), nodes in C (the green shadow) and F (the orange shadow) are disconnected from other nodes in the network because they are out of the transmission range of any node in A, B1 and B2, D, E1 and E2. In other words, when vehicle density is low, network has high probability of being disconnected. Such dynamic intermittent network connectivity hinders applications of mobility-assisted schemes for message dissemination and topology control in VANETs

The unique features of VANETs present a challenging question: how to detect intermittently connected vehicle networks on the fly such as to explore mobility-assisted data forwarding and topology control in VANETs. Since link dynamics and network structure evolutions are mostly determined by vehicle mobility, which is not a prior-knowledge, the challenge is how

to characterize mobility correlations among vehicles such that we can trace real time network topology. Fortunately, vehicle mobility is usually constrained by road layout, speed limit, traffic flow, and driver's destination rather than random. On one hand, car movement depends on the close-by vehicles (e.g., similar speeds and same moving direction) and geographic surroundings (e.g., road layout and speed limit), i.e., vehicle mobility reveals spatial locality. Vehicles with similar spatial locality properties can maintain stable links and move as a group for a long time. On the other hand, being driven by human, vehicles likely frequent several community sites, such as home and office, i.e., vehicle mobility, like human mobility , exhibits temporal locality. Vehicles with similar temporal locality properties have high chance to travel overlapping routes and meet one another. Thus, there is a close relationship between network structure and spatial-temporal locality similarity of vehicles

2. Related Work:

Mr. Yugal Kumar et. al. **(2011),** according to them now a day, one of the most attractive research topics in the area of Intelligent Movement Control is Inter vehicle correspondence. In V2V correspondence or we can likewise called VANET i.e. vehicular specially appointed system; a vehicle can impart to its neighboring vehicles even without a focal Base Station. The idea of this immediate correspondence is to send vehicle security messages balanced or one to numerous vehicles through remote association. Such messages are typically short long and have short lifetime in which they must achieve at the destination. The Inter-vehicle correspondence framework is an adhoc system with high portability and changing number of hubs, where versatile hubs rapidly make impermanent systems and using so as to exchange messages from one hub to others various jumps because of restriction of short range. The steering in vehicular Ad hoc Networks (VANET) has pulled in numerous considerations amid the most recent couple of years. So in this work we are concentrating on the directing idea for the VANET i.e. standards for directing, disintegration of the steering capacity and prerequisite. The information conveyance through Vehicular Ad-hoc Networks is trying since it should productively handle quick topology changes and a divided system.

Sherali Zeadally et. al., (2012), according to them late advances in equipment, programming, and correspondence innovations are empowering the configuration and execution of an entire scope of diverse sorts of systems that are being sent in different situations. One such system that has gotten a considerable measure of enthusiasm for the last couple of years is the Vehicular Ad-Hoc Network (VANET). VANET has turned into a dynamic range of exploration, institutionalization, and advancement in light of the fact that it can possibly enhance vehicle and street security, movement effectiveness, and accommodation and additionally solace to both drivers and travelers. Late research endeavors have set an in number accentuation on novel VANET outline architectures and executions. A considerable measure of VANET exploration work have concentrated on particular territories including steering, TV, Quality of Service (QoS), and security. We study a percentage of the late research results in these areas.We present a survey of remote access benchmarks for VANETs, and portray a percentage of the late VANET trials and organizations in the US, Japan, and the European Union. Likewise, we additionally quickly display a percentage of the test systems right now accessible to VANET analysts for VANET recreations and we survey their advantages and confinements. At long last, they diagram a portion of the VANET examination challenges that still should be tended to empower the omnipresent sending and widespead appropriation of versatile, solid, vigorous, and secure VANET architectures, conventions, advancements, and administrations.

P. S. Nithya Darisini et. al. (2013) worked on Vehicular Ad hoc Network (VANET) which is a subset of Mobile Ad hoc Networks (MANET), late advances in equipment, programming, and correspondence innovations are empowering the configuration and execution of an entire scope of diverse sorts of systems that are being sent in different situations. One such system that has gotten a considerable measure of enthusiasm for the last couple of years is the Vehicular Ad-Hoc Network (VANET). VANET has turned into a dynamic range of exploration, institutionalization, and advancement in light of the fact that it can possibly enhance vehicle and street security, movement effectiveness, and accommodation and additionally solace to both drivers and travelers. Late research endeavors have set an in number accentuation on novel VANET outline architectures and executions. A considerable measure of VANET exploration work have concentrated on particular territories including steering, TV, Quality of Service (QoS), and security. We study a percentage of the late research results in these areas.We present a survey of remote access benchmarks for VANETs, and portray a percentage of the late VANET trials and organizations in the US, Japan, and the European Union. Likewise, we additionally quickly display a percentage of the test systems right now accessible to VANET analysts for VANET recreations and we survey their advantages and confinements. At long last, they diagram a portion of the VANET examination challenges that still should be tended to empower the omnipresent sending and widespead appropriation of versatile, solid, vigorous, and secure VANET architectures, conventions, advancements, and administrations.

Vehicular ad hoc network (VANET) is suffering from intermittent connectivity problems due to vehicles mobility, which challenge routing protocols. To address the issue another work proposed by **Xin Wang et. al. (2013)** that consists of a novel strategy called Reactive Pseudo-suboptimal-path Selection routing protocol (RPS). It is not quite the same as existing arrangements which depend on vehicles physical development to convey bundles in discontinuous integration situations. RPS allows the as of late passed crossing point to choose another way from imperfect way singularly controlled by nearby information. Along these lines it enhances the likelihood of transmission through remote channels. An examination in the middle of RPS and current conventions is exhibited and results demonstrate that the proposed RPS has higher bundle conveyance proportion and lower end-to-end delay.

Sourav Kumar Bhoi et. al., (2013), according to them Vehicular Ad Hoc Network (VANET) is a rising region of examination to give Intelligent Transportation System (ITS) administrations to the end clients. It is a testing point for its high versatility and successive connection interruption. As of late analysts are dealing with numerous particular issues identified with VANET like directing, TV, Quality of Service (QoS), security, architectures, applications, conventions, and so forth. The increment in vehicles prompts serious street mishaps and road turned parking lot in urban zones, so to annihilate these issues there ought to be a proficient and secure correspondence between the vehicles. Security is a principle issue these days in VANET on the grounds that malignant drivers in the system disturb the framework execution. This work exhibits another Position Based Secure Routing Protocol (PBSRP) which is a half and half of Most Forward inside of Radius (MFR) and Border Node based Most Forward inside of Radius (B-MFR) directing conventions. A security module is included this convention by utilizing station to station key understanding convention to keep the framework from different assaults. It comprises of three stages: introduction stage, ideal hub choice stage and secure information conveyance stage. Reproduction results shows PBSRP shows preferable results over MFR and B-MFR regarding end to end postponement and parcel conveyance proportion when noxious drivers are incorporated in the system.

3. Methodology:

We have developed an algorithm for routing protocol based on RBVT (Road-based using vehicular traffic) by using MATLAB 2010 A platform. This algorithm is further extended in to RBVT –RPS protocol for improving the performance of our average packet delivery ratio with minimum delay, by using a predefined weight factor taken similar to the intersection mode of RPS (Reactive Pseudo-suboptimal-path Selection routing protocol) protocol related packet delivery system. In this chapter we are described our both of the algorithms one by one sequentially in upcoming sections.

3.1 RBVT-P: RBVT algorithms description is given below.

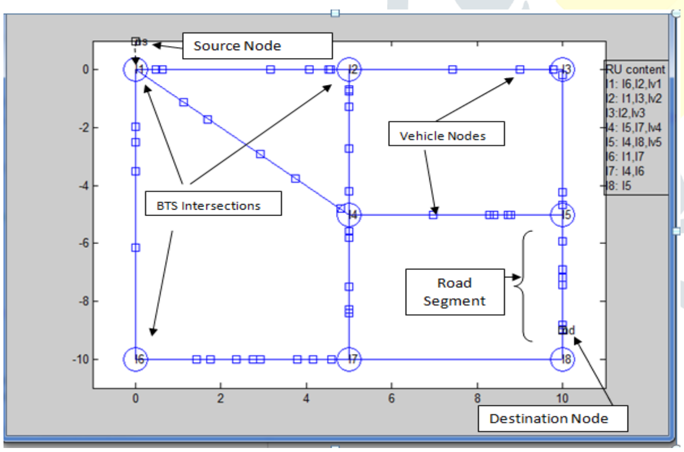

Fig 2: Network Roadmap for representing VANET routing.

3.1.1 Initialization: Initially we have assume that there is an vehicular network having 8 intersections I_1-I_8 , and it has random no of vehicles on each segments formed by connecting different inter sections, the maximum possible segment are given as:

I_1-I_2, I_2-I_3, I_3-I_5, I_4-I_5, I_5-I_8, I_4-I_7, I_2-I_4, I_1-I_6, I_6-I_7, I_7-$I_{8.}$.

The network roadmap is shown in figure 3.1. In this figure each segment is shown by solid lines and different intersections are shown by circles. In this way the intersections are different node of the graph and each segment is the branch of the graph. The square shapes scatter on different segment to represent the vehicle on these road segments. n_s and n_d are the source and destination of the vehicles .

The BTS is the main controlling unit that has a information of all the neighbouring intersections with respect to the current BTS intersections gives as $I_{all.}$. It also has information of the connected intersections and non connected intersections as I_c and I_{nc} . It also stores the information of no. of vehicles on all the segments which are formed by the BTS with the connected intersections given as V.

3.1.2 CP Generation : The position of vehicles is totally random and they changes on running the algorithms every times, each nodes and BTS has the connectivity packets Cp which consists of following information.

Cp perimeter- it represent maximum allowable range of packet transmission.

Cp stack- it preserve the information of all the segments through which packet is forwarded from source to destination.

Cp states- this information is either R or U. It represent that which of the segments are reachable(R) or unreachable (U).

3.1.3 Data Assessment: From the Cp packet information each node can access the information of the connected and non connected segments and no. of vehicles in each connected segments. For instant if

Cp. states = (“ R R U R R R U U R R U”)

Then it indicates that 1,2,4,6,9,10 are reachable and remaining are unreachable. In this way the connected segments list is for above Cp. states are given below

List of connected road segments are: [(1,6) ,(1,2) ,(2,1) ,(2,3) ,(3,2) ,(4,5) ,(5,4) ,(4,7) ,(5,8) ,(6,7) ,(6.1) ,(7,4) ,(7,6) ,(8,5)].

List of non connected road segments are: [(1,4) ,(4,1) ,(2,4) ,(4,2) ,(3,5) ,(5,3) ,(7,8) ,(8,7)]

Number of vehicles in connected and non connected segment = [4,6,6,3,3,5,5,5,6,8,4,5,8,6].

The total no. of vehicles are 50 (including connected and non connected both road segments.

The source is assumed as location (x, y) = (0, 1).

The destination is assumed as (x, y) = (10, -9).

3.1.4 Packet Forwarding: Initially from the information of each vehicles positions and all the BTS position distance between the source node with every intersection BTS is calculated, this distance is used to gather the information of the nearest BTS to the source.

In next step all the information about the BTS content is generated, formally information of connected and non connected segments, this information is saved as Ic, Inc, V. Hence the BTS content consists of 1x8 structure array shown below.

BTS = 1x8 structure array with fields.
Iall :
Ic :
Inc :
V:

BTS (1) = Iall: [6 2 4]
Ic : [6 2]
Inc: 4
V: [4 6]

BTS (2) = Iall: [1 3 4]
Ic: [1 3]
Inc: 4

V: [6 3]
BTS(3) = Iall: [2 5]
Ic: 2
Inc: 5
V: 3
BTS(4) = Iall: [5 7 1 2]
Ic: [5 7]
Inc: [1 2]
V: [5 5]
BTS(5) = Iall: [4 8 3]
Ic: [4 8]
Inc: 3
V: [5 6]
BTS(6) = Iall: [7 1]
Ic: [7 1]
Inc: [1x0 double]
V: [8 4]
BTS(7) = Iall: [4 6 8]
Ic: [4 6]
Inc: 8
V: [5 8]

BTS(8) = Iall: [5 7]
Ic: 5
Inc: 7
V : [6, 0]

3.1.5 Neighbouring Node Search : In next step the minimum distance of source node to all the BTS is found and nearest BASE station is taken as a current intersection I_J and it is assume that initially the next intersection I_{JX} =0 then after the loop wise iteration runs automatically for selection of I_{JNXT} for approaching the destination, the connected intersection to the I_J is taken as I_{JNXT} and a unicast is send by the BTS at I_J intersection and wait for acknowledgement message from the vehicular nodes . After waiting for a particular packet time tCP , at I_J base station we send unicast until it does not receives the acknowledgement , on receiving the acknowledgement the BTS calculated the no. of vehicles present at connected road segment which has send the acknowledgement, the segment which has a minimum no. of vehicles is selected for next segment which has a minimum no of vehicles and BTS on that segment end is considered as next current segment (I_{JNXT}) for controlling the transmission of data and decision of next segment in the root of accessing destination, at the end of this step Cp stack is updated with the value of I_J, I_{JNXT} and the timing involved in transmission of data from I_J, I_{JNXT} is stored in Cp.tstamp.

In this manner if the traffic over a segment is above than a threshold, then another intersection is selected as I_{JNXT} which has a minimum no. of traffic. In this way our RBVT algorithms runs iteratively and every times destination segments is checked and if the destination is reached the iteration stops automatically.

4. Result and Discussion:

Our algorithms for conventional RBVT-P routing is designed for 8 BTS node intersection points having 50 vehicular nodes scattered on 11 road segments as shown in figure below 3.

Table 1 : Routing Update Table	
I1	I6, I2, Iv1
I2	I1,I3, Iv2
I3	I2, Iv3
I4	I5, I7, Iv4
I5	I4,I8, Iv5
I6	I1,I7
I7	I4, I6
I8	I5

Each vehicular nodes iteratively receives the RU (route update) content from the BTS as shown in figure under the heading RU content(shown in table 3), where each row in the RU content table represent the BTS intersection name I_1, I_2 ,I_3 , I_4 , I_5 , I_6 , I_7 , I_8 and second to last column represent the intersection which are connected to the BTS of the respective row , where Iv represented that there is no connection with the particular intersection.

In this way in figure 3 it is given that

I_1: I_6, I_2, Iv_1

It indicates that I_1 is connected to I_6 and I_2 but with the I_4 there is a virtual connection I_{V1} (there is a road segment but connectivity lost). Similarly we can see that there are virtual connections Iv_2, are present between I_3 and I_5 , and I_{V3} are present between I_4 and I_1, and Iv_4 are present between I_5 and I_3 .

I_2: I_1, I_3, I_4.
I_3: I_2, Iv_2.
I_4: I_5, I_7, I_2, Iv_3
I_5: I_4, I_8, Iv_4.
I_6: I_1, I_7.
I_7: I_4, I_6.
I_8: I_5

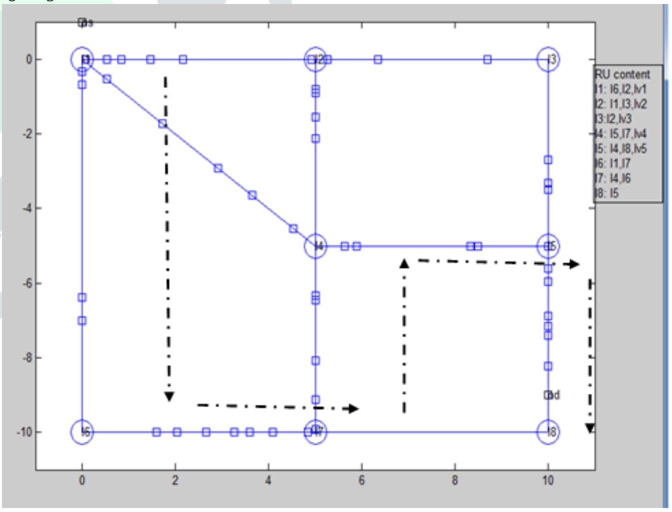

Fig. 3: Path followed by PBVT-P routing for reaching destination segment

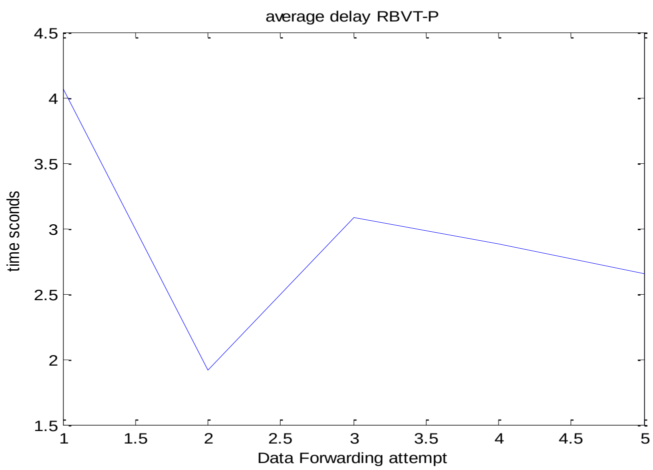

Fig 4: Average delay time(sec.) for forwarding data in each segment

5. Conclusion:

This thesis work based on the area of intelligent traffic control for the inter vehicles communication called as V-V communication or VANET. We are developed an algorithms with concerning an environment in which a vehicles can communicate to its neighboring vehicles with the control of distributed base station at different intersection point of road. The developed algorithms concentrate on the concept of direct communication by sending vehicles messages one to one to a destination vehicles via wireless communication .We have consider that this vehicle to vehicle system base algorithms in the above network with providing secure data transmission in a high mobility and changing location of the vehicle node in a predefined structured road map is generated by BTS information

References:

[1] Josiane Nzouonta, et. al, " VANET Routing on City Roads Using Real-Time Vehicular Traffic Information" IEEE transactions on vehicular technology, vol. 58, no. 7, september 2009.

[2] Vasco N.G.J. Soares et. al, " GeoSpray: A geographic routing protocol for vehicular delay-tolerant networks" 1566-2535/$ - see front matter 2011 Elsevier B.V.

[3] Mr. Yugal Kumar et. al., " A Survey on Routing Mechanism and Techniques in Vehicle to Vehicle Communication (VANET)" International Journal of Computer Science & Engineering Survey (IJCSES) Vol.2, No.1, Feb 2011

[4] Sherali Zeadally et. al., " Vehicular ad hoc networks (VANETS): status, results, and challenges" Springer Science+Business Media, LLC 2012.

[5] P. S. Nithya Darisini et. al., " A Survey of Routing Protocols for VANET in Urban Scenarios" Proceedings of the 2013 International Conference on Pattern Recognition, Informatics and Mobile Engineering (PRIME) February 21-22.

[6] Xin Wang et. al., " An Effective Routing Protocol for Intermittently Connected Vehicular Ad Hoc Networks" 2013 IEEE wireless communications and networking conference (wcnc): networks.

[7] Sourav Kumar Bhoi et. al, " A Secure Routing Protocol for Vehicular Ad Hoc Network to Provide ITS Services" International conference on Communication and Signal Processing, April 3-5, 2013, India.

[8] Yousef-Awwad Daraghmi et. al., "A Taxonomy Of Data Communication Protocols For Vehicular Ad Hoc Networks" 2013 - 151.100.17.32.

[9] Baraa T. Sharef et. al., " Vehicular communication adhoc routing protocols: A survey" elseveir 2013.

[10] Marco Conti et. al., " Mobile Ad Hoc Networking: Milestones, Challenges, and New Research Directions" IEEE Communications Magazine, January 2014.

[11] M. Heddebaut, J. Rioult, J. P. Ghys, C. Gransart, and S. Ambellouis, "Broadband vehicle-to-vehicle communication using an extended autonomous cruise control sensor," Meas. Sci. Technol., vol. 16, no. 6, pp. 1363–1373, Jun. 2005.

[12] W.-B. Zhang, H.-S. Tan, A. Steinfeld, B. Bougler, D. Empey, K. Zhou, and M. Tomizuka, "Implementing advanced vehicle control and safety systems (AVCSS) for highway maintenance operations," in Proc. 6th Annu. World Congr. ITS, Toronto, ON, Canada, Nov. 1999.

[13] Y. Ko and N. H. Vaidya, "Location-aided routing (LAR) in mobile ad hoc networks," in Proc. IEEE/ACM MobiCom, Dallas, TX, Oct. 1998, pp. 66–75.