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Stable Communication among Vehicles through VANET

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Article Info
Volume 83
Page Number: 4176-4182
Publication Issue:
May - June 2020

Article History
Article Received:*19 November 2019*
Revised: *27 January 2020*
Accepted: *24 February 2020*
Publication: *12 May 2020*

Abstract

Grouping in VANET is significant for late days because of increasingly number of vehicle present in urban region. In future Canny Transportation Framework (ITS), VANET can give security related applications, Web getting to and some client applications for drivers and travelers. Bunching based topology a proficient information collaboration among vehicles, can be applied to the gatherings of vehicle hubs in land region together that supports direct cooperation between the intercluster information association through group heads (CHs). In existing method, so many algorithms developed Related to clustering based VANET communication, but due to high mobility of vehicle and their parameters like position, velocity and acceleration is improve the complexity and reduce the performance. In this paper, we propose an adaptive self-learning approach based hybrid clustering. In hybrid clustering, the process divided in three steps. In first step Type1, it used for Road side unit (RSU) act as a static cluster head. In second step, divide the multiple zones with whole area and apply zone sensitive based clustering algorithm. It is used for predict the efficient centroid/weight value for each Vehicles. Finally in third step, from the above algorithm, in neuro- fuzzy training samples we got. Neuro fuzzy prediction based cluster head selection was applied. Percentages of cluster-Head for each zone assign the purpose of reduces the end-to-end delay and reduce congestion. In simulation results shows that demonstrate the efficiency of proposed algorithm compare to existing method. Implement in MATLAB2014a Trial Version, Thank you for MATLAB. A language has versatile option in single IDE.

Keywords**:** *MATLAB2014a Trial Version, IDE, RSU.*

1. Introduction

Today VANET is important for both safety and important message transformation. It is may be Road traffic or emergency situation. In Recent years VANET have many Surveys for performance improvement. Data transfer importance and complex due to Spontaneous network architecture and mobility based communication. Unlike WSN model, VANET have these parameters. We have to improve the performance in both Network Cluster and Routing. VANETs causes vehicles to associate with one another just as side of the road stations to help various applications, for example crisis preventative, mishap avoidance, see blockage, road state, way evolving help, crisis electronic brake light sign, web perusing, content dispersion, map update, video download, gaming, diversion and so forth. VANETs can give security and diminish the reactions of street traffic with data either to the vehicle's driver or to the vehicle.

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Bunching makes VANETs into little gatherings which limits channel dispute just as productively controls the system topology. Vehicular impromptu systems (VANETs) mean to give security data among vehicles to Improve street wellbeing and forestall mishaps. VANETs are advance type of versatile impromptu systems (MANETs), where vehicles are outfitted with a remote correspondence office (locally available unit (OBU)) to give specially appointed availability. The Sorts of various flavors are vehicle-to-sensor, vehicle-to-vehicle, vehicle-to-Web, and vehicle-to-street foundation. Correspondence is a basic part in concentrating about VANETs. The basic role of VANETs innovation is to help security and non-wellbeing related applications by utilizing V2V and V2I between various vehicles. VANETs have numerous difficulties and assignments because of its dynamic nature. To adapt to the dynamic structure of VANETs, a productive and powerful steering plan is required for information scattering. Without a productive directing plan, vehicles will most likely be unable to trade data and will lose all the favorable circumstances offered by cutting edge VANETs innovation.The proposed Directing plans have been portrayed in the writing to handle with the dynamic structure of VANET. VANET have high correspondence overhead on the Communicate based conventions disperse an enormous number of messages. The conventional single-jump grouping calculation doesn't show great execution influenced by the dynamic difference in topology in VANET.

2. Related Works

The purpose of the related work is the most misunderstood by young authors. Therefore, it is very important to writing this section. In 802.11 EDCA components shows four access classifications (ACs) with various parameter to keep up for a channel. Creators show that the exhibition of VANETs relies upon size of bunch, vehicle speed of vehicle, traffic request and conflict window size. Be that as it may, no RTS/CTS bundles are traded before Information transmission. Another paper proposed the clusterbased multichannel Macintosh convention for VANETs which depends on TDMA. The TDMA-based Macintosh a convention is referenced in [2-5] it can't use constantly openings of a casing because of absence of neighboring hubs in the system which sits around spaces. In [6] Ren et al. proposed a novel bunch based steering plan center to shape a steady gathering of vehicles driving by typical or required CH. The CH Determination rule was conflict dependent on a back-off clock and is to determined from relative speed, separation and lifetime (LLT)). In [7] Hartmann et al. says that the current advancing diagram model didn't utilize the unwavering quality of vehicles joins. The current model is extend to VANET-arranged Advancing Chart (VoEG) model concentrating on satisfying the necessities of a vehicular system. Eiza and Ni [10] proposed VoEG (VANET situated Developing Chart) model

For solid and stable vehicular correspondence. The VoEG model is then stretched out to another steering plan called EGRAODV (Advancing diagram, Dependable Specially appointed on Demand Separation Vector). In [11] Li et al. proposed a bunching calculation CCA (Criticality based Grouping Calculation) in light of basic measurements. CCA uses both uninvolved and basic measures to group, yet it doesn't think about the inclusion and adaptability. Hafeez[8], Dror et al. [9], Liu and Zhang [12], Javaid et al.[13], and Zhang et al.[14] proposed a grouping calculation dependent on fluffy rationale, he utilized fluffy procedure to manage interface dependability issue to ensure that the bunch security is gotten better, since speed is the primary purpose behind connection insecurity. A multi-jump grouping calculation is proposed by Zhang et al. [15] every vehicle hub is utilized to communicate the data to its one-jump neighbour node on either side. The neighbor hub gets two back to back Hi guide bundles from a specific vehicle to ascertain the Total Portability worth or AM worth and afterward the AM esteem are communicated to the N-jump run.

Bunching dependent on rule base condition like speed, separation, quickening of vehicle. In the conventional multi-bounce bunching calculation, vehicle hubs and group head hubs with less relative portability are gets signify the group as bunch individuals to frame a steady bunch structure. By utilizing the Bunching dependent on the quickening of vehicle the Adaptability is low when system is dynamic.

Khan and Fan says that the traditional Kmeans to arrange VANET into three groups. The primary issues which K-implies manages are the prespecified number of bunches, and furthermore it may not named vehicles, which are nonlinearly divisible in input space. In advancing VANETs, structure of topology changes at each second and the quantity of bunches may not be kept up. K-implies is non-curved which can't be advanced. Group arrangement utilizing kmeans like propelled calculation dormancy is high. GPSR Directing Under GPSR, parcels are set apart by their goal areas. The sending hub can settles on an ideal and covetous decision in picking a parcel's next bounce. In particular, if a hub knows its close by radio positions the locally ideal decision of next jump is the neighbor geologically nearest to the bundle's goal.

Avaricious based directing that settles on the locally ideal decision at that phase where there is a desire for getting worldwide ideal. For geographic directing, the insatiable steering picks the lightest load out-going connection at each sending hub, and the heaviness of each connection is get chosen by the picked directing metric which catches different execution components and area data.

Adaptive Disjoint path vector Routing The destination node selects the path which is mostly disjoint from the shortest delay path. If more than one maximally

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disjoint path exists, the connection is broken by choosing the path with the shortest hop count. Cluster has two types the Intra-cluster communication and Inter-cluster communication. In Intra-cluster communication is managed through link state routing, and the inter-cluster communication is through gateway nodes that are present in both the clusters. When a source node in one cluster has to determine multiple disjoint paths to a destination node in another cluster, it sends a RREQ Message to its adjacent clusters. The Routing latency is high and greedy process is iterative.

In Proposed system we have divided the number of zones and apply region based clustering. In this region based clustering taken as a reference of Neuro-Fuzzy model. This Neuro-Fuzzy model predicts, the output based on Training Data. Thus our self –learning mechanism give higher performance. In our proposed work divided into threesection

1. Section-II has explained the concept of clustering related work.

2. Section-III has System model, algorithm and all details.
3. Section-IV have simulation Result and Analysis

3. System Model

In VANET nodes are Dynamics in nature. The vehicle to vehicle communication and vehicle to RSU Communication link breaking or data loss due to fast movement of node. To over-come the problems so many methods develop by using cluster head method. But most of the Existing CH Method only consider about selection of CH. Since initial condition doesn't follow after some time interval. So we need initial CH Selection and frequency updating of CH with fast & efficient manner. At the same time congestion overhead also important problem, all datatransfer by single CH means it's create congestion or delay in data communication.

To overcome the above problem in proposed method, initial case we have assign percentage of cluster head assign in each zone. In example, Nearest to sink node have high percentage of cluster head for avoid data congestion. In second step develop static zone based clustering based on node position, velocity & Buffer size parameters number of cluster assign based on PCH. After assign initial cluster with CH selection. In VANET have high dynamic condition is nature, so CH Validate & update also important based in initial clustering we have extract the learning data and it's apply to Neuro-Fuzzy Rules predicted by self-learning mechanism used in initial clustering method. This self learning mechanism predicate the rules based on these rules we create or update the CH efficiently.

Initialize no of node their X, Y position, velocity and Buffer size of each node. Initially selected the high buffer size node selected as a cluster head. Notation Description N Total no. of nodes RSU Total no. of RSU maxW Maximum width of Road Len Length of Road Vel Velocity of Vehicle. Table1.1 Important Notations.

a) Zone division & Pch Estimation:

In VANET we have analyze static zone clustering method. Initial the Region divided by zones. In our method equal zone division approach is applied. Normally zone division is calculated by sensor radius of vehicle node. Then only increase the coverage area.In Pch estimation process is thoroughly to avoid data congestion. So each zone vehicle divided initially estimate maximum Buffer size node in each zone compute the distance between the source & sink node in each zone. Finally develop the rules for each condition like distance < 100 then Pch =10 likewise this details explained in Algorithm (1). The Proposed model based on static zone method. In static zones we have arrange more no of nodes let assume we have 2 lane with height h=200 and width=400

No of Zone = Total Width/Zone

Width x 2 ----(1)

The 2 lane region divided the zones based on equation (1) and sink nodes shows in Right top end.

Pch –Percentage of Cluster Head.

Chm – Max Buffer size each Zone

Chm dist = abs (Chm position-sink node position)

Pch = f (Chm dist)…….(2)

According to Equation (2) computes the percentage of cluster head.

Algorithm1 Initialize: N, Rsu, 2-node division

Input: position, buffer size

Output: Compute Pch(Percentage of CH)

Initialize zones and assign equal no. of zones

for each zones

index = max Buffer size node

Dist = (sink node position-index node position)

if (Dist<100)

Pc=30

elseif (Dist>10 && Dist<=200)

Pc=10

elseif (Dist>200 && Dist<=300)

Pc=5

else

pc=3

end

end zones

b) Weight based Clustering:

In this section developed static zone based clustering. In most of the existing method only given importance in zone region only but in our proposed method we need to add additional parameters like velocity & Buffer size of each node.

In clustering the node in each zones separately. So each zone have cluster member and cluster head. No of cluster head assign based on Pch Value.

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Each node position (x1, y1), (x2, y2)…….. (XN, YN)

Each zone node indicate

[X (index), Y (index)]……..(X1, Y1) Zone center position indicated by

[zX + 50, zY+ 50] …. (X2, Y2)

Position distance =

$$\sqrt{((X1 - X2)2 + (Y1 - Y2)2)}$$

Each zone assigns weight value in 3 parameters like position velocity & Buffer size. The velocity of each vehicle & Buffer size of each vehicle assign some weight value like

w1 =0.6; w2 =0.2, w3= 0.2

The final weight value calculation based on clustering. W=w1 position distance + w2 x velocity + w3 x Bs

The weight based clustering performed by k-means algorithm. Ineach iteration, calculate the weighted centroid value. In this algorithm our main aim is intra cluster value should be minimum and inter cluster distance should be maximum. These proposed concepts explained in Algorithm (2). Algorithm 2(Modified) Initialize: N, RSU, zW Input: position, velocity and buffer size of each vehicle, pch Output: cluster head selection Initialize nodes and assign equal no. of zones for each zones if (zones! = Rsu) pos=[x,y] vel=velocity of vehicles Buff=Buffer size w= w.pos + w2.vel +w3.Buffer;

Objective function of clustering

F= K/((1/ik)

Update the value xk based on k-means Iterate k-means until get optimal centroid Else No clustering Rsu unit assign as cluster head

End Result: multi-centroids (cluster with cluster head)

c) Neuro-Fuzzy prediction:

In previous step, CH selects made by clustering Algorithm. After ktime zone update & validate of CH also important. For creation of this model, we create Neuro-Fuzzy prediction method. At first fuzzy based membership function will be created we have to Gaussian –bell shape membership function is used for more information. For efficient creation of rules, Neuro-fuzzy modelbased training sample acquired by initial clustering Algorithm (2).

In Neuro-Fuzzy given i/p for node position [X,Y], Velocity Buffer size of vehicle. A self learning mechanism is nothing but the fuzzy rules are created by initial clustering algorithm. So we don't need any additional training Neuro-Fuzzy easily turning depend upon initial condition nodes.Based on training data fuzzy rules create and updated. Totally we use 40 iteration for minimum training error in neuro-fuzzy. This updated neuro-fuzzy engine called as selflearning CH predictor. After the vehicle/node movement in each zone, our CH predictor, predict the particular node CH or not. It's a fast process, so CH formation delay also very less. All details explained in Algorithm 3 Algorithm 3: (Neuro-Fuzzy Training) I/p: i) Node member with Centroid value ii) Membership function model of Fuzzy O/p: Rule Prediction a) Initialize zones and compute

Pch→Percentage of CH

PCHzones = Total no. Of nodes in particular zone / Total nodes

b) Neural N/w used for Training the Fuzzy Model

yik = f(n, Dik)

c) Rules Creation by using Neural N/w

d) Predicted rules

d) Routing:

After CH formation & validation the data communicate to source to destination. Initially compute the distance b/w each CH to CH distance and velocity the distance is greater their sensor radius we have assign the link reliability is infinite. Apply dijkstra algorithm for routing, so we consider both like forward and backward searching. The routing path estimated with minimum cost.

4. Simulation Result

All the simulations performed by using MATLAB 2019a. We design both animator and CH Selection with Routing. At first define the zone area & division second apply zone clustering and CH Selection. Third update/ Validate the CH by using Neuro Fuzzy method. Finally Routing happen by Dijkstra algorithm.

a) Simulation Test case: Simulation Test Case model with different No of Vehicles like [100,160,200], we have evaluate the performance in two condition, One is based on different velocity delV= [5, 10, 15, 20] and another one test case for different sensor radius R = [100,120,150,170].

The Simulation Environment carried over two different conditions. Like with RSU and without RSU. Totally USE 4KM distance with 2 lanes. Parameter Value No. of Lane 2 Length 4 Km Zones 8 PacketSize 500

No of Vehicle [100 160 200]

Sensor Radius [100 120 150 170] m Change in Velocity [5 10 15 20] Km/h

Table 2.1 Simulation Parameters: The efficiency measure method described below Packet delivery Ratio:The average ratio of successfully received packers as sink node and total packet generated in source node.

Average End-to-End Delay: It is the time difference b/w communication the data source from destination. Data transfer b/w source to destination may be loss due to node coverage area or their position. CH formation Delay:Initially CH Selection based on clustering algorithm, after t- time slot CH updates /validate based on

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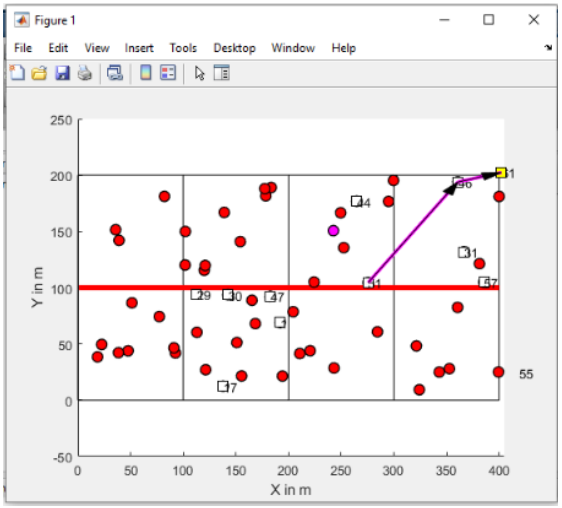
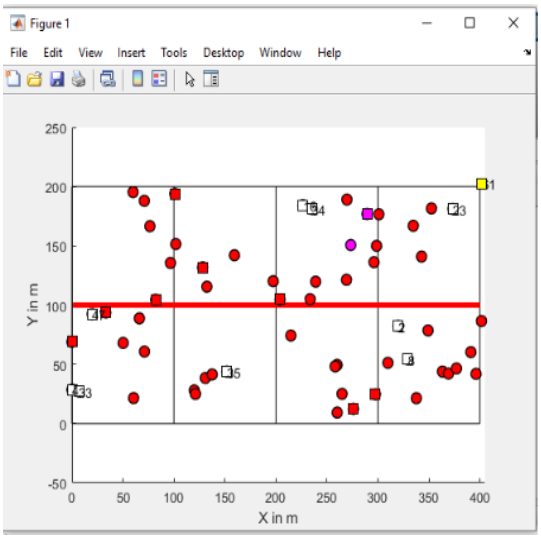
Neurofuzzy prediction. This time duration of CH update called as CH formation delay.



In this figure, totally 60 nodes, sink node indicate as yellow color find cluster head node shows white square color. Routing path shows in magenta color. The Routing path shows communicate via, source to destination.

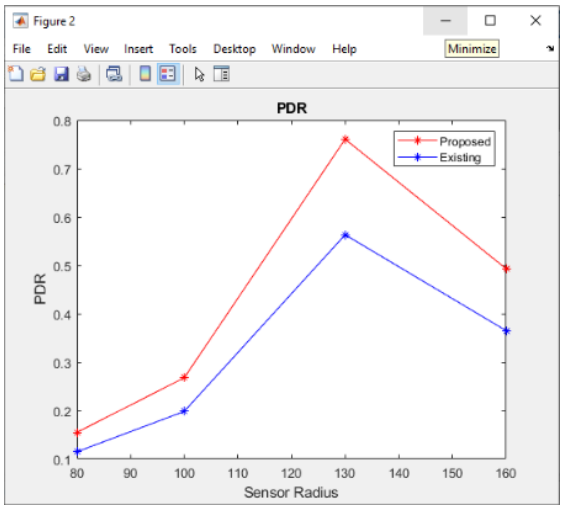


In this figure, after t – time slots, Here also use 60 nodes with different velocity of nodes white node as cluster Head updated by NeuroFuzzy. The routing path shows in magenta color.

a) Performance Related to Sensor Radius (R):

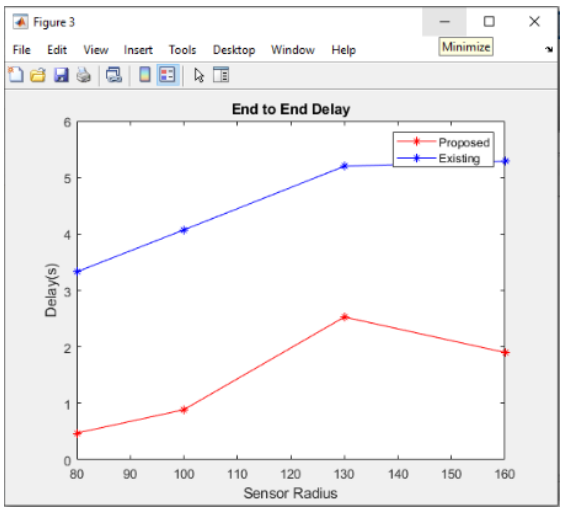
In first test case performance Analyzed with different sensor Radius like
R= [100,120,150,170] m. I. Packet delivery Ratio

I. Packet delivery Ratio



The above figure compares the Packet Delivery Ratio (PDR) with sensor Radius. If the sensor radius is low, the communication path breakage maybe happen, so it's automatically reduce the PDR if sensor radius increases more most of the communicate data from source to sink with low number of hopes in this time due to packet congestion, the PDR may be decrease. But compare to existing method proposed method have high PDR.

5. End to End delay



End to End delay varies based on sensor radius. The sensor Radius in low value, the path breakage may ne happen. So normally in low sensor radius End to End delay is high .When sensor radius increases the End to End decreases compare to exiting method proposed method have low End to End delay.

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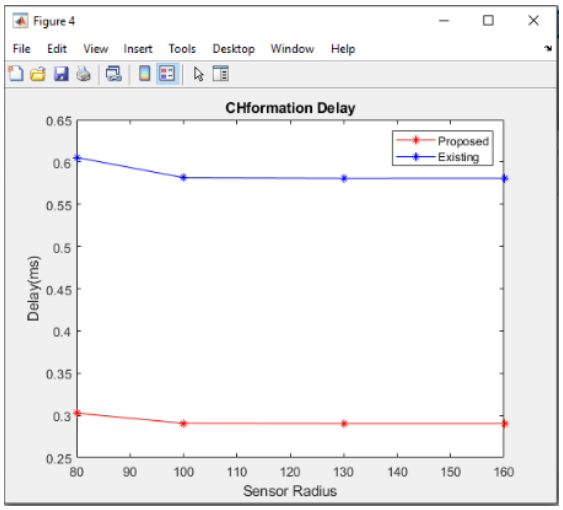
II. CH formation Delay:



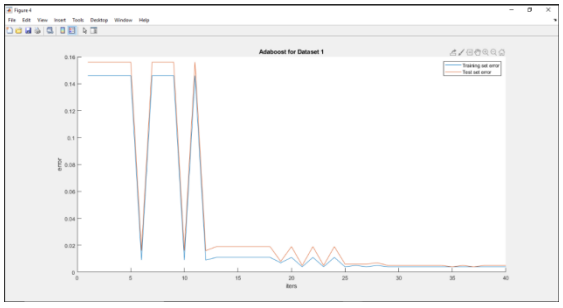
If Sensor radius increases doesn't affect the cluster head formation delay. Since every particular event check the CH validate (update) based on Neuro fuzzy prediction, prediction &update new CH). The overall delay process charge based on No of vehicle only. Compare to exiting method proposed method have low CH formation delay.

If change in velocity increases it doesn't after the cluster head formation delay. Since every particular event check the CH Validate/Update based on Neuro fuzzy prediction predict & Update new CH.

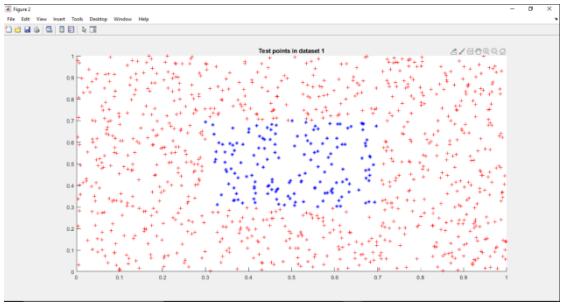
Ada Boost Algorithm:

Boosting technique is used to train predators step by step, with each step it tries to correct its predator. AdaBoost is very much similar to Random Forest where they both try to convert weak classifier into strong one.

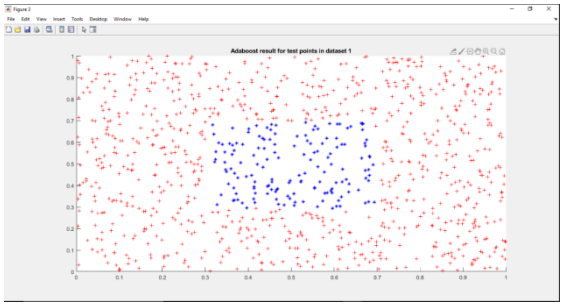
In our project we used the real time dataset which is created in the running project using 2000 nodes at a time.



In the above graph which is created by using adaboost algorithm it shows the relation between Training set error and Test set error. Red colour graph indicates the test set error



This figure represent the test points in dataset 1.



This graph shows the Adaboost result of test points in dataset 1.

6. Conclusion

In this paper, we propose an adaptive self-learningapproach-based hybrid clustering. In hybrid clustering, the process divided in three steps.

In first step Type1, it used for Road side unit (RSU) act as a static cluster head.

In second step, divide the multiple zones with whole area and apply zone sensitive based clustering algorithm. It is used for predict the efficient centroid/weight value for each Vehicles. Finally in third step, from the above algorithm, in neuro- fuzzy training samples we got. Neuro fuzzy prediction based cluster head selection was applied. Percentages of clusterHead for each zone assign the purpose of reduces the end-to-end delay and reduce congestion. The simulation results demonstrate the efficiency of proposed algorithm in-terms of PDR, Avg end-to end delay and cluster Formation delay all are efficient compare to existing method. Acknowledgement This Proposed Analysis, with the help of MATLAB. Thank you for Trial Version, it is having versatile option for any analytics in simulation made easy. A better tool for researcher's for single window application.

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