A Fuzzy Based Route Optimization model for QoS Optimization in VANET

Jatin Malik
Department of Computer Science and Engineering, Sat Priya Group of Institutions, Rohtak, Haryana, India.

Rupali Malhotra
H.O.D in Computer Science Department, Sat Priya Group of Institutions, Rohtak, Haryana, India.

Abstract – Vehicle Ad hoc Network is one of most critical network defined under the constraints of mobile and sensor networks. As of public area network, it suffers from different integrated attacks. DDOS is one of such critical attack that degrades the performance of network. In this present work a fuzzy adaptive model is presented to provide effective communication under DDOS attack. The work has combined to the I2I observation and V2V communication to generate the path. The analysis comparative results show that the work has improved the communication throughput and reduced the communication loss.

Index Terms – DDOS, VANET, V2V, V2I.

1. INTRODUCTION

Vehicular Ad hoc Network is the specialized network form that is defined with unique characteristics set that makes it distinguished from other mobile networks. This network is defined under associated challenges and provides configurable properties along with associated challenges. Some of these challenges associated to mobile network are shown in figure 1. These challenges include the communication adaptive as well as architecture constraints based limitations of the network. The foremost challenge in vehicular network is dynamic communication and topology transformation. The network is established in wide area with mobile vehicle nodes. The position of these vehicles is based on the area scenario so that the dynamic topology formation is done. The network is also controlled by some infrastructure devices. These devices are established on road side with sensing range specification. The RSUs (Road Side Units) are established to provide the controlled communication with utilization of restriction range communication [14, 15, 16, 17]. The V2I and I2I communications are collectively formed to provide the utilization of available resources.

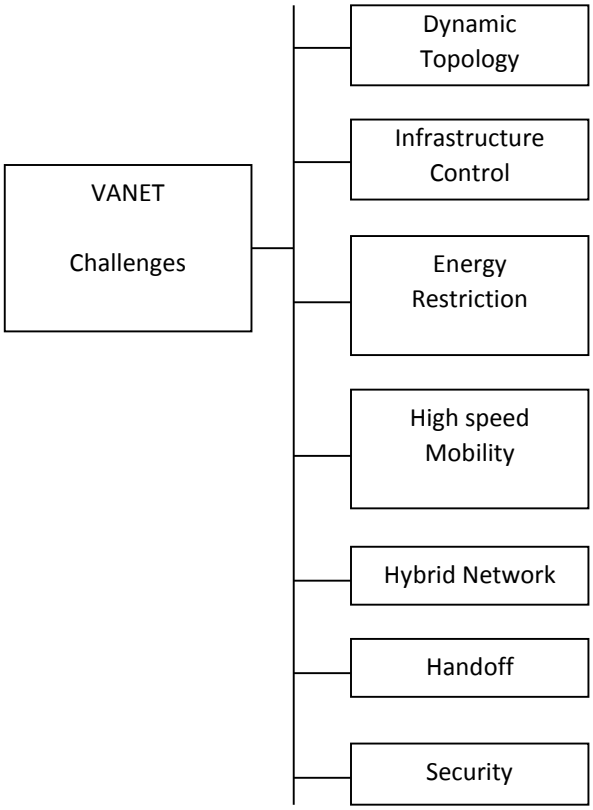

Figure 1: VANET Characteristics

Another property of vehicle nodes is the energy specification with each node. As the node participates in communication some amount of energy is consumed. The energy adaptive communication describes the network life and utilization of available battery. Another challenge in these networks is the variable and high speed mobility of vehicle nodes. The mobility is generally direction specific so that the predictive estimation and decisions can be taken to optimize the communication. Another challenge in mobile network is the hybridization of different network types and the associated technologies. Such as the same network can have Wi-Fi and WiMax adaptive base stations. A single node can be present in

more than over network coverage at the same time. As of public network, the network suffers from various internal and external attacks. These attacks can degrade the network performance or can reveal the network information.

In this paper, a route optimization model is presented for DDOS infected vehicle network. The work is defined under I2I adaptive analysis for reliable route generation. In this section, the challenges associated with vehicle network are discussed. In section II, the work defined by earlier researchers is discussed. In section III, the proposed research model is presented. In section IV, the results obtained from the work are presented. In section V, the conclusion of the work is presented.

2. RELATED WORK

Different researchers provided lot of work on VANET optimization in different aspects. The most challenge phenomenon associated with vehicle ad hoc network is MAC configuration and management. A significant research is provided by earlier researchers to utilize the MAC protocol in different ways for vehicle network. In this paper, some of the contribution of earlier researchers is discussed. Cristina Rico Garcia[1] has provided a work on design of an improved reliable MAC protocol. Author define the cell based analysis driven MAC protocol to provide localized communication during broad cast. This improved protocol is able to reduce the collision over the network. The high speed communication support is provided by the protocol along with cross layer communication. Author provided the intra cell communication scheme to provide the direction and speed aware communication. Hamid Menouar[2] has provided a study based work to identify the role MAC protocol in VANET optimization. Author analyze the network collision and provided the efficient communication under characteristics specification with high mobility. Author provided the safe communication under summarized and qualitative communication in vehicle network. Marthinus J. Booysen[3] has provided a study based work on MAC protocols in VANET. Author discussed different configuration of MAC for different scenarios and for different communication types. Author discussed the associated deployment along to optimize the communication in VANET. Khalid Abdel Hafeez[4] has provided a work on efficient and reliable MAC protocol configuration for VANET. Author provided the accident analysis adaptive communication. Author provided the MAC optimization under safety vector and provided the conditional traffic driven communication. Author provided the situation adaptive communication to provide the safe communication under constraints specification. The knowledge adaptive safe communication is provided to improve the analytical behavior of network. V. Baskar [5] has provided a work on broadcast services under TDMA adaptive communication in VANET. Author provided the safety adaptive improvement in protocol to provide the activity control adaptive communication. Jagruti Sahoo [6] has provided a partition adaptive message dissemination for MAC optimization. Author provided the service range based road safe communication to identify the emergency messages. Author control the density, accident adaptive communication in network.

M.Hari Prasad[7] has provided a performance adaptive communication in clustered routing model. Author defined the hierarchical communication model for route generation under multi metric analysis. Boangoat Jarupan[8] has provided the cross layer communication design to provide shared channel communication under dynamic constraints. A validation adaptive cross layer design is defined to optimize the transportation system. Pierpaolo Salvo[9] has defined service defined controlled communication under timer adaptive network. Author optimizes the MAC protocol under local characteristic optimization. B. Ramakrishnan[10] has provided a direction adaptive high speed communication under traffic observation. MAC protocol is defined under speed and direction observation to control the communication. K.Selvakumaran[11] has presented a contention window adaptive communication in vehicle adhoc network. Author defined the multi channel communication under channel sensing and priority adaptive communication. Author provided the frame adaptive analysis model for communication optimization. K. Sudharson[12] has provided a radio channel communication to optimize inter cluster communication in multi hop adaptive network. The traffic regulation is also provided to generate the cluster groups and region specific analysis to reduce the communication latency. Aarja Kaur[13] has provided the investigation on QoS aware routing by MAC optimization. Author reduced the communication delay to optimize the network communication.

3. PROPOSED MODEL

In this present work, an optimization to the vehicle network is provided under congestion. The network is here defined with high speed moving vehicle nodes. As the communication performed, the node communication observation is done under infrastructure specification.

The work has combined two stage analysis. In first stage, the region analysis is provided by the infrastructure device to analyze the region. This analysis is performed based on the density and distance parameters. These parameters are observed by the infrastructure device and the identification of effective communication region is done. In second phase of this work, the communication parameters are analyzed. The neighbor node election is performed based on the communication. The parameters considered for the analysis includes communication rate, loss rate and communication delay. These operators are analyzed collectively and the effective neighbor node is obtained. The process is repeated till the destination node not occurs. Here figure 2 is showing the algorithmic model defined to generate the optimized communication in the network.

3.1. Phase I

In this phase, the region adaptive parameters are analyzed. These parameters include the distance analysis and node density analysis in the particular region. This region is identified by the infrastructure coverage. The infrastructure coverage is here defined with specification of the device on the road size. As the communication request is performed by a vehicle node, the congestion analysis is applied by the region nodes. These region nodes are here analyzed under distance and density vectors. Based on these parameters the adaptive region is identification from the network.

3.2. Phase II

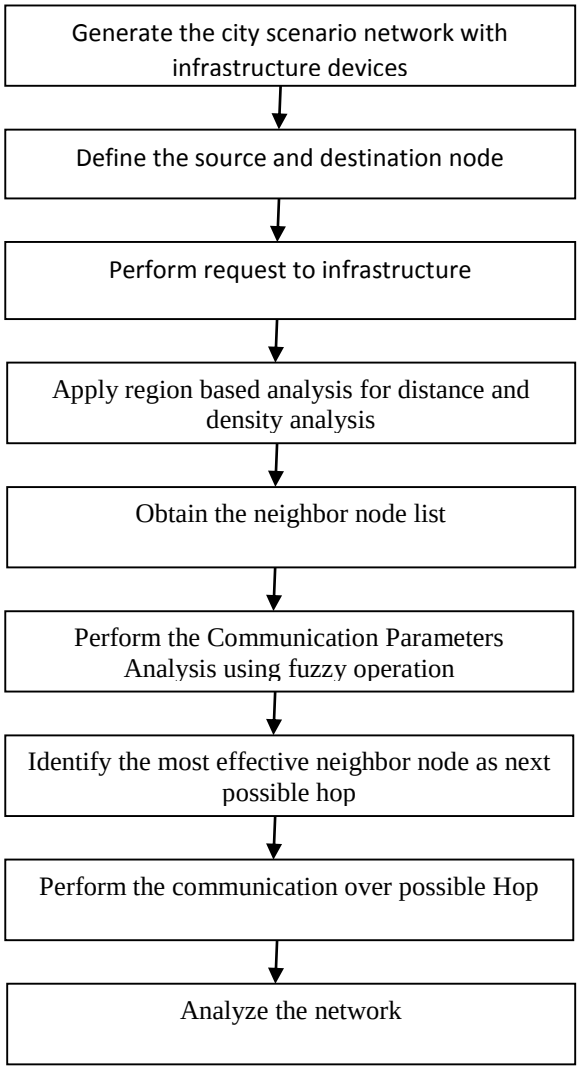

Figure 2: Flow of Work

In this phase, the node communication route analysis is performed based on the communication parameters. These parameters include communication loss analysis, communication throughput and packet delay analysis. Based on these all parameters the effective neighbor is obtained and by collecting these effective neighbors the communication route is generated over the network path. Based on these parameters the adaptive communication path will be formed over the network so that the optimized communication will be formed over the infrastructure based network.

The simulation of the work is applied on a real time network. The city scenario with infrastructure device is established to optimize the communication in this work. The flow of the work associated with this work is shown in figure 2. The results obtained from the work are discussed in next section.

4. RESULTS

In this work, the simulation of work is implemented in NS2 environment. The communication is applied with specification in city scenario. The work has performed the fuzzy based analysis on multiple parameters to optimize the congested vehicle network. The parameters considered in this work is shown in figure 1.

Parameter	**Value**
Number of Nodes	40
Network Scenario	City
Type of Network	Infrastructure Based
Simulation Time	5
Network Area	2000x2000
Data Rate	10.4e6
Bandwidth	20.0e6
Propagation model	Two ray ground
Antenna Model	Omni directional
MS Speed	Directional

Table 1: Simulation Parameters

The analysis of the work is done in terms of communication analysis. The communication is here identified in terms of packet communication and bit rate analysis. The comparative results obtained from the work given here under.

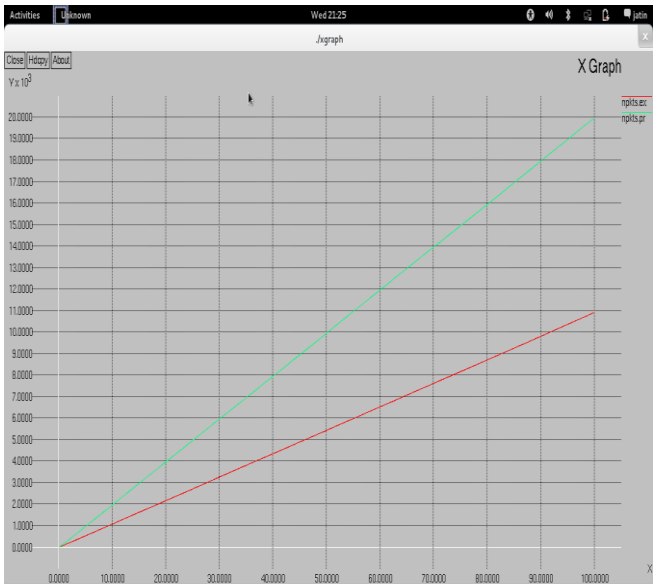

Figure 3 : Packet Communication Analysis

Here figure 3 is showing the packet communication analysis obtained from the work. The work is implemented for 100 sec. Here green line is showing the packet communication and red line is showing the communication in existing work. The resutls shows that the work has improved the packet communication over the network.

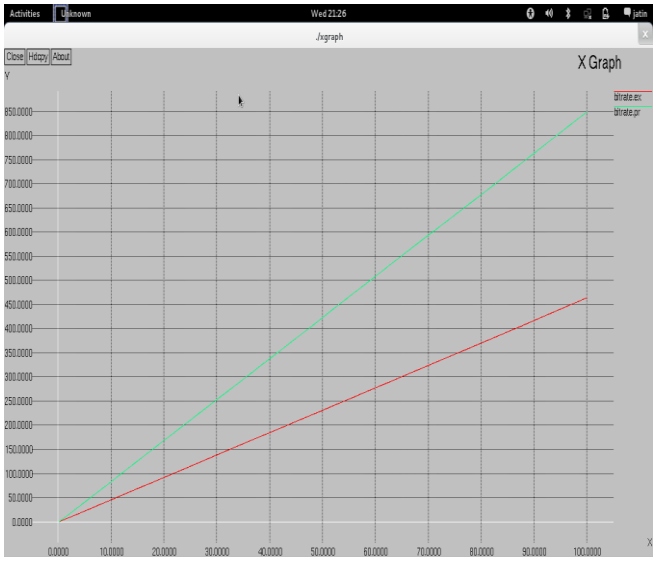

Figure 4 : Bitrate Communication Analysis

Here figure 4 is showing the bitrate communication analysis obtained from the work. The work is implemented for 100 sec. Here green line is showing the packet communication and red line is showing the communication in existing work. The resutls shows that the work has improved the packet communication over the network.

5. CONCLUSION

In this paper, a fuzzy adaptive route optimization model is presented for DDOS infected vehicle network. The work has combined the fuzzy adaptive analysis phase under I2I optimization. The work has improved the network communication and reduced the communication delay.

REFERENCES

[1] Cristina Rico Garcia," A Reliable MAC Protocol for Broadcast VANETs".
[2] HAMID MENOUAR," A SURVEY AND QUALITATIVE ANALYSIS OF MAC PROTOCOLS FOR VEHICULAR AD HOC NETWORKS", 1536-1284/06© 2006 IEEE.
[3] Marthinus J. Booysen," A Survey of Media Access Control (MAC) Protocols for Vehicular Ad-hoc Networks (VANETs)".
[4] Khalid Abdel Hafeez," DESIGN AND ANALYSIS OF AN EFFICIENT AND RELIABLE MAC PROTOCOL FOR VANETS", 2012.
[5] V.BASKAR," Efficient Broadcast Services Using TDMA Based For MAC Protocol in VANETs", International Journal of Science and Engineering Research (IJ0SER), 2013.
[6] Jagruti Sahoo," Binary-Partition-Assisted MAC-Layer Broadcast for Emergency Message Dissemination in VANETs", IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS 2011, 1524-9050 © 2011 IEEE.
[7] M.Hari Prasad," Performance Enhancement of VANETs Using Cluster Based Routing", International Journal of Innovative Research in Science, Engineering and Technology 2014, ISSN: 2319-8753.
[8] Boangoat Jarupan," A survey of cross-layer design for VANETs", 2011.
[9] Pierpaolo Salvo," Timer-based distributed dissemination protocols for VANETs and their interaction with MAC layer", 978-1-4673-6337-2/13 ©2013 IEEE.
[10] B. Ramakrishnan," Performance Analysis of 802.11 and 802.11p in Cluster Based Simple Highway Model", (IJCSIT) International Journal of Computer Science and Information Technologies 2010.
[11] K.Selvakumaran," Bayes Timeslot Utilization for Efficient Contention Access in VeMAC-VANET", International Journal of Computer Science and Mobile Computing 2013.
[12] K.Sudharson," GHOST - Geo Cache Hybrid On-Demand Scheme For Tracking VANET", International Journal of Engineering Science and Innovative Technology (IJESIT) 2013, ISSN: 2319-5967.
[13] Aarja Kaur," Simulative Investigation of QoS Aware Routing in VANET", Australian Journal of Information Technology and Communication ISSN 2203-2843.
[14] Joe, M. Milton, R. S. Shaji, and K. Ashok Kumar. "Establishing Inter Vehicle Wireless Communication in Vanet and Preventing It from Hackers."International Journal of Computer Network and Information Security (IJCNIS)5.8 (2013): 55.
[15] Joe, M. Milton, B. Ramakrishnan, and R. S. Shaji. "Modeling GSM Based Network Communication in Vehicular Network." International Journal of Computer Network and Information Security (IJCNIS) 6.3 (2014): 37.
[16] Ramakrishan, B., M. Milton Joe, and R. Bhagavath Nishanth. "Modeling and simulation of efficient cluster based Manhattan Mobility model for Vehicular communication." Journal of Emerging Technologies in Web Intelligence 6.2 (2014): 253-261.
[17] Ramakrishnan, B. "Performance analysis of AODV routing protocol in Vehicular ad-hoc network service discovery architecture." network 13.14 (2009): 15.