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Selection of Weighting Factors in Weighted Clustering Algorithm in MANET

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Abstract—**There are different clustering algorithms in MANET for selection of clusterhead in a network. The selection of clusterhead has many advantages like increases the efficiency and stability of the network, larger life time, low energy consumption, aggregation of topology information, lower communication bandwidth, spatial reuse, routing efficiency and etc. The concept of clustering is implemented in different networks due to its growing advantage, but the method of formation of a cluster in MANET, showing the orientation of node movement and then selecting the clusterhead is field of interest. Weight based Clustering Algorithm (WCA) for the selection of clusterhead considers combined weight metric. The co-efficient used in weight calculations are w_1, w_2, w_3 and w_4, the sum of these co-efficient is 1. They are actually used to normalize the factors like node degree, transmission power, mobility and battery power. Any of these factors in a weight metric can be used for the election procedure of clusterhead. The co-efficient used in weight calculations are assumed as such that, the factor which has higher importance is given higher coefficient value. The weights related to metric has no predefined values initially, that means it lacks knowing the weights of all the nodes before clustering phenomenon occurs for the selection of clusterhead. Thus, primarily before starting clustering phenomenon for the selection of clusterhead, the selection of weights for all the nodes participating in a network is done by tuning the effect of weights in terms of throughput and end to end delay with variation of mobility. The combination of weights which gives the optimum value of throughput and end to end delay at ranges of mobility are selected and used for the selection of clusterhead.**

Index Terms—**Ad-hoc, clusterhead, metric, weights.**

I. Introduction

Ad-hoc network states to network which has no centralized administration and is easily deployable. The easily deployable nature is due to the fact as it attributes the property of self organization of nodes which performs the control over the network acting as a router itself. It works in a standalone fashion. Mobile Ad-hoc Network (MANET) consists of mobile nodes which can move freely and can communicate to other nodes by direct link or through intermediate nodes. Performance suffers as the number of nodes increases and the network becomes difficult to manage. Ad-hoc network can be characterized as, decentralized, Self configurable, Self deployed, Dynamic network topology.

Wireless communication between the mobile users is becoming more popular and famous these days. This is due to the recent technological advancement in laptops, computers and wireless data communication devices, such as wireless modems and wireless LANs. This leads to a high data rate considering the optimal cost, which is the main reason of the growth of mobile computing devices.

There are different approaches for the communication process between the two hosts. The first approach is to send voice and data through existing cellular infrastructure. The major problem behind this is the occurrence of hand off. Another problem is the limitation of cellular infrastructure because of geographical variations. The second approach is to form an Ad-hoc network between all the users with a desire to communicate with each other. This means that the users in Ad-hoc network willing to participate in packet transmission must be assured of the transmission of the packet from source to destination. This form of network has limitations in transmission ranges of nodes and is typically small as compared to cellular network, which however does not guarantee the superiority of cellular approach over Ad-hoc network.

Ad-hoc network does not rely on any pre-established infrastructure so it can be deployed at any places at any instant of time. It is useful in disaster recovery where no communications exists. There are routing protocols which routes the packets from a defined source to a destination. As the network grows there subsists an overhead in packet transmission due to flooding. Thus, the network may be saturated due to a large number of packets in a queue to complete the route that makes the network flat. A better approach to these kinds of problem is to cluster the nodes in a suitable manner and make use appropriate routing algorithms. Clustering model increases the efficiency of the network with larger life time, low energy consumption, and averts the unnecessary use of network bandwidth.

A. Clustering in Ad-hoc network

With the recent growth in Ad-hoc network the use of different personal computing devices like mobile, laptops, touch pads etc. has been increasing and gaining popularity. The wireless Ad-hoc network has gained worldwide attention for the past few decades. A ubiquitous computing society is slowly being developed with a strong desire to stay connected with the outer world even on fly [1].

Thus MANET has proven to be the best network structure without any fixed infrastructures. The structure of the MANET was initially assumed to be flat because of different constraints like life of the network, bandwidth management, packet drop outs, power control and so on. Thus, scalability of the network is not properly addressed and it's a regarded as a challenge. To overcome such barriers and successfully address the issues of scalability and maintenance of MANET, it is essential to build hierarchies among the nodes such that the network topology can be abstracted. This process is commonly referred to as clustering and the substructures that are collapsed in higher levels are called clusters [2].

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Clustering is the management of dynamic mobile nodes into various groups in a specified geographical region governed by some set of rules and protocols. Increasing the networks capacity and reducing the overhead of routing using the clustering bring effectiveness in scalability with respect to the number of nodes and mobility.

The objective of clustering is to maintain a connected cluster. Nodes play different roles in clustering techniques. There are three types of nodes. They are defined as follows:-

1) Ordinary Nodes/ Cluster Member
   - These are members of a cluster who do not have any neighboring mobile node that belong to a different cluster.
2) Clusterhead
   - These are elected from the ordinary nodes which form the network backbone and also act as local coordinators to perform power control and routing functions [3]. Although they don't possess any special hardware, they represent dynamic and mobile behavior. Clusterhead exhibit some special features in comparison to other ordinary nodes. Nodes with higher degree of relative stability and greater power backup are elected as clusterheads. The primary task of clusterhead is to discover the routes for distant messages and forward inter cluster packets. Firstly, a packet originating from an ordinary node, is directed to its clusterhead. If the destination is in the same cluster, it is forwarded to the destination node. If it is in a different cluster, the clusterhead of the source node route the packet within the network to the clusterhead of the destination node [4].
3) Cluster Gateways
   - These are ordinary nodes in a non-clustered state always located at the periphery of a cluster. Such types of nodes listen to transmissions from other nodes in different clusters. They act as routing devices because they help in transporting the packet from one cluster to another.

B. Goals of Clustering

Clustering algorithms are necessary and crucial for the design of the network. If the network has to be realized in a global structure with high mobility of nodes. The mobile nodes have to communicate with each other effectively, efficiently, and reliably without loss of connectivity, data or huge amounts of energy. Thus the design goals in MANET have to be considered.

1) Load Balancing
   - As the clusterhead is the node which has the responsibility of managing the routes, updating routing tables, intra routing, giving the node ID within the cluster, discover new routes and etc. The clusterhead has a tendency to keep the number of nodes in a balanced manner within the cluster so that the expected performance goals should not be compromised. Load balancing in MANET is the establishment of equally sized clusters offers energy savings and prolongs the network lifetime rather than employing a subset of high rate clusterheads that could expire too early. Even node distribution can also influence data delay [14].
2) Clustering Formation
   - The clustering concept offers amazing potential for MANET but their formation needs careful consideration as the variety of applications using clustering may require different priorities in the node arrangements, their size and ideal parameters for the style of configuration [15].
3) Real Time Operation
   - The life time of the data is one of the considerations to be made, it may be relevant to one application and possibly not to another. If we consider the practical applications like in military tracking and emergency applications the real time data are received [16]. Thus, while tailoring such applications different constrains of clustering scheme like delay, recovery time and packet losses etc, should be taken under considerations.
4) Maximizing Network Life time
   - As clustering scheme is carried on with the selection of clusterhead, it is the integral part for communication taking place between the networks, also it plays a role for data aggregation thus clusterhead is resource rich as compared to other cluster member [17]. Hence, it becomes essential to reduce the energy consumption by making the cluster member near to the clusterhead or by using the load balancing technique as discussed earlier, which maximizes the life of the network.
5) Maintenance Mechanism
   - There are several situations that might provoke link failure in MANET, the physical mobility and nomadic nature of some devices, node death and interference. Clustering schemes need to have link recovery mechanism.
6) Quality of Service
   - There has to be an overview of quality of service to determine the efficacy of MANET requirements regarding communication overhead. The mobility of node causes topology change (link /cluster additions or deletions) which may spread up to any level.

C. Weighted Clustering Algorithm (WCA)

According to [5], WCA considers a new approach of selection of clusterheads considering the combined weight metric. This approach takes several system parameters like node degree, transmission power, mobility and battery power. Depending on the system requirements and applications, any of these parameters in this metric can be used to elect clusterhead. Clusterhead election procedure, the procedure consists of the following steps:

- **step 1.** Find the neighbors of each node v (i.e., nodes within its transmission range) which define its *degree*, d_v, as

$$d_v = |N(v)| = \sum_{v' \in V, v' \neq v} dist(v, v') < tx_{range} \quad (1)$$

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- **Step 2.** Compute the *degree-difference*, $\Delta_v = d_v - \delta_v$, for every node v.
- **Step 3.** For every node, compute the sum of the distances, D_v, with all its neighbors, as

$$D_v = \sum_{v' \in N(v)} dist(v, v') \quad (2)$$

- **Step 4.** Compute the running average of the speed for every node till current time T . This gives a measure of mobility and is denoted by M_v, as

$$M_v = \frac{1}{T} \sum_{t=1}^{T} \sqrt{(X_t - X_{t-1})^2 + (Y_t - Y_{t-1})^2} \quad (3)$$

  where (X_t , Y_t) and (X_{t-1} , Y_{t-1}) are the coordinates of the node v at time t and $t - 1$, respectively.
- **Step 5.** Compute the cumulative time, P_v, during which a node v acts as a clusterhead. P_v implies how much battery power has been consumed which is assumed more for a clusterhead than an ordinary node.
- **Step 6.** Calculate the combined weight W_v for each node v, where

$$W_v = w_1 * \Delta_v + w_2 * D_v + w_3 * M_v + w_4 * P_v \quad (4)$$

  where w_1,w_2,w_3 and w_4 are the *weighing factors* for the corresponding system parameters.
- **Step 7.** Choose that node with the smallest W_v as the clusterhead. All the neighbors of the chosen clusterhead are no longer allowed to participate in the election procedure.
- **Step 8.** Repeat steps 2 to 7 for the remaining nodes not yet selected as a clusterhead or assigned to a cluster.

Selects a clusterhead according to the number of nodes it can handle, mobility, transmission power and battery power [5].

$$W_v = w_1 * \Delta_v + w_2 * D_v + w_3 * M_v + w_4 * P_v \quad (5)$$

The node with the minimum weight is selected as a clusterhead. The weighting factors are chosen so that

$$w_1 + w_2 + w_3 + w_4 = 1 \quad (6)$$

D. Lowest ID Cluster Algorithm

In this algorithm the node with the lowest identification is selected as the clusterhead [7]. The neighbour will have a higher identification as compared to the identification of clusterhead. A gateway node is the one which lies in between the range of two or more clusterheads. Hence, node with lower identification has high probability of becoming a clusterhead. Each node is assigned a distinct *id*. Periodically, the node broadcasts the list of nodes that it can hear (including itself). The Lowest ID scheme concerns only with the lowest node *ids* which are arbitrarily assigned numbers without considering any other qualifications of a node for election as a clusterhead. Since the node *ids* do not change with time, those with smaller *ids* are more likely to become clusterheads than nodes with larger *ids*. Thus, drawback of lowest ID algorithm is that certain nodes are prone to power drainage due to serving as clusterheads for longer periods of time.

E. Modified Weighted Clustering Algorithm (MWCA)

The Modified weighted clustering algorithm involves Weighted Clustering Algorithm (WCA) for cluster formation and Mobility Prediction for cluster maintenance. Referencing to [6], clustering is an effective technique for node management in a MANET. Cluster formation involves election of a mobile node as clusterhead and it controls the other nodes in the newly formed cluster. The connections between nodes and the cluster head changes rapidly in a mobile Ad-hoc network. Thus cluster maintenance is also essential. Prediction of mobility based cluster maintenance involves the process of finding out the next position that a mobile node might take based on the previous locations it visited.

The following assumptions are made before clustering

1) The network topology is static during the execution of the clustering algorithm.
2) Each mobile node joins exactly one clusterhead.
3) The optimal number of nodes in the cluster is assumed to be 8.
4) The co-efficient used in Weight calculations are assumed the following values, w_1=0.7, w_2=0.2, w_3=0.05, w_4=0.05. The sum of these co-efficient is 1. This is actually used to normalize the factors such as spreading degree, distance with its neighbors, mobility of the node, and power consumed used in the calculation of weight of a node. The factors spreading degree and distance with its neighbors are given more importance and assumed higher co-efficient values 0.7 and 0.2 respectively.

Formation of Cluster

Initially, each node broadcasts a beacon message to notify its presence to the neighbors. A beacon message contains the state of the node. Each node builds its neighbor list based on the beacon messages received. The clusterheads Election is based on the weight values [8], [9] of the nodes and the node having the lowest weight is chosen as clusterhead [10]. Each node computes its weight value based on the following algorithm:

- **Step 1:** The coefficients used in weight calculation are assumed the following values w_1=0.7, w_2=0.2, w_3=0.05, w_4=0.05.
- **Step 2:** Compute the difference between the optimal cluster's size α and the real number of neighbors R(V) as spreading degree,

$$\Delta sp = 1 - (| - R(V)|/\alpha) \quad (7)$$

- **Step 3:** For every node the sum of the distances, D_v, with all its neighbors is calculated.

$$Dv = \sum dist(v, v') \quad (8)$$

  where v'∈N(v).
- **Step 4:** Calculate the average speed for every node until the current time T. This gives the measure of the mobility M_v [11], [12] based on the X co-ordinate and Y co-ordinate i.e., position of the node v at all previous time instance t.
- **Step 5:** Determine how much battery power has been consumed as P_v. This is assumed to be more for a Cluster-Head [13] when compared to an ordinary node.

Because Cluster-Head has taken care of all the members of the cluster by continuously sending the signal.

- **Step 6:** The weight W_v for each node is calculated based on

$$Wv = (w1 * \Delta sp) + (w2 * Dv) + (w3 * Mv) + (w4 * Pv) \tag{9}$$

Where Δsp is the spreading degree, D_v is the distance with its neighbors, M_v is the mobility of the node, and power consumed is represented by, P_v.

- **Step 7:** The node with the smallest W_v is elected as a clusterhead. All the neighbors of the chosen clusterhead are no more allowed to participate in the election procedure.
- **Step 8:** All the above steps are repeated for remaining nodes which is not yet elected as a clusterhead or assigned to a cluster.

II. Proposed Method

A. Selection of Weights

Referencing [6] the weighting factors actually used to normalize the factors such as spreading degree, distance with the neighbors, mobility of the nodes and power consumption by the individual nodes. The combination of individual factors can be appropriately chosen by tuning the weighting factors. The individual weights for individual nodes are given at an interval of 0.05 which varies from 0 to 1 for individual nodes, this is because the weighting factors summation is always equal to 1. The weights incorporated by these nodes should be initially determined rather than substitution according to the requirement of scenario. It has a drawback of not knowing the weights of all the nodes before starting clustering process and draining clusterheads rapidly. Different weights can be tuned at mobility with measurement of throughput and end to end delay and the effect of weighting factors is analyzed. Finally substitute the best suitable weights for selection of clusterhead.

B. Selection Steps

1) Step 1
   - Initialize the weights w_1, w_2, w_3, w_4 which varies from 0 to 1 at interval of 0.05 for each node.
     set init - 0.05
     set incr 0.05
     for set mp 0 $mp < nn incr mp
     set w($mp) [expr $init + $incr]
     set incr [expr $incr + 0.05]

2) Step 2
   - Calculate the weight of each node such that it's summation equals to 1.
     This four depth loops runs and finds all possible combinations of w_1, w_2, w_3, w_4 with sum = 1

     if $\{w(\ w_1$i) + $w(\ w_2$i) + $w(\ w_3$i) + $w(\ w_4$i) == 1 $\}$
     Condition begins
     Compute the degree
     Compute the degree difference
     Compute the sum of distances
     Compute mobility M_v
     Compute Time for which node remains clusterhead P_v
     Calculate Combined weight W_v

3) Step 3
   - Minimum weight?
     - *Yes, Clusterhead selected, selecting the minimum value of W_v*
     - *No, Repeat all to select the Clusterhead with minimum value of W_v*

4) Step 4
   - Find the minimum weights of each node.
     - *Tune/iterate the values of weights 1 to N times*
     - *Determine best suitable weights by tuning in terms performance parameters i.e., throughput and end to end delay*

5) Step 5
   - Weight selected?
     - *Yes, Apply selected weights to compare different clustering algorithm*
     - *No, Go to step 1*

C. Simulation Scenario

The simulator to simulate the network model is NS-2 (Version 2.34). The channel type is wireless channel with MAC type 802.11 g.The network interface type also being wireless and the interface queue of network packets is Queue/Droptail. Two-ray-ground model is used for radio propagation, as it considers both indoor and outdoor propagation. Each wireless node is considered to have Omni directional antenna. For the simulation scenario, 400*400 m^2 area is taken into account. 50 to 100 nodes were considered for simulation as it optimizes the result considering the area chosen. The transmission agent being UDP with simulation time ranging from 0-150 s, the mobility model is random. Speed of each mobile node varies as 5, 10, 15, 20 m/s respectively for a CBR packet size of 512 bytes and maximum packets delivered is 10,000 packets in order to achieve the specific throughput of a model at an interval of 0.025 s with rate of 256 Kbps. The coverage radius is 250 m. Routing of packets from source to destination is used using source initiated AODV routing protocol. The operating frequency is 2.4 GHz for 802.11 g and channel bandwidth is 1 Mbps. The TX-RX antenna height is 1.5 m. The system loss is 0 dB, the transmitter and the receiver antenna gain is 0 dB. The parameters are assumed in such a way that they account to the scenario where a node moving at a speed of (0-5) m/s corresponds to a pedestrian walk, node moving at a speed of (15-20) m/s represents a vehicle moving in a highway. The measurement of throughput and end to end delay is considered in both the cases. The table shows the simulation parameters with its assumed value in the simulation.

III. Simulation Results

A. Variation of Weighting Factors on Throughput at different Mobility

In Fig.1, the effect of weighting factors on throughput can be observed with variation of mobility. As it is well-know

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TABLE I
SIMULATION PARAMETERS

Parameter	Value
Area	400*400 m^2
Mobile Nodes	50, 100
Simulation Time	0-150 s
CBR, Packet size	512 Bytes
Interval, Rate	0.025 s, 256 Kbps
Maximum Packets	10,000 Bytes
Routing Protocol	AODV
Tx Power	0 to 1 Watt
Coverage Radius	250 m
Channel Bandwidth	1 Mbps
Antenna Tx-Rx Height	1.5 m

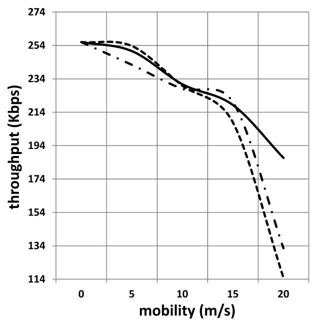

Fig. 1. Effect of weighting factors on throughput at different mobility

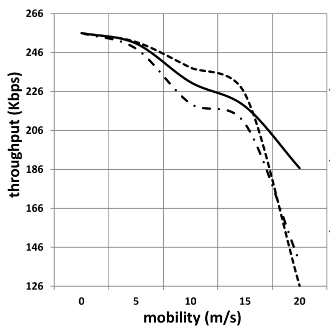

Fig. 2. Effect of weighting factors on throughput at different mobility

that throughput is the amount of information carried between the nodes at a specific time; increase in mobility decreases the amount of throughput. Now as moved on from (0 to 5) m/s, the overall effect of throughput is more or less constant for all three different weights. But as moved on from (5 to 10) m/s, the effect of weights w_1 = 0.1, w_2 = 0.05, w_3 = 0.45, w_4 = 0.4 and w_1 = 0.1, w_2 = 0.05, w_3 = 0.2, w_4 = 0.65 on throughput is same as compared to w_1 = 0.25, w_2 = 0.05, w_3 = 0.15, w_4 = 0.55. Similarly, as on increasing the mobility from (10 to 20) m/s, i.e., at higher mobility the throughput with the corresponding weight w_1 = 0.1, w_2 = 0.05, w_3 = 0.45, w_4 = 0.4 is better as compared to remaining weights.

Fig.2, depicts the effect of weighting factors in throughput at different mobility. On increasing the mobility the amount of throughput gets decreased, this is because of the increment of randomness with the increment of the mobility of nodes. Now if the effects of throughput are observed on varying mobility on different weighting factors, and moving on from (0 to 5) m/s, it is seen that the throughput is almost constant for all three different weighting factors, but as the mobility is increased from (5 to 15) m/s, the effect of throughput of weights w_1 = 0.1, w_2 = 0.05, w_3 = 0.45, w_4 = 0.4 lies between the remaining two weights, i.e., almost equal to w_1 = 0.1, w_2 = 0.05, w_3 = 0.15, w_4 = 0.7. Similarly, at higher mobility it is seen that the effect w_1 = 0.1, w_2 = 0.05, w_3 = 0.45, w_4 = 0.4 is comparatively better as compared to other weights.

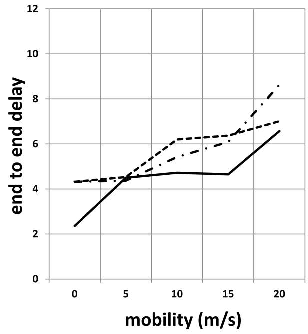

Fig. 3. Effect of weighting factors on end to end delay at different mobility

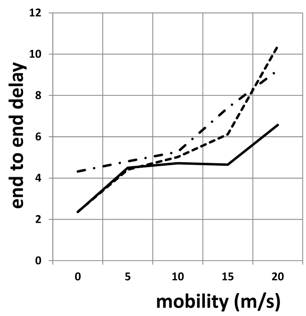

Fig. 4. Effect of weighting factors on end to end delay at different mobility

B. Variation of Weighting Factors on End to End delay at different Mobility

From Fig.3, the effect of delay in mobility at different weighting factors is observed. On increasing the mobility, delay tends to get high. It can be depicted that the effect of delay is minimum with weights w_1 = 0.1, w_2 = 0.05, w_3 = 0.45, w_4 = 0.4 as compared to other weights. At a mobility of (0 to 5) m/s, delay is equal to 2 s and for mobility of (5 to 15) m/s, delay is almost constant and equal to 4 s . Similarly, at higher mobility, delay is equal to 6 s. Hence, at lower and upper values of mobility, delay is minimum compared to delays with weights w_1 = 0.25, w_2 = 0.05, w_3 = 0.15, w_4 = 0.55 and w_1= 0.1, w_2 = 0.05, w_3 = 0.2, w_4 = 0.65.

Similarly, Fig.4, shows the effect of delay is minimum considering the weights w_1 = 0.1, w_2 = 0.05, w_3 = 0.45, w_4 = 0.4. At a mobility of (0 to 5) m/s, delay is equal to 2 s and for mobility (5 to 15) m/s delay is almost constant and equal to 4 s. Similarly, at higher mobility, delay is equal to 6 s. Hence, at lower and upper values of mobility, delay is minimum compared to delays with weights w_1 = 0.05, w_2 = 0.05, w_3 = 0.3, w_4 = 0.6 and w_1 = 0.1, w_2 = 0.05, w_3 = 0.15, w_4 = 0.7. Hence, while comparing different weights the effect of weight w_1 = 0.1 w_2 = 0.05 w_3 = 0.45 w_4 = 0.4 is minimum in terms of delay as compared to other weighting factors at upper and lower values of mobility.

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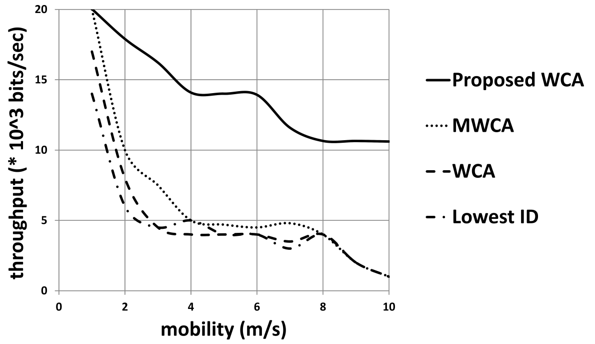

Fig. 5. Throughput Vs mobility at data rate of 20 Kbps

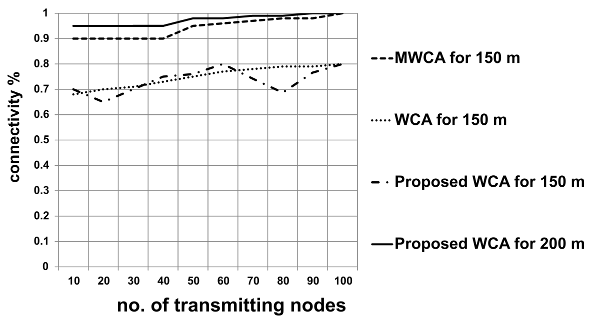

Fig. 6. Connectivity for scalability with transmission range of 200 m

C. Throughput vs Mobility for 10 m/s

Fig.5, shows variation in throughput and maximum mobility of nodes are inversely related. Throughput is the amount of useful information transmitted between the nodes at specific time intervals. Basically, the throughput decreases when the mobility with which the node travels increases. In comparison with different clustering algorithms with data rate of 20 Kbps at mobility of (1-10) m/s, MWCA (Modified Weighted Clustering Algorithm), lowest ID, WCA (Weighted Clustering Algorithm) and proposed WCA with weights w_1 = 0.1, w_2 = 0.05, w_3 = 0.45,w_4 = 0.4, the throughput is comparatively better. At a mobility of 1 m/s, MWCA and WCA (proposed) has equal throughput but as moved from 1 m/s to 10 m/s, the amount of throughput is high. Thus, the power utilization of the nodes is comparatively lower in case of proposed WCA.

D. Connectivity in Clusters

Fig.6, above depicts that increase in transmission range from 150 m to 200 m, it ensures better connectivity, i.e., 100% connectivity as compared to WCA (Weighted Clustering Algorithm) and MWCA (Modified Weighted Clustering Algorithm). This is because the increase in transmission range decreases the average number of clusters and clusters become larger in size and more nodes can hear each other.

IV. CONCLUSION

The combined weight metric doesn't have absolute values of weights according to system requirements. Initially, the values of weights are selected by measuring the throughput and end to end delay of a system at different values of weights varying the mobility. The selected values of weights for our system is w_1 = 0.1, w_2 = 0.05, w_3 = 0.45, w_4 = 0.4, which gives the optimum value of throughput and end to end delay at these weights. The selected values of weights are incorporated in different clustering algorithms for determination of clusterhead. In comparison, the output of the paper depicts that, for connectivity of clusters for transmission range of 150 m, MWCA (Modified Weighted Clustering) has 100% connectivity, but as we increase the transmission range from 150 m to 200 m with selected weights, the proposed WCA has better connectivity as compared to MWCA and WCA because connectivity ensures more nodes can hear each other at a given range. Also when comparing throughput at mobility of 10 m/s with data rate of 20 kbps, the proposed WCA has better throughput and the power utilization of each node is low as compared to MWCA and Lowest ID.

V. FUTURE SCOPE

These selected values of individual weights can be optimized using suitable optimization technique. The calculated weights in this paper can be analyzed for different weighted clustering algorithm like MWCA(Modified Weighted Clustering algorithm), TRBC(Transmission Range based Clustering Algorithm), MPWCA (Mobility Prediction-based Weighted Clustering Algorithm), Lowest ID, Power aware clustering and etc in terms of different performance parameters .The comparative study of different clustering algorithm using these weights is possible. The simulation can be further carried out by considering different network parameters like: node density, area, transmission range and etc, other than considered in this dissertation. As MANET has a dynamic property, so there is always a unique scenario if a single parameter of node is changed. Setting up a scenario required by a system representing different simulation parameters can be used for further analysis. The performance of determination of weights has been considered using AODV routing protocol, it can further be analyzed using different routing protocols like: OLSR, OSPF, DSR, DSDV, RIP, etc.

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