International Journal of Information Movement Vol.2 Issue VII (November 2017)
Website: www.ijim.in ISSN: 2456-0553 (online) Pages 111-117

CLUSTERING TECHNIQUE USING PSO BASED VANET

Chetna
Research Scholar
Department Of Electronic & Communication Engg.
Galaxy Global Group of Institutions, Dinarpur

Saranjeet Singh
Faculty
Department of Electronic & Communication Engg.
Galaxy Global Group of Institutions, Dinarpur
Email: saranjeetsinghbabra@gmail.com

Abstract: Presented a stable clustering technique based on the changes in the relative mobility of the vehicles which is calculated by finding the average of the relative speed of all the same direction neighbors. The two factor which are holding back the development of VANETs. Firstly, there is a lack of traffic analysis & modeling for VANETs. Secondly, network optimization for VANETs needs more investigation. It includes the traffic dynamic with VANETs provide a network optimization and anomaly detection for VANETs. The method of implementation of a tool for deploying Matlab. The data is forwarded over a set of groups with an optimal Cluster Head which is selected using PSO optimization algorithm. throughput, speed value and distance between neighbours are used to form a cluster

Keywords: VANET,V2V,V2I,Cluster,PSO

1.0 Introduction

Vehicular ad hoc networks (VANETs) are created by applying the principles of mobile ad hoc networks (MANETs) the spontaneous creation of a wireless network for data exchange to the domain of vehicles. VANETs were first mentioned and introduced in 2001 under "car-to-car ad hoc mobile communication and networking" applications, where networks can be formed and information can be relayed among cars. It was shown in figure1.1 that vehicle-to-vehicle and vehicle-to-roadside communications architectures will co-exist in VANETs to provide road safety, navigation, and other roadside services. The term VANET became mostly synonymous with the more generic term inter-vehicle communication (IVC), although the focus remains on the aspect of spontaneous networking, much less on the use of infrastructure like Road Side Units (RSUs) or cellular networks.

1.1 Inter-Vehicle Communication

This is vehicle to vehicle architecture where vehicles act as both consumers and producers as vehicles receive information from other vehicles in the network and distribute that information to other vehicles in the network. So, both collection and distribution of data are done within the network for faster delivery of messages [3] and uses multi-hop multicast/broadcast to send traffic related information over multiple hops to a group of receivers. In V2V, vehicles only need to be take care of activity on the road ahead and not behind [4].

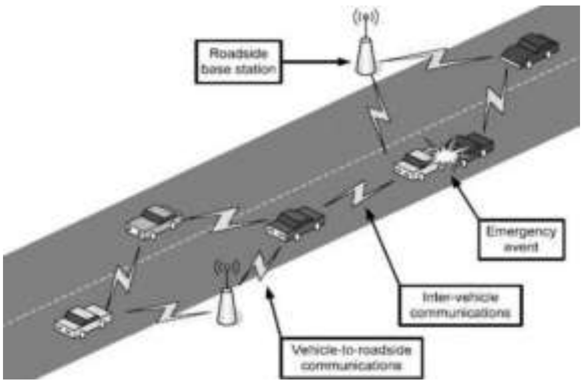

Figure 1.1: Architecture of V2V and V2I Communication

1.2 Vehicle-to-Roadside Communication

This is vehicle to infrastructure wireless architecture in which infrastructure is used to collect information from vehicles and provide that information to other vehicles when necessary [3] and represents a single hop broadcast where the RSUs send a broadcast message to all equipped vehicles in the vicinity. V2R communication configuration provides a high bandwidth link between vehicles and roadside units. The RSUs may be placed in every kilometer or less, allowing high data rates to be maintained in heavy traffic [4].

2.0 Clustering

Clustering in Vehicular Ad-hoc Networks is one of the schemes used to transfer the data from one node to another in the cluster[19]. Clustering neighbor vehicles manageable units is crucial to achieve efficient and reliable safety communications. Among vehicles without any limitations [7]:

- Too many vehicles can interface with each other in contention for radio bandwidth for transmissions.
- All messages may propagate everywhere, flooding the network system.

In VANETs nodes may be densely populated and lined on roadways, the conventional clustering strategies may not be effective to form efficient groups and organize vehicles in the clusters. More organizing methods need to be derived with the consideration of the VANET environment. The cluster formation should form clusters based on the spatial-temporal stability of the mobiles nodes forming the ad-hoc networks.

2.1 Parts of Cluster: Cluster approach consists of three parts, cluster head, cluster gateway and cluster member.

a) **Cluster head** :- It is a local coordinator for its cluster which performs transmission arrangement and data forwarding.
b) **Cluster gate way**:- It is a non cluster head node which accesses the neighbor node and forward the data in between clusters.
c) **Cluster member** :- It is usually called the ordinary cluster node which participates in the same cluster without any inter link between the adjacent clusters.

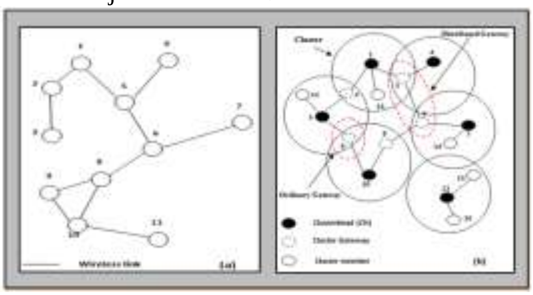

Figure 2.1 : Nodes in flat and cluster structure

For the performance of cluster nodes different algorithms and protocols are defined which focus on the minimum number of cluster. Most VANET clustering algorithms are derived from MANET (Mobile Ad-hoc network) and these algorithms clustering schemes considering only position and direction of nodes located in a geographic location. The existence of the nodes doesn't mean that they exhibit same mobility pattern we believe that VANET clustering have full status elements; speed, location, formation of topology and direction instead of considering location and direction only [6]. VANET have commercial applications where VANET can play major role can be categorized into two broad categories:

2.2 Safety Related Applications for VANET: These applications are used to increase the safety on the roads. These are divided into different categories:

1) Collision Avoidance of Vehicles: According to studies, 70% accidents can be avoided if drivers were provided a warning before collision. If a driver get a warning message on time the collision will be avoided to secure the driver life.
2) Cooperative Driving System: Drivers can get information for traffic related issues like curve speed warning, Lane change warning etc. These signals can co-operate the driver for a safe driving.
3) Traffic optimization Scheme: Traffic can optimized by the use of sending information like jam, accidents, road construction etc. to the vehicles so that they can choose their different path and can save time and resources.

2.3 User Based Applications for VANET: These applications provide the user information. A VANET provide following services for the user apart from safety:

1) Peer to peer application system: These applications are useful to provide services like sharing music, movies, messages etc. among the vehicles in the network of nodes.
2) Internet Connectivity scheme: VANET provides the constant connectivity of the Internet to the users for long time through which people connect with each other for sharing of information and to get the valuable knowledge.
3) Other services scheme: VANET can be used in other user based application like payment service to collect the tall taxes, to locate the fuel station, restaurant, bills etc [8,9].

3.0 Related Work

Salim Bitam et.al. (2015) presented a new cloud computing model for VANET called VANET Cloud. The proposal is based on two sub-models: permanent and temporary clouds. The VANET-Cloud model consists of three layers. The client layer is formed by different cloud end users. The cloud layer is based on stationary data centers and mobile ones such as vehicular resources. To ensure communication between the client layer and the cloud layer, a third communication layer is proposed. In vehicular networks, reduced delay, efficiency, scalability, reliability, and security are very crucial to improve road safety and passenger comfort through intelligent transportation systems (ITS). The problem is the improvement of energy efficiency and include security and privacy, data aggregation, energy efficiency, interoperability, and resource management [16]. Therefore **S. Barghi et.al. (2009)** proposed a new protocol, which selects a route with the longest lifetime to connect VANET nodes to the wired network. It consider vehicles to be stationary or mobile, but the gateways to be purely stationary. The authors use two metrics, namely Link Expiration Time (LET) between adjacent vehicles and Route Expiration Time (RET) between vehicles and gateways. Communication with gateways is pro-active and gateway handover is also addressed. LET and RET reflect the stability of the link between two adjacent vehicles and the life-time of the route between the vehicles and the gateways, respectively. By defining these metrics, the authors established pro-active communication between the vehicles and the fixed gateways by measuring the stability of the links and updating the progress towards the destination, after that **Tarik Taleb et.al. (2010)** a clustering approach with a risk aware collaborative vehicular collision avoidance systems. Vehicles are clustered based on their velocities, their direction of movement, and inter-vehicle distances. Additionally, a risk-aware Media Access Control (MAC) protocol is designed to increase the responsiveness of the system by associating an emergency level with each vehicle in its corresponding cluster. Though risk-aware collision avoidance is beyond the scope of our paper, our clustering mechanism is also metric-based. Hence due to the inconsistency and unpredictable nature of mobility speed do not base our clustering on vehicles' velocities . Then UMTS signal strength his considered and discussed in].Therefore the lowest ID clustering algorithm]is one of the easiest way to cluster mobile nodes for wireless networks. Using this algorithm, all of the wireless nodes broadcast beacon messages in which the node IDs are encapsulated

4.0 Proposed Work

Based on the above description, Particular Swarm Optimization can solve formation reconfiguration problem. The algorithm can be divided into two stages, the Particular Swarm Optimization stage and the Genetic algorithm stage. The solutions can be found by the following steps:

Step 1: Initialize M nodes randomly, the max iteration time Ncmax,. The crossover probability and mutation probability are 0.9 and 0.05 respectively.

Step 2: Calculate the objective function values of all nodes, store the position of the node with the minimum objective function value as the global best node.

Then, we can get the new objective function value of x_i and record it as f_i' . If f_i' is less than F_i , the current personal best node's objective function is f_i' , and the current personal best position is the new position. If$f_i'$is less than G_{pso} , the global best node's objective function value is f_i' and the global best position is the new position.

Step 3: Genetic algorithm stage has three operators, namely selection, crossover, and mutation, described as follows:

Step :1for i = 1:n

Step 2 current_fitness(i) = (current_position(:,i));

Step 3 : end

Step 4 :local_best_fitness = current_fitness ;

Step 5 global_best_fitness,g] = (local_best_fitness)

Step 6 :for i=1:n

Step7:globl_best_position(:,i)= n_best_position(:,g)

Step8: Velocity=w*velocity+ *(R1.*(local_best_position-current_position))+ c2*(R2.*(globl_best_position-current_position));

Step 9: options.nPopulation = 15;

```
options.maxIter = 50;
iter = 0 ;        Itera
while  (iter<bird_setp )
iter = iter + 1;
for i = 1:n,
current_fitness(i) = tracklsq(current_position(:,i)) ;
end
for i = 1 : n
ifcurrent_fitness(i) <local_best_fitness(i)
local_best_fitness(i)  = current_fitness(i);
local_best_position(:,i) = current_position(:,i)   ;
end
end
```

5.0 Result Analysis

There are various tools available for study of VANET mobility like FleetNet from DaimlerChrysler which used simple wifi based interface with framework data provided from real world systems, NHTSA (National High-way Traffic Safety Application) simulator, Clarion simulator and many more. The advantage that MATLAB offers is that it is widely available, continuously updated and has wider reach. The lack of real parallel threads as it was observed does not diminish the utility of the tool for building up models for VANET system tests. Also the mobility and generation topologies for various models are already available for MATLAB which can be made use of to save development time. As the majority of tools available at present do not have the ease and widespread reach, using MATLB offers unique advantage over other systems.

5.1 Comparison Analysis of Existing and Proposed Technique of Throughput

Comparison of Throughput: Figure 5.1 presents the performance of the existing and the proposed protocols in terms of throughput parameter. It shows that proposed outperforms exciting with increasing in the number of vehicles. The throughput value proposed is more elevated than the basis version. It means that the majority of data packets sent to the destination has been arrived successfully. Throughput is a measure of how much traffic is successfully received at the intended destination in a unit interval of time. A routing protocol should try to maximize this value. In case of session-oriented traffic, the most important parameter is time needed to complete a session. An application layer at the destination node only gets the packets after all the packets are received in the correct order.

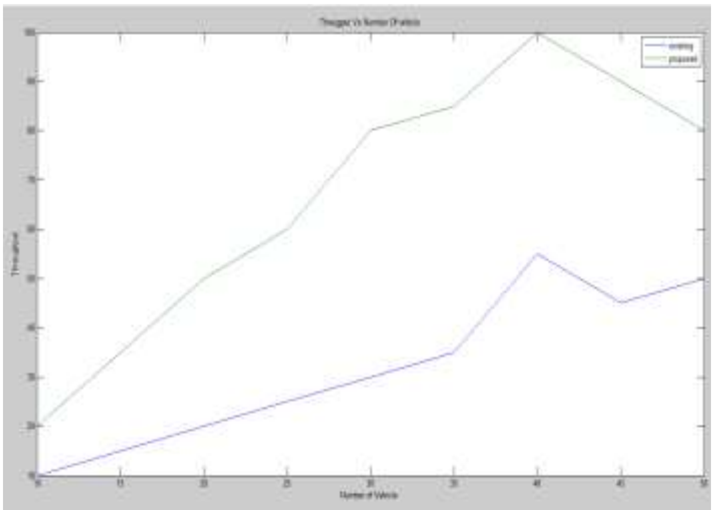

Figure 5.1: Graph for No. of out of range nodes Vs time

Table 5.1 Dataset for Out of Range Node

No of nodes	No of Throughput (Existing Technique)	No of Throughput (Proposed Technique)
10	4	20
15	12	35
20	18	50
25	24	60
30	28	80
35	32	85
40	40	100
45	43	90
50	49	80

5.2 Comparison Analysis of Existing and Proposed Technique of Rate of Dropped Packet

5.2.1 Comparison of Rate of Dropped Packets: According to Fig.5.2, it can be seen that at interval there is an ignorable difference between both protocols in term of average of dropped packets. However, as the number of vehicles increases our method performs better than existing. Indeed, the rate of dropped packets value of existing increases from 22% at 45 vehicles to 24% at 50 vehicles. However, Proposed maintains its good behavior from 25% at 45 vehicles to 30% at 50 vehicles.

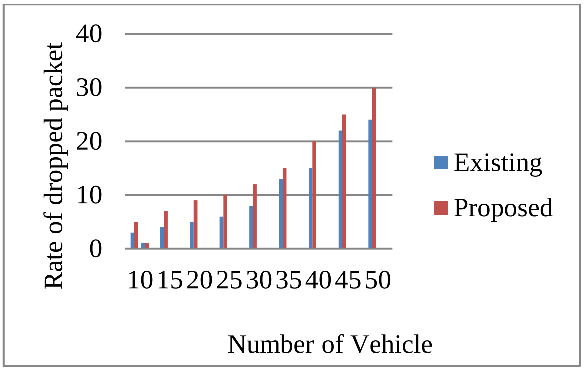

Figure 5.2: Rate of Dropped Packet using existing and proposed techniques

Table 5.2: Rate of Dropped Packet for Existing and Proposed Techniques

No. of nodes in network	Throughput(No. of successful deliveries) (Existing Value)	Throughput(No. of successful deliveries) (Proposed Value)
10	3	5
15	4	7
20	5	9
25	6	10
30	8	12

35	13	15
40	15	20
45	22	25
50	24	30

5.3 Comparison Analysis of Existing and Proposed Technique of Comparison of Overhead

5.3.1 Comparison of Overhead: In this Fig. 5.3, Proposed outperforms existing in terms of the average of routing overhead. That is because in the improved version, the concept of forwarding the data over a set of vehicles (cluster) reduces the routing overhead compared to exciting approach.

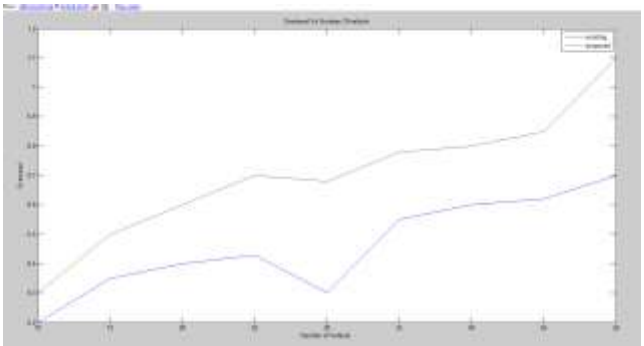

Figure 5.3: No. of nodes in network overhead in two techniques

Table 5.3: Number of overhead for Existing and Proposed techniques

No. of nodes in network	No. of dead nodes (Existing Value)	No. of dead nodes (Proposed Value)
10	0.2	0.3
15	0.35	0.5
20	0.4	0.6
25	0.43	0.7
30	0.3	0.68
35	0.55	0.78
40	0.6	0.8
45	0.62	0.85
50	0.7	1.1

Packet delay factors out this waiting time and hence favours multi-path algorithms which deliver packets in an out-of-order manner but with smaller delays is measure tells us how many data packets are successfully delivered at their destinations. Under saturated loads a 1% improvement in packet delivery ratio at times means about few 100,000 more data packets delivered at their destination.

6.0 Conclusion and Future Scope

In this paper, we have propsed Particular Swarm Optimization based Vanaet's environment. The data is selected a set of group an cluter head using Particular Swarm optimzation alogrthim. Speed value,Vehicle density and best value is used to form of cluster.This proposed work reduces the avearge number of dropped packet and decrese the unused path. Since most applications in VANETs favour broadcast transmission as opposed to point-to-point routing, routing protocols should be designed to address the broadcast storm problem to avoid unnecessary loss of important safety related packets during a broadcast storm

As future work, we aim to investigate the use of VMaSC LTE in urban traffic scenarios and extend VMaSC-LTE architecture with data aggregation and calculation of the clustering metric with additional information such as the most probable path information of the vehicles. In the future, this assumption can possibly be weakened, so that some nodes can work without this knowledge. We would like to further analyze the solution for the overhead it induces in the network.

7.0 References

1. GrzegorzWolny"**Modified DMAC Clustering Algorithm for VANETs**"The Third International Conference on Systems and Networks Communications, page no. 268-273 IEEE 2008.
2. Marco Fiore Jerome Harri, FethiFilali, Christian Bonnet "**Vehicular Mobility Simulation for VANETs**" IEEE 2007.
3. Zaydoun Y Rawashdeh and Syed Masud Mahmud "**A Novel Algorithm to form Stable Clusters in Vehicular Ad Hoc Networks on Highways**" pp. 1-13 Springer 2012.
4. B.Ayyappan,Dr.P.Mohankumar "**Vehicular Ad Hoc Networks (VANET): Architectures, Methodologies And Design Issues**''Second International Conference on Science Technology Engineering and Management pp. 177-180 IEEE 2016.
5. Saif Al Sultan, Moath M. Al Doori, Ali H. Al Bayatti, HussienZedan "**A Comprehensive Survey on Vehicular Ad Hoc Network**'' page no. 1-39 IEEE 2013.
6. W. Xiaoling, S. Lei, W.Jin, J. Cho and S. Lee "**Energy Routing Algorithm Based Virtual Scheme for VANETs**" pp. 373-382 Springer 2006.
7. B. Singh and D.K Lobiyal "**A Novel Energy Aware Cluster Head Selection Based on Optimization for VANETs**" Human Centric Computing and Information Sciences pp. 1-18 Springer 2012.
8. S. Thilagavathi and B.G. Geetha" **Energy Aware Swarm Optimization with Intercluster Search for VANETs"** The Scientific World Journal IEEE 2015.
9. Tao Song and LianfengShen " **Cluster Based Directional Routing Protocol in VANET** '' pp. 1172-1175 IEEE 2010.
10. Surmukh Singh Sunil Agarwal "**VANETRouting Protocols: Issues and Challenges**''IEEE 2014.
11. S. Barghi, A. Benslimane and C. Assi "**An Efficient Routing Protocol for Connecting Vehicular Networks to the Internet**" International Conference on World of Wireless, Mobile and Multimedia Networks IEEE 2009.
12. SalimBitam, AbdelhamidMellouk, "**VANET CLOUD: A Generic Cloud Computing Model for Vehicular Ad Hoc Networks**" IEEE 2015.
13. .EssaiesMeriam" **VANET Adaptive and Reliable Broadcast Protocol**" IEEE 2014.
14. TarikTaleb, A.Benslimane and K.B Letaif "An **Effective Risk Conscious and Collaborative Vehicular Collision Avoidance Systems**" IEEE 2010.
15. E. Sakhaee, A. Jamalipour, K. Hashimoto and N. Kato "**A Stable Routing Protocol to Support ITS Services in VANET**" pp. 3337-3347 IEEE 2007.
16. R. Manoharan, S. Rajarajan, S. Sashtinathan and K. Sri ram "**A Novel Multi hop B3G Architecture for Adaptive Gateway Management in Wireless Networks**" IEEE 2009.
17. F.P Setiawan, S.H. Bouk and I. Sasase "**An Optimization Multiple Metrics Gateway Selection Mechanism in VANET**" IEEE 2008.
18. U. Javaid, D. Meddour and S.A Mahmud "**Adaptive Distributed Gateway Discovery Scheme in Wireless Networks**" IEEE 2008.
19. B. Singh "**An Improved Handover Algorithm Based on Signal Strength plus Distance for interoperability in Mobile Networks**" pp. 879-887 Springer 2007.