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AN APPROACH FOR ROAD TRAFFIC MANAGEMENT TO REDUCE TRAFFIC CONGESTION IN VANET

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ABSTRACT

Vehicular Ad-hoc network (VANET) is one of the best solutions which permit the vehicle to vehicle communication between nearby vehicles and nearby fixed equipment. In recent times transport efficiency plays an important part in the economic growth in advanced cities. Road traffic management involves monitoring of the actual traffic situation in real-time. With the goal of controlling the information from the vehicles, it is used in the traffic flows to reduce traffic congestion. This information is used to address with accidents and provide accurate and reliable traffic information in order to make predictions for drivers and transport authorities. Vehicle to Vehicle communication (V2V) and Vehicle to roadside Infrastructure communication (V2I) network is used to send and obtain the messages. The end result is simulated by using Intelligent Based Clustering Algorithm (IBCAV) and indicates this is one of the powerful ways to control congestion. The proposed technique guarantees reliable and well-timed delivery of messages to recognize congestion and avoids it.

Keywords: VANET, V2I, V2V, IBCAV algorithm.

1. INTRODUCTION

The vehicular ad-hoc network is a new form of network where nodes (i.e. vehicles) communicate with each other [1]. The ad-hoc network is a group of wireless mobile nodes without any fixed base station infrastructure and centralized control. In the Ad-hoc network, VANET is used for the continuous creation of a wireless network for data exchange in the domain moving vehicles. This fast growth within the number of vehicles on the roads has created a plethora of challenges for road traffic management authorities such as traffic congestion, increasing number of accidents, air pollution and so forth. VANET is a self sufficient and self-organizing wireless communication network. In this network, cars are called as nodes.

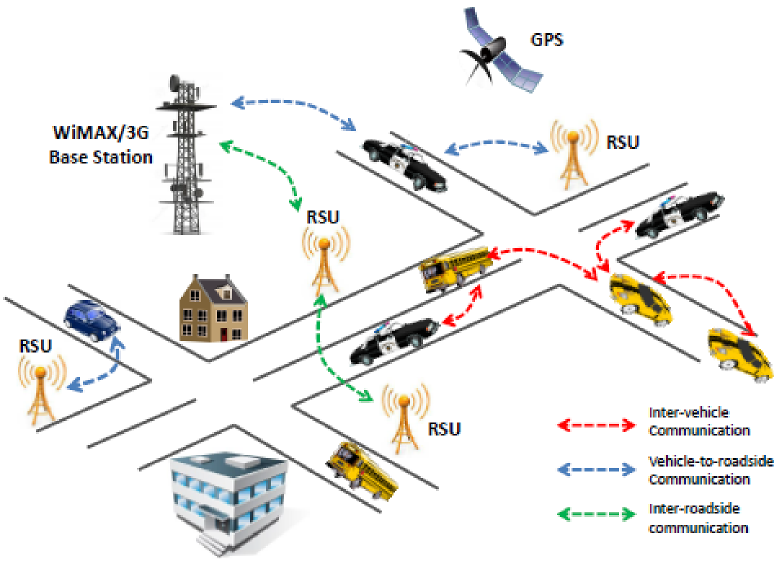

Figure 1. VANET Scenario

It involves themselves as servers or client for exchanging and sharing information. Each node acts as both host and router which moves arbitrarily and communicates with each other. The purpose of VANET is to switch data with high speed and to reduce the delay in communication range. The nature of the mobile node is continuously changed in VANET. The development of an effective system in the vehicular network has numerous advantages for road operators, as well as drivers point of view. Efficient movement alarms and data about traffic incidents will diminish car influxes, enlarge street well- being and enhance the sheltered driving on the Highways. The mobility patterns of VANET are confined with road maps. The two main forms of common routing protocols are Proactive and Reactive. Proactive algorithms contain nodes as data. To maintain the validity of data, it should be communicated between nodes which use algorithms for high bandwidth. Proactive algorithms are also called as table-based algorithms. DSDV, OLSR and STAR are referred as the algorithms used for routing purposes [2, 3].

Reactive algorithms operate to detect a route only when there is a need for a route. This method of routing is utilized by AODV, DSR and TORA algorithms. The disadvantage of the proactive method relates to its poor scaling system and the problem with the reactive method is that before transmission of the primary packet it needs to detect the route. This ends at longer transmission time and when the route is detected from its authentic point of departure to its destination, it could disappear even before the transmission of the first packet due to the high motion of the nodes. The active duration of a path declines with the wide variety of hops and the route also fade away at the same speed it appeared [4, 5]. VANET has the highest number of nodes and the clustering approach is an efficient solution to the scalability issue. The remainder of this paper is organized as follows: Section II presents the related works, Section III discuss proposed work and Section IV describes the simulation and the results and Section V concludes the paper.

2. LITERATURE REVIEW

The traffic congestion is one of the biggest issues around the world. There are many factors causing traffic congestion, such as rush hour, road construction, accident and bad weather. Those factors can cause traffic congestion and drivers who are unaware of congestion. The more extreme congestion is, the more time it will take to clear. This [6] might lead to a more efficient use of road infrastructure. There is a need for a system that provides useful information to drivers about traffic situations, Information such as congestion type, location and boundaries. The traffic Congestion system must relay this information to drivers within the congestion and those heading close to it. Congestion information may be useful for many VANET applications, such as route planning or traffic. Congestion information is collected as the number of vehicles passing a point per unit time by some roadside equipment and transmitted to different places for broadcasting to vehicles. The aggregate number of vehicles in the global has encountered an astounding development, increasing activity thickness and bringing on more mishaps.

The primary issue with the networks is spreading messages to vehicles at high speed. Integrating V2I, V2R and V2V method can provide the solution to this and it is achieved with a weighted cluster algorithm (WCA) and computing the overall performance on different parameters of the network [7]. The congestion information [8] is commonly available only at a single macroscopic level for all vehicles and is not customized for the requirements of each vehicle. For vehicles within the congestion to form their own picture, they need to collaborate using Vehicle-to-Vehicle (V2V) or vehicle-to-infrastructure (V2I) [9] communication. The information needs to be relayed to vehicles far away from the congestion and the vehicles heading closer to it may take actions [10].

VANET allows a tight connection between physical driving and the communication system, which requires considering the impact of each area and it is termed as a cyber-physical system [11]. An application-oriented technique that regards the specific goals of traffic for VANET protocol design has been recently stated for huge-area transportation networks with respect to simulators [12] and for understanding the influence of communication to driving safety at the microscopic level [13]. This allows the fastest way based on the tragic state to avoid congestion. However the overall performance of location-based traffic services can fail sometimes due to the disadvantages of inability to use in urban areas with tall buildings, where the satellite signals may be blocked. Another strategy to reduce congestion is to optimize traffic signals [14] deployed at intersections by analyzing the data collected in real time traffic. Collision avoidance systems [15, 16] are designed to detect a traffic incident in real-time and rapidly relay this information to nearby vehicles to prevent a collision. These systems are very different from traffic congestion systems. Vehicle-based GPS systems are used to discover and disseminate traffic congestion information [17] and the system is known as COC for VANET. This system maintains and disseminates three types of information: Raw Information (level 1), density information (level 2) and congestion area information (level 3).

A versatile activity sign control system focused on V2V communication is introduced. It permits the holding up time of the vehicles at the crossing point with queue duration. The idea of clustering is utilized for the vehicles approaching the convergence [18]. The timing cycle of traffic signals is controlled through vehicles in groups and it uses DBCV algorithm. This algorithm is a mix of cluster and dissemination procedure and is utilized to accumulate the obliged dense data. Clusters are formed around the heading of the vehicles in a given geographic district approaching the convergence. Street-smart uses clustering algorithms that work over a distributed network where each node analyzes the collected statistics and eliminating the need for a central entity [19]. IBCAV is a combination of cluster size, velocity and density, it is compared to a manner in which each of the elements is considered separately for header selection and reduce cluster head selection operation followed by a reduced usage of network resources and decline end-to-end delay, throughput is increased [20].

3. PROPOSED WORK

The proposed work includes the idea for detection of congestion and provides information to the driver and also communicates those to other vehicles. Clustering strategies are normally applied in VANETs to reduce beneficial aid consumption and enhance the overall performance of the network. Vehicles have the unique role of clustering and only a few of them chosen as cluster heads and transmit packets of information. At the same time as the vehicles are positioned as a cluster, it is very important to select a cluster head. In IBCAV, RSU is selected as a cluster head when it is within the limits of the cluster. RSUs have stronger processing capabilities than other nodes and when they are motionless, there is no need to change the cluster head. Traffic load is shaped by many factors such as street development, container necks climate and so on. The drivers are unaware of traffic load and the traffic burden is the additional time it will take to clear. The capacity of a driver is to recognize the road conditions and it will allow them to look for the alternate ways. In order to provide useful information to drivers about traffic, a system must recognize the traffic load, position and relay the data to drivers. These requirements are satisfied by traffic detection system.

To find the traffic load, an observer needs to identify the vehicles which are away from each other. Vehicles in the congestion have collaborated the usage of V2V (vehicle-to-vehicle) or V2I (vehicle-to-infrastructure) communication. Vehicle to Vehicle Communication is a technology which enables the vehicles to communicate with each other. Vehicle to Infrastructure communications is the wireless exchange of data between vehicles and highway infrastructure. In vehicle to infrastructure communication, the vehicle and the decision server communicate with each other for providing the traffic. In Vehicle to Road Side Unit communication, Road Side Units (RSUs) use the data of moving nodes like speed, distance from RSU, and route information of vehicles. This is a communication infrastructure used to support the route information during traffic. The different system parameters are,

Data Collection: Collect data from the environment such as the current location and speed.

Information Sharing: The information is shared between V2V and V2I communication.

Decision Server: Appropriate decision has to be taken so that the congestion can be detected.

Message Broadcast: The warning message is broadcast continuously and provides information to the driver and also communicates these to other vehicles.

4. SIMULATION RESULT

The proposed approach has distinctive scenarios. First, the appropriate communication method for the vehicle 2 vehicle communication using Intelligent Based Clustering Algorithm (IBCAV) is used. The main aim of using this algorithm is to enhance the performance of the network. In IBCAV a few essential elements are considered such as cluster size, velocity and density. In clustering techniques, moving nodes are divided into different groups and put together in a single cluster based on certain rules. The size of each cluster represents the range of vehicles in a highway, within a communication range and form a cluster. In each cluster, a vehicle should be designated as a cluster head. IBCAV locate the quality of communicating nodes (v) by which the stability of network parameters is stable. The key parameters are connectivity, mobility and speed. Connectivity parameter indicates that the vehicles are in identical range or not. Mobility indicates the distance between the vehicles and the speed indicates the traveling time of the vehicle.

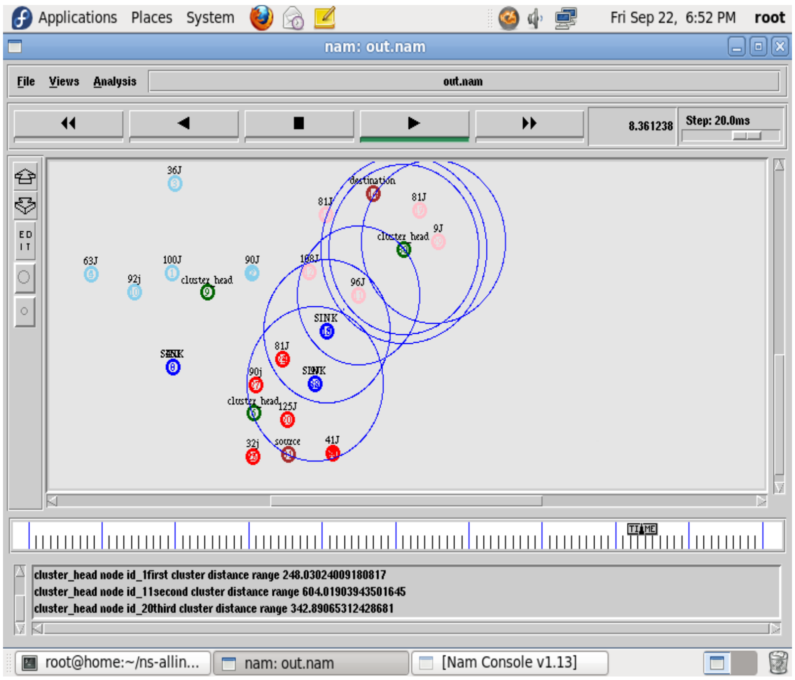

Figure 1. Simulation Scenario of nodes

The performance of the vehicular network is calculated by means of parameters such as Packet Delivery Ratio, Routing Overhead and End to End Delay. Throughput is defined as an average number of bits, bytes or packets per unit time.

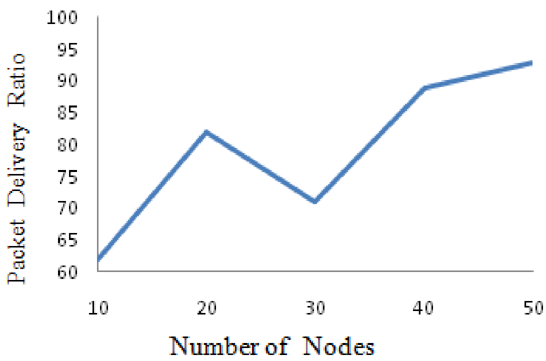

Figure 2. Packet Delivery Ratio

The Packet Delivery Ratio is the ratio of the received packet and sum of dropped and received packets in the network.

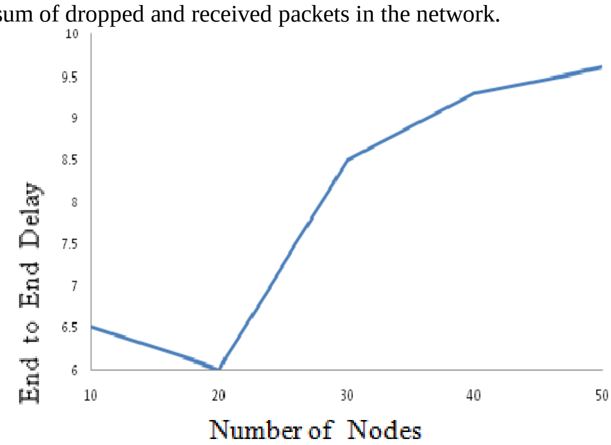

Figure 3. End to End Delay

The End to End delay is a time required by a packet to reach its destination

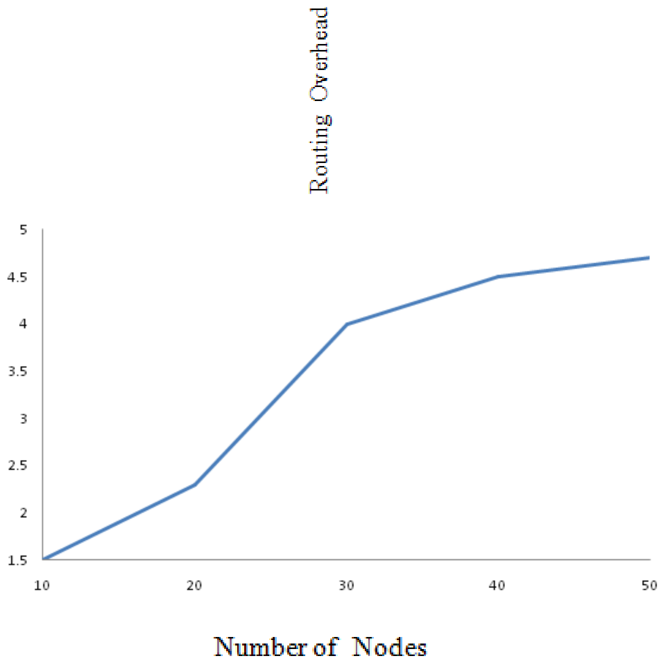

Figure 4. Routing Overhead

The Routing Overhead is the total number of routing packets travel in the network at simulation time.

5. CONCLUSION

VANET is a network of vehicles where nodes are capable to communicate with each other. This work evaluated the performance of VANET with parameters, i.e. routing overhead, packet delivery ratio, end-to-end delay and throughput. The different events happen on the road and its condition information is broadcasted to alert the drivers about the congestion. This timely information is useful for taking a decision and to the broadcasted message. The main issue in the network is to spread messages in vehicles at high speed. In IBCAV, control packets of network decreases and packet delivery ratio increases. Simulation results indicate that each of the elements is considered separately for header selection and reduce the cluster head selection operation by a reduced usage of network resources with the decline of end-to-end delay and throughput is increased.

REFERENCES

[1] Azzedine Boukerche, Horacio A.B.F. Oliveira, Eduardo F. Nakamura, Antonio A.F. Loureiro, "Vehicular Ad Hoc Networks: A New Challenge for Localization-Based Systems", A.Boukerche et al./Computer Communication (2008).

[2] Sh. XU, S. Lee, "A Direct Routing Algorithm with Less Route Built Throughput", International Conference on Traffic and Transportation Engineering (ICICN 2012).

[3] U. Nagaraj, Dr. M. U. Kharat, P. Dhamal, "Study of Various Routing Protocols in VANET", International Journal of Computer Science & Technology, IJCST, Vol. 2, Issue 4, 2011.

[4] K. Pandy, A. Swaroop, "A Comprehensive Performance Analysis of Proactive, Reactive and Hybrid MANETs Routing Protocols", IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 6, No 3, 2011.

[5] R. Kumar, M. Dave, "A Comparative Study of Various Routing Protocols in VANET", International Journal of Computer Science Issues, Vol. 8, Issue 4, No 1, 2011.

[6] Pritesh Patwa Rudra Dutta," Joint Modeling of Mobility and Communication in a V2V Network for Congestion Amelioration", Computer Science, North Carolina State University, (2006).

[7] Prashant Panse,Dr.Tarun Shrimali,Dr.Meenu Dave - "An Approach for preventing Accidents and Traffic Load Detection on Highways using V2V Communication in VANET", International Journal of Information,Communication and Computing Technology (IJICCT), 2016.

[8] Reshma R, Nayak, Sahana S K," Smart Traffic Congestion Control Using Wireless Communication", Journal of Advanced Research in Computer and Communication Engineering, (September 2013).

[9] Mohamed Watfa," Advances in Vehicular Ad-Hoc Networks: Developments and Challenges", University of Wollongong, UAE, (2010).

[10] Tarun Prakash, Ritu Tiwari," Counter-based Traffic Management Scheme for Vehicular Networks", Journal of Emerging Trends in Computing and Information Sciences, JUNE (2011).

[11] E. A. Lee,"Cyber physical systems, Design challenges, Elect. Eng, Comput.Sci.Dept, Univ.California, Berkeley, CA,Tech. Rep.UCB/EECS-2008.

[12] T. Gaugel, F, Schmidt-Eisenlohr, J, Mittag, and H. Hartenstein, "A change in perspective: Information-centric modeling of inter-vehicle communication," in Proc.8th ACM Int.Workshop VANET,2011, pp. 61–66.

[13] D.Baselt, M.Mauve and B.Scheuermann, "A top-down approach to inter-vehicle communication (poster)," in Proc. 3rd Annu. IEEE VNC, 2011, pp. 123–130.

[14] Barba, C.T, Mateos, M.A, Soto P, Mezher A.M, Igartua, M.A, "Smart city for VANETs using warning messages, traffic statistics and intelligent traffic lights," Intelligent Vehicles Symposium (IV), 2012 IEEE, vol., no., pp.902,907, 3-7 June 2012.

[15] Rawashdeh Z.Y and Mahmud S.M," Intersection Collision Avoidance System Architecture,5th IEEE Consumer Communications and Networking Conference, 2008, pp. 493 - 494.

[16] Mak, T.K, K.P Laberteaux and R Sengupta," A Multi-Channel VANET Providing Concurrent Safety and Commercial Service," Proceedings of the 2nd ACM international workshop on Vehicular Adhoc networks, January 2005.

[17] Fukumoto, Junya, et al,"Analytic Method for Real-Time Traffic Problems by Using Content Oriented Communications in VANET", 7th International Conference on ITS, 2007, pp. 1-6

[18] Maslekar N, Boussedjra M, Mouzna J, Labiod H," VANET based Adaptive Traffic signal Control",IEEE 73rd Vehicular Technology Conference (VTC Spring), pp.1-5,2011.

[19] Dornbush S and Joshi A," StreetSmart Traffic: Discovering and Disseminating Automobile Congestion using VANET", Vehicular Technology Conference. 2007, pp. 11-15.

[20] Mehrnaz Mottahedi, Sam Jabbehdari and Sepideh Adabi," IBCAV: Intelligent Based Clustering Algorithm in VANET", International journal of computer science issues, vol 10,issue 1, January 2013.