DBSCAN APLLY In Weighted Clustering Algorithm for MANET

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Abstract – In this paper, we propose a mobile ad-hoc network, an emerging type of wireless networking, from which mobile nodes associate extemporaneous or ad-hoc basis. Nowadays due to on – demand, mobile node is a collection of multi-node. The mobile ad-hoc network is a wireless communication technology, which do not have any fixed infrastructure in network domain. In network architecture, nodes move dynamic in nature. In Network architecture nodes have dynamic mobility resulting network faces break down issues. Mobile ad-hoc network have less stable, so to improve stability it requires large transmission area. We designed density based clustering algorithm to improve the stability and efficiency in mobile network. In our network architecture we have number of domain to choose cluster to manage all information in that domain cluster head. Election is involved on on-demand procedure, To reduce the computation , communication and communication cost mobile node chooses on the basis of its neighbor's density, so we apply density based clustering algorithm at mobile ad-hoc network and selected cluster head node in cluster. For ε-neighboring, min-pts based weighted cluster algorithm We propose DBSCAN from which it take into parameter gets mobility and battery power of mobile nodes. As a result, of cluster head selection the cluster formation approaches to show the constant rate of head selection and reasonable amount of computation time.

Index Terms – ad-hoc networks, clustering in mobile node, DBSCAN, load balancing.

1. INTRODUCTION

Mobile ad-hoc network (MANET) is a wireless network. A mobile multi-hop ratio is also known as ad hoc or peer-to-peer network. Multi-cluster, multi-hop packet network architecture for the wireless system should dynamically adjust itself to changing network configurations [1]. The mobile ad-hoc network support to mobility and ad-hoc network configuration. MANET suffers from performance as well as the security due to their adoptive and ad hoc nature. When the cluster head moves fast, the nodes be leave from the its cluster and as a result, a re-affiliation occur. Re-affiliation takes place when a node moves out form its cluster and joins another existing cluster. A Certain node called cluster heads are responsible for the maintenance of topology of network and formation of clusters each consisting of a number of nodes [4]. The network topology changes rapidly move by chance. Due to the incomplete transmission range of wireless network nodes, multiple network hops may be desirable for one node to exchange data with another across the node [2].

The cluster head responsible for manage such as cluster formation, cluster maintenance, cluster process, updating routing table, and discovery of new routes. The group of cluster head is called as a dominant set.

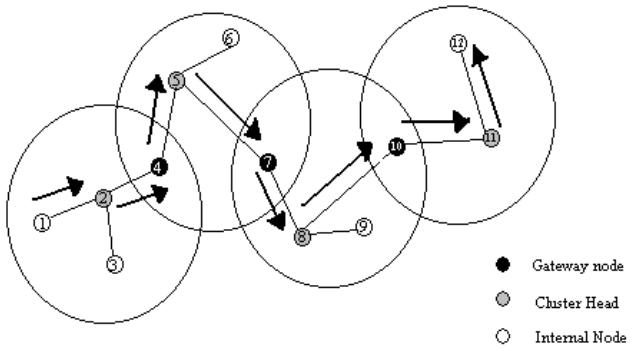

Figure1. Clustering in MANET

Figure1 show the cluster head does the source distribution to all the nodes belong to its cluster. Due to the dynamic nature of the mobile nodes, the association and dissociation from clusters change the stability of network and reconfiguration system performance [3]. This is a major problem in network since frequent cluster head changes harmfully modify the performance of other protocol like as source distribution and routing that it. Selecting cluster head optimally is an NP-hard problem [4]. Since this difficulty solutions are based on heuristic approaches and not challenge to maintain the stability of the network topology. The good clustering scheme should maintain its structure as possible as moving the node is slowly. Otherwise the node will result in high computing overhead when the cluster head of re-computation and frequent information exchange among the participating nodes.

We have done the earlier which are follow that a weight based distributed clustering algorithm which takes into consideration the number of nodes a cluster head can ideally, transmission

power, mobility, and battery power of nodes. Exiting scheme which are invoked periodically resulting in high communication overhead, this algorithm is adaptively invoked based on the mobility of the nodes. The cluster head election procedure is delayed possible to reduce the computation cost. The load balance between cluster head, it is difficult to maintain a completely balanced system due to the dynamic nature of the pre defined threshold on the number of nodes that a cluster head can handle ideally. This paper define load balancing factor to measure the degree of load balancing among the cluster heads.

2. RELATED WORK

In this year 2016 Aswathy P Sreevatsan, D. Thomas, in his paper [1] proposed An optimal weighted cluster based routing protocol for MANET work mainly consist of three phases, first phase cleaning the network ,which include identifying the malicious nodes. Second phase of the weighted clustering of the network which incorporates a new re-clustering condition known as stability factor. The third phase of a fuzzy method to choose the best path among the paths available for routing based on the energy and mobility of the nodes. As a result compare to the normal WCA algorithm the new method solves the problem of malicious nodes loading the clusters due to movement of node and the problem of nodes dying out while router.

In this year 2016 Jaroslaw Michalak, Wojciech Bednarczyk Leszek Newosielski, in his [2] proposed that A weighted Interconnection node election algorithm for MANET, uses gateway nodes and cluster network .The problem solution uses priorities and level limits for taken weight component connection with mobility battery level and received signal to noise power for every node. As a result WINE algorithm have the set GW minimizing energy used for retransmission with maximizing of live time of clustered network probability of information delivery.

In this year 2015 Hengxin Zhou, Jie Zhang, in his [3] proposed that an efficient clustering algorithm for MANET based on weighted parameter to elect cluster head and maintain the structure of cluster which based on the relative movement speed rather than absolute speed. Comprehensive analysis of various network parameters on the structural stability of the network clustering, various decisive parameter variables are assigned to different weights.

In the year 2013 Wojciech Bednarczyk , Piotr Gajewski in his paper [3] Propose that An enhanced algorithm for MANET Clustering Based on Weighed Parameters, combined weight clustering algorithm to establish a stable clustering architecture. the proposed algorithm structure that can maintain topology of MANET as stable as possible ,thereby optimizing network performance and making efficient resource allocation for nodes. This makes it possible to maintain efficient and stable topology in MANET environment. Due to the weight group, the cluster creation is done very quickly which causes the network services to be more accessible.

In the year 2011 Naveen Chauhan et al in his paper [4] proposed and implement a distributed weighted clustering algorithm for MANET. The proposed approach is based on combined weighted metric in which system take parameter such as node degree, transmission range; energy and mobility of nodes are considered. The cluster head can be determined using some of these parameters in the metric depend on the type of application. When a packet is routed from source to destination more cluster head will lead to extra number of nodes. This proposed scheme that the original distributed weighted clustering algorithm (DWCA) was outperformed.

In the year 2010 S.Muthuramalingam, R.RajaRam, Kothai Pethaperumal in his paper [6] A Dynamic Clustering Algorithm for MANET by modifying Weighted Algorithm with mobility Prediction. The proposed a Modified algorithm that uses weighted clustering for cluster formation and mobility Prediction for maintenance. In this paper combine weighted metric in system take parameter such as node degree, transmission range, energy and mobility of nodes are considered and cluster head determined using some of these parameters in the metric depend on the type of application. As a result reduce the overhead in communication by predicting mobility of node.

3. DBSCAN

DBSCAN is a density based algorithm. Network density means the portion of the potential connection in a network that is actual connections. ”A potential connection” is a connection that could potentially exist between two nodes-regardless of whether or not it actually does.

We will execute the DBSCAN for clustering algorithm, As its input the algorithm will take a distance matrix rather than a set of point or feature vector.

Density = number of points within a specified radius r (esp).

The DBSCAN algorithm works as follows:- we need two parameters: esp and min-point. The first of them, esp is the maximum distance between two objects or nodes in the same group. It prescribes how dense you want the cluster to be (lower esp→ $higher\ density$).

The second one, min-point is the minimal number of objects in a groups. Its value effectively specifies the minimal size of clusters. The algorithm visits all inputs objects (their collection is called a dataset). For each objects the algorithm detects which objects are close to it (closer than esp.). If their number is big enough (equal or greater to min-points), the algorithm start to from a cluster.

4. METHODOLOGY

4.1 Basic of our Algorithm

In this paper, our selection for algorithm cluster is adaptive invoked and non periodic procedure on moving of nodes or changing the relative distance between cluster heads and the nodes. Selection process is repeated until all nodes must be their member of any cluster or cluster head. This reduces system updates and hence computation time and communication cost.

If the distance between cluster member and cluster head is within transmission range, results improved communication.

In battery power, the relative distance affected the consumption nodes. Cluster head consumes more battery power to communicate through a larger distance. It consume more battery power than ordinary nodes because of its extra responsibility to send information for its member.

Mobility is one of the most important challenges for MANETs. It decides the cluster head to change network topology. This is desirable to selecting cluster head that does not move very quickly. If the cluster head move fast , the nodes may be moved out of cluster, and joined to another cluster resulting reducing the stability of the network.

4.2 Proposed Algorithm

We propose an algorithm DBSCAN clustering in weighted clustering algorithm for mobile ad-hoc network. These effectively combine each of the above system parameter to use DBSCAN and WCA factors; it will be utilized according to the system needs. The modified algorithms DBSCAN apply in mobile ad-hoc network to calculate distance between each cluster node and elected cluster heads.

DBSCAN Algorithm

1. Create a graph whose nodes are the points to be clustered.

2. For each core – point c create an edge from c to every point p in the eps-neighborhood of c.

3. Set N to the nodes of the graph.

4. If N nodes not contain any core points terminate.

5. Pick a core point's c in N.

6. Let X is the set of nodes that can be reached from c by going forward:

- Create a cluster containing X U {c}
- N = N (N ∪ $\{c\}$)

7. Continue with step4

Cluster head election procedure

The procedure consists of eight steps as described below:

Step1. Discover the neighbors of each node v (i.e. nodes within its transmission range) which is identify its degree, d_v as

$$d_v = |N(v)| = \sum_{v' \in V, v' \neq v} \{dist(v, v') < tx_{range}\}$$

Step2. Calculate the degree – distinction,

$$\Delta_v = | d_v - \delta |, \text{ for every node } v.$$

Step3. For every node, calculate the sum of the distances D_v ,with every its neighbors, as

$$D_v = \sum_{v' \in N(v)} \{ dist(v, v') \}$$

Step4. Calculate the running average of the speed for each node till current time T. This gives a measure of mobility and is denoted by M_v as,

$$M_V = \frac{1}{T} \sum_{t=1}^{T} \sqrt{(X_t - X_{t-1})^2 + (Y_t - Y_{t-1})^2}$$

Where (X_t, Y_t) and (X_{t-1}, Y_{t-1}) are the coordinates of the nodes *v* at time and (t-1), respectively.

Step5. Calculate the collective time, P_v, during which a node v perform as a cluster head. P_v Implies how much battery power has been extreme which is assumed more for a cluster head than an ordinary node.

Step6. Calculate the combine weight W_v for each node v, Where

$$W_v = w_1 \Delta_v + w_2 D_v + w_3 M_V + w_4 P_v$$

Where $w_1, w_2, w_3 \text{ and } w_4$ is the weighting factor for the corresponding system parameters.

Step7.Select that node with the smallest W_v as the cluster head. All the neighbors of the selected cluster head are no longer permissible to participate in the election procedure.

Step8. Do again steps 2-7 for the residual nodes not yet elected as a cluster head or assigned to a cluster.

Table1. Execution of DBSCAN

Node id	dv	Δv	Dv	Mv	Pv	W	LBF
1.	7	2	666.7508	33.4215	6	226.8010	1.0000
2.	7	2	599.8521	59.9083	5	208.4874	0.3889
3.	7	2	481.1515	56.8595	4	168.6489	1.0000
4.	7	2	691.2128	44.4072	5	236.3377	0.3103
5.	9	4	980.0848	59.6657	4	334.2178	0.3103
6.	9	4	974.8663	44.0114	5	330.3576	0.4737
7.	9	4	1.19e+03	20.5183	5	399.3090	0.4737
8.	10	5	1.07e+03	18.3576	9	360.9449	0.3000
9.	10	5	1.08e+03	30.3645	9	364.3175	0.1731
10.	9	4	1.02e+03	33.6155	6	345.7292	1
11.	8	3	576.8152	27.4591	8	196.8979	0.4545
12.	10	5	1.11e+03	23.0868	5	373.4163	0.4545
13.	10	5	1.13e+03	36.8782	5	383.0820	0.4545
14.	10	5	1.29e+03	26.8782	8	434.3883	0.4545
15.	12	7	1.55e+03	48.5489	10	523.4916	0.4545

4.3 An illustrative example

We `show our density based algorithm with the figure2. All value show as calculate from executes by this cluster algorithm and tabulated in table1. Initial observation of the node in the network with particular node id. In our algorithm density based clustering take 2 parameter ε-neighbor and min-pts. It used clustering algorithm make clusters. Figure 1 shows circles with represent the fixed transmission range for every node.

The every node broadcast unique id from the neighbor's nodes, which are within its transmission range. The d_v is degree, which represent the total number of neighbors a node. Δ_v is a degree difference, which every node with ideal degree δ=5, is calculate in step2. D_v $is\ distance$ for every node, calculate step3, from it neighboring node. The value of M_v is mobility, which node does not move at all.

We choose arbitrary value for P_v. P_v is power battery ,which represent amount of time a node has acted as a cluster head. At last the W is weighted value. All the computed the weighted metric w for each node as proposed step6.

The weights take considered are $w_1 = 0.25, w_2 = 0.33, w_3 = 0.15, w_4 = 021$. After step7 choose smallest w as a the total number of neighbors served by each cluster head close for maximum pre define degree δ=5.

4.4 LOAD BALANCING

Load balancing is a dividing the amount of work that two node. Balancing the load between cluster heads is another desirable feature of any clustering algorithm. Load balance aim to optimize resource maximize throughput.

Our algorithm calculate load balancing factor (LBF), node which the ad hoc per network throughput has more accurate from other clustering algorithm. The load handle by a cluster head depends on number of node.

It difficult to maintain load balanced in system at all time due to frequent connects and disconnects of the nodes from and to the cluster head. We represent LBF as the inverse of variance of cardinality of cluster.

LBF=$\frac{n_c}{\sum_i (x_{i-\mu})^2}$

Where n_c is number of cluster heads, $x_i$is the degree of cluster head

$$\mu = \frac{(N - n_c)}{n_c}$$

LBF is better load distribution and perfectly balanced system.

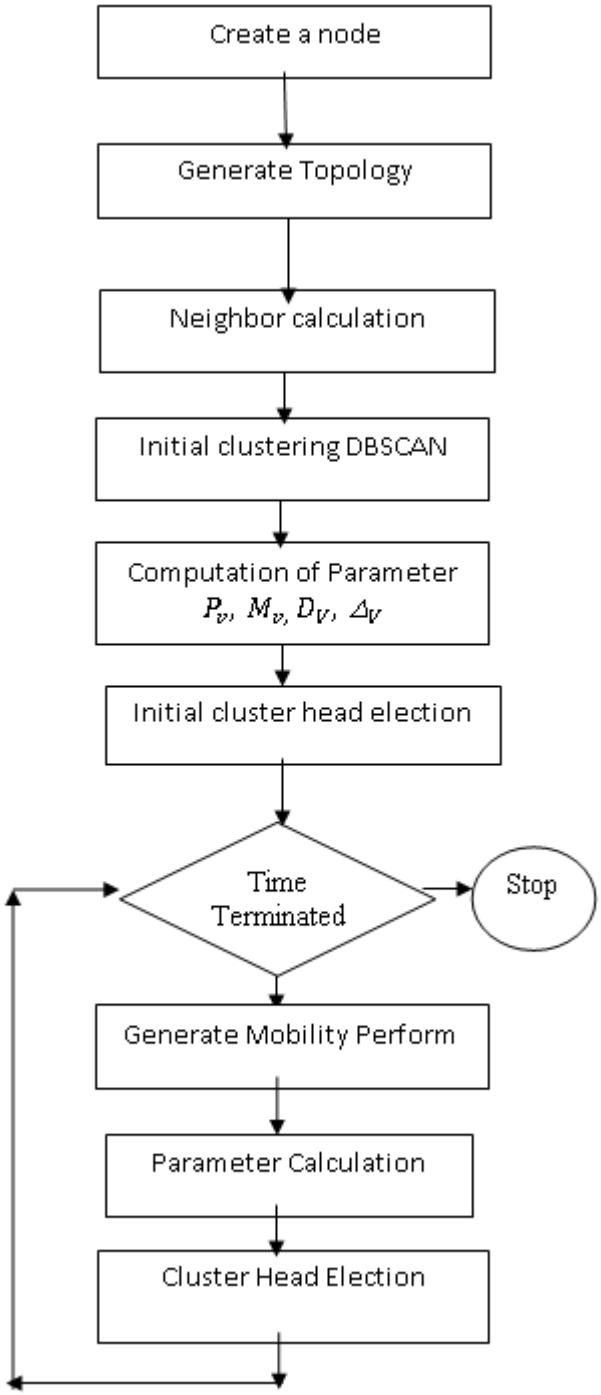

Figure2. Flow chart of Methodology

5. RESULT AND DISCUSSION

We were creating nodes in network environment to generate topology that create cluster. In topology we find neighbor in each node and applied in DBSCAN clustering algorithm for generating density based algorithm which have 2 parameter ε-neighbor and min pts by using performance of our system. Now

we calculate P_v, M_v, D_v, Δ_v parameter for each and every node which defines mobility.

We elected a cluster heads for each domain and increase their time duration 20 sec resulting each elected cluster head achieve mobility. When every node has mobility they move from one domain to another, this process is known as re-affiliation. After re-affiliation we require a new cluster heads for domain which are moved. This process proceeding continue until when cluster head elected with given time durations.

OUTPUT:

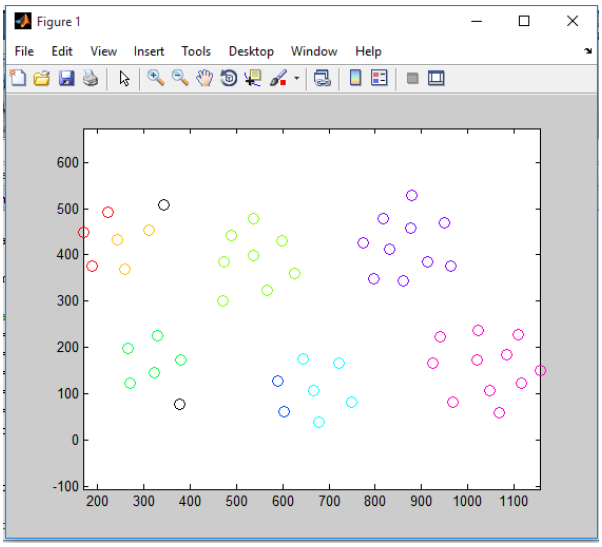

Figure 2. Output of methodology

6. SIMULATION STUDY

In our simulation experiments, N was varied between 50 and 100, and the transmission range was varied between 0 to 250. When the mobility time is set 0 to 20 the nodes are moved randomly in all possible direction in 50×50 square metrics. The node can move in all possible directions with increase varying uniformly between 0 to maximum value and transmission range, per unit time.

Density based clustering Algorithm of our algorithm to measure the performance, we identify 2 matrices:

1. Number of cluster heads

2. The number of re-affiliations

In mobility every time a upgrade the re-affiliation is identified, it degree gives the number of cluster heads.

The re-affiliation count incremented when nodes gets move very fast and dissociated from its cluster head and join another cluster within the current dominate set. The dominant set update take place when a node can no longer be a neighbor or any of the exiting cluster heads.

Our algorithm studied 2 parameter for varying number of nodes in the system, transmission range. We also calculate how to load balance factor changes in the system evolves.

In simulation experiment, N was varied between 25 to 125 and the transmission range was varied between 200 and 250. The node mode moved randomly in all possible direction a increase transmission range 250 and the maximum displacement of 5 every node of the degree. Due to put the node degree as to close the maximum node possible, the weight w1 associated with Δ_v was close to high. The high weight w2 was given sum of distanceD_v. Remaining parameter mobility and battery power is low weights. The simulation was take weights w1, w2, w3, w4. this value are arbitrary at this time and should be change according to the system requirement.

6.1 EXPERIMENTAL RESULTS

Figure 3 show the variation of the average number of cluster-heads with respect to transmission range where max_disp of 5.the result as shown varying for node N. We observe that the number of cluster heads decreases and the transmission range increase. This large transmission range increases due to the fact that a cluster head cover large area.

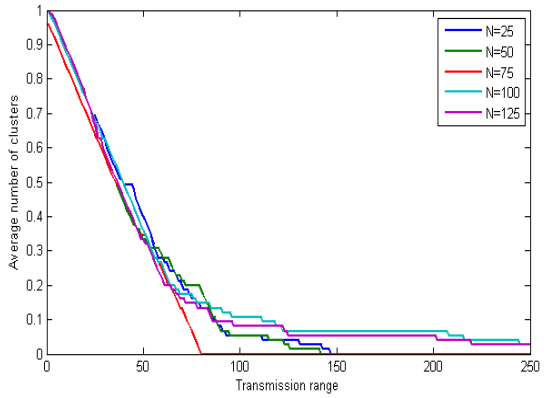

Figure 3.Average number of clusters

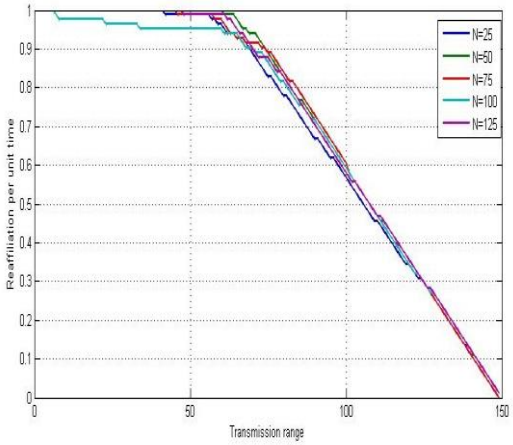

Figure 4.Re-affiliations per unit time

Figure 5 we calculate that after each dominant set update, there plodding improve in the load balace factor (LBF). This plodding improve in LBF is due to the spread of the nodes among cluster. This move all possible clusters heads and helps with cluster formation. The cluster algorithm tries to connect all the nodes at the cost of imbalance which is represented by pointed reduce in LBF.

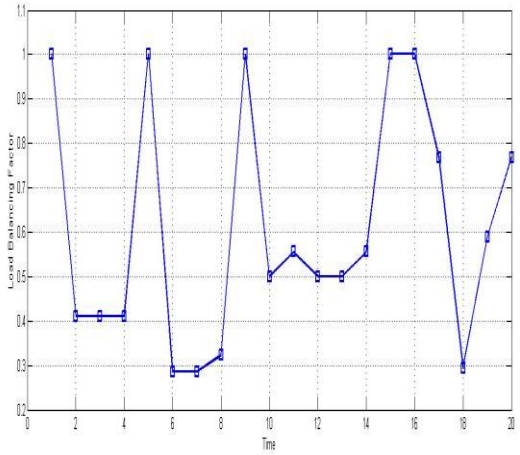

Figure 5.Load distribution

7. CONCLUSION

We proposed a density based clustering algorithm, which can move node dynamically in ad-hoc networks. It is density based cluster algorithm which takes into parameter for degree, transmission range, and distance and battery power.

The algorithm is implemented only when it requires demand i.e. when a node to communicate major distance nodes. We conducted simulation experiments to measure the performance of our clustering algorithm and show that it performs better than WCA.

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