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RESEARCH ARTICLE

A SURVEY ON PERFORMANCE OF MPBCA AND WBC IN MOBILE ADHOC NETWORKS

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Abstract

Mobile ad-hoc network are nowadays very widely used network .They are wireless network and can be formed independently and can be moved in any direction. There self-organizing ability had made them very popular in the Wireless Sensor Networks (WSN).in MANET mobile nodes are dynamic in nature. Due to very large network it is very hard to manage all the node freely in the network .Clustering gives us the solution for this problem by forming groups in which nodes are being divided. But frequently adding and deleting the nodes from the cluster affects the stability of the network and hence reconfiguration of network is unavoidable .There are various types of the clustering algorithm exists. . In this paper we will study v weighted clustering algorithm and mobility prediction based clustering algorithm which lifts the capacity of network and decreases the routing overheads in order to bring more efficient and effective routing in MANET

Introduction:-

The emerging changes in the mobile computing and wireless communication technology has made requirement for the development of protocols for easily deployable wireless networks. These networks are infrastructure less and have no existent. They are easily providing the inter connectivity between the workgroups moving in urban or rural area. The main perturb in the efficient network services are absence of physical infrastructure, limited bandwidth, unpredictable link failure, limited battery, etc. in MANET mobile nodes have a wireless link between them for the communication purpose. These cannot be break when the nodes are in the same transmission range. But due the dynamic nature if any node move from one places to another place it will causes the link failure and wobbly network. Hence to achieve the stability nodes should be grouped in a manner, this grouping of node is known as clustering. Some nodes are elected as the cluster-head and are treated as the head of cluster .cluster head is responsible for the formation of the cluster and maintenance of the topology of the network. In this paper we will firstly see the previous clustering algorithms and then compare the performance of Mobility prediction based weighted clustering algorithm and Weighted Clustering Algorithm[1].Finally, we will conclude our study.

Other clustering Algorithms:-

The HID [2] is based where degree of nodes is defined as the number of neighbors of a given node.at the time of the selection process every node broadcast its unique ID in the network. Every node computes its degree and then broadcasted it to its every neighbor and the node with highest degree becomes the cluster head. But in HID cluster head changes very frequently due to the lack of the upper bound on the number of nodes. And also as the number of nodes increases the throughput drops and system performance degrades.

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The Lowest-ID (LID) algorithm [3] in which each is assigned with the distinct ID, node with the lowest ID becomes the cluster head. This procedure will be repeated for remaining nodes until every node will becomes a cluster head or cluster member in the cluster. Even though it is better than the HID but its main drawback is, it is partially towards nodes with smaller IDs that lead to battery drainage of certain nodes and uniform load balancing among nodes is not done.

LCC[4] Least Cluster Change algorithm, minimizes cluster head change that occurs when two cluster heads comes in each other's range and had direct contact .In these cases one cluster head has to leaves its cluster head position. Some nodes from the earlier cluster may not become the member of the other cluster head .Therefore, some nodes must become the new cluster head while causing a lot of re-direction because of the broadcast of such changes across the entire network

Distributed clustering algorithm[5] in this each node will also has unique weight other than just node IDs .these weights are utilize here for the selection process of the cluster head. In nodes will compare their weight with the other neighbor node and if the value of its weight is highest among all other neighbor than it will declare itself as the cluster head of that cluster, else it will join to neighboring cluster. The network topology of this algorithm does not change during the execution so it is good only for the static network rather than the dynamic network where mobility is high like Ad hoc network.

Challenging Issues In Clustering Algorithm:-

Some important challenges [7] in cluster based WSNs are:-

- Limited Energy: Due to limited energy wireless sensor struggles with the problem of limited energy storage and once they are deployed it is not practically possible to change or recharge their batteries. If we remove the amount of data transmission then clustering algorithm becomes the more energy efficient compare to the direct routing algorithm. By optimizing the cluster formation and re-cluster periodically on their residual energy balancing in energy consumption is done
- Network lifetime: Limited lifetime for nodes is the result of the energy limitation on node. By reducing the number of nodes contending access, data aggregation at CHs clustering techniques helps to extend the network lifetime
- Cluster formation and cluster head selection: Cluster formation and cluster head selection are two of the most important part of the clustering algorithm. We have to manage the proper size of the cluster, election and re-election of the cluster heads, and cluster maintenance. These are the main focused point while creating any clustering algorithm
- Synchronization: Slotted transmission schemas for e.g. TDMA permit nodes to frequently schedule sleep intervals to diminish the energy used.

Algorithm:-

Weighted clustering algorithm [1] has a different working scheme than other algorithms. It is only invoked on demand by isolated nodes. While choosing the cluster head node by this algorithm we have to decide the following parameter. Idle number of nodes that can be handled by the cluster, speed of nodes, battery power consumed by the node and distance between the node and its neighbor. Algorithm provides the weight to these parameter. The set of cluster heads is known as the dominant set. The election procedure of cluster head starts at the system of system activation and also when dominant set is not able to cover all the nodes .every time when election algorithm run that does not means that every cluster head from the previous dominant set will be replaced by the new cluster heads. If any node detaches itself from its current cluster head and get attached in some other cluster head then the election algorithm will not run immediately, the node will attach itself to its list simply [1].

After the election process will get over all the nodes will have their list of their neighbors and all the cluster heads have been assigned.

All the nodes will be continuously observe the signal strength of the Hello message that was send by other nodes. If the distances between two nodes increases then signal strength will decreases. In that mobile node has to notify it cluster head that it is not able to attach anymore from its list and it will tries to handover the node to its first neighbor cluster head. If the node goes to some region where it comes in range of no cluster head then a new dominant set will be made.

That periodic hello messages will introduce a high commination overhead.
Further we will see its comparison with Mobility Prediction based clustering algorithm on the various parameters.

Mobility Based Prediction Weighted Clustering Algorithm[8**]**: The overhead made by WCA is very high, since a large part of bandwidth is consumed due to overhead, which now cannot be used in the useful data transmission.

To avoid that overhead, we can increase the duration between two hello messages will be increased. Due to nodes mobility, the topology is always changing. If the duration will increase it will lead to the link failure because now cluster head will not get updated list of its nodes frequently. So now we will study new distributed mobility prediction-based algorithm.

This algorithm starts working after the election of cluster-heads, when the other nodes are monitoring the signal strength of packets from the cluster- head. It starts working as:
Now cluster-head will periodically sends info about its position and its speed in hello message. When other nodes than cluster-head receives these hello messages, it stores the info about its cluster-head into a list named as information list. The stored info are:

- The position of the cluster-head in Cartesian coordinates(x ,y, z)
- The speed of the cluster head

If an ordinary node has less than two past info about its cluster-head in its list, during between two hello message then it wait for next hello message (step 1).
Else, it will use the past information list to get idea about the current position and speed of their cluster heads and store them into a new list called prediction list. Since time difference between two hello messages can be very large, the ordinary node can make more than one assumption which will now store into the prediction list. In this case, the prediction list will be attached to past information list to make other assumptions.

Now the ordinary node will compute the distance to the estimated position of its cluster-head. So that ordinary node will decide that if it should stay in its current cluster or not .then it will compare this distance with the transmission range, which is same for all nodes. If the distance is less then it will stays in its cluster else it will tries to handover to its neighbor cluster-head and if cannot find another cluster-head in its neighborhood then it will stays current cluster-head waiting for next hello message for the estimation process ,to avoid updates of the dominant set which are not required, due to false estimation

The ordinary node will make assumptions only till it receives new hello message, their prediction list will be cleared after it will receive new hello message.
Since an ordinary node always guesses position using past info, so it needs to take “fresh information”. So, the past information list will have finite size and as the list will be full it will remove the oldest info out of it.

Performance evaluation[8]:-
Now by using the simulations, we show that MBPWCA performs better than the WCA in term of the number of updates of a dominant set and number of successful handovers of a node in a cluster

Simulation study:-
We simulate two systems of 50 and 100 nodes respectively on a 1000m * 1000m area. The nodes will have a transmission range of 100m and 200m.The nodes can arbitrarily move in all possible directions with speed varying uniformly between 0 and one parameter demonstrating the max value of the speed.

The cluster-head selection will be done at the start of the simulation process and when a node can no longer be enclosed by any dominant set [1]

Now for this election, we will assume that every cluster-head can handle $\Delta=3$ nodes (ideal degree) in its cluster in context of resource allocation. If the transmission range will be less and the density of nodes in the network is frail, then little connectivity will be finding in cluster heads and if the bandwidth is restricted, then cluster-head cannot handle too many nodes at same period. Finally, it is the value which will be used by GloMoSim user [6]

Besides, in this election, the selection of parameters w_i (i=1.4) is done as in [1] and as GloMoSim user.in this experiment , the values used are w1=0.7, w2=0.2, w3=0.05 and w4=0.05

When every cluster-heads will be chosen, they will start sending hello message with interval of 2s, instead of 1s, as usually used in WCA. Then ordinary nodes will start prediction as described above in step 2 and 3.to minimize the effect of overhead brought by hello message we will divide their frequency by two. But that can results into unpredictability of the hierarchy so, we will add location estimation between two hello messages to replace the missing info and it can be shown that hierarchy remains stable.

In this experiment, ordinary nodes make two estimations before receiving the next hello message. After that, the prediction list is cleared and then algorithm is then step 1.

We will consider two metrics to measure the performance of the our system

Simulation Results:-

In our simulation experiment, we choose values 1m/s, 5m/s, 10m/s, 20m/s, 30m/s and 40m/s for the maximum speed of nodes. Here the lowest value will be equals to walking speed and highest value will be equal to a bike speed on faster highways. The nodes travel arbitrarily and uniformly in all possible directions.

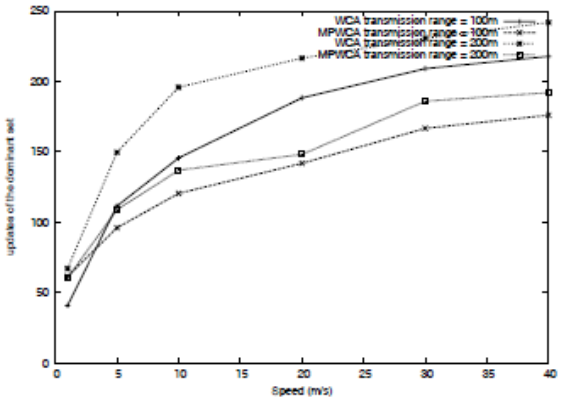

Figure 1. *number of updates of the dominant set vs maximum speed (100nodes)*

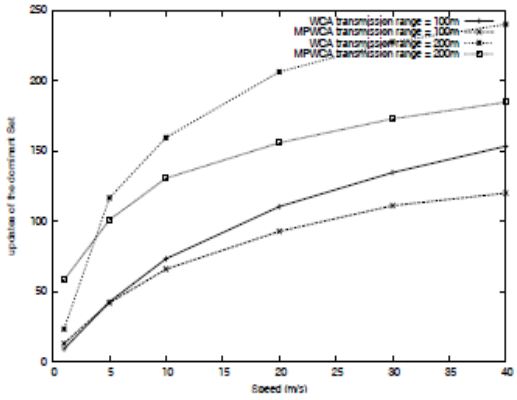

Figure 2. *number of updates of the dominant set vs maximum speed (50 nodes)*

Figure 1 and 2 shows that, for a static value of speed, MBPCWA give improved result for this metric, since WCA includes extra updates of dominant set than MBPCWA and price of these updates will be high in terms of CPU distribution and bandwidth.

As well as in case of handovers, we can see that the amount of updates of dominant set rises as speed rises, due to mobility.

If the number of nodes will be higher then dominant set will be more stable.

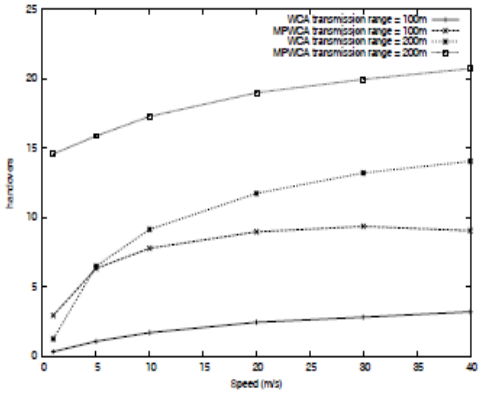

Figure 3. *number of successful handovers vs maximum speed (50 nodes)*

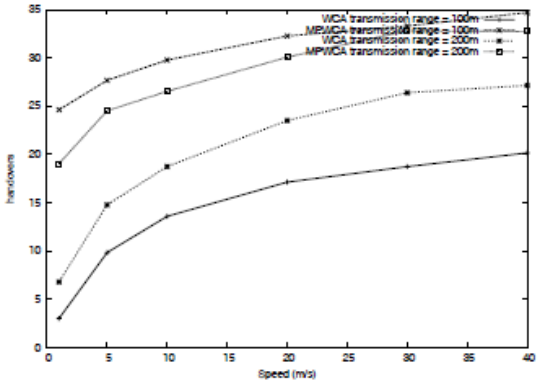

Figure 4. *number of successful handovers vs maximum speed (100 nodes)*

In figure 3 and figure 4 we can observe that for a static value of speed, MBPCWA permits a higher number of positive handovers than WCA.

We can also see that the number of positive handovers increases while speed increases. Because of mobility, nodes will not always stay in the same cluster. But changes will be less if nodes have a high broadcast range or if they move gradually.

Conclusion:-

In this paper we studied MBPCWA and WCA. To control the overhead created by hello messages, we increases the time interval between two messages. During this extended time the nodes try to approximate the movement of their cluster-head and then anticipate handovers to avoid link breaks.

Using GloMoSim [6],we simulate two network of 50 and 100 nodes respectively, that were equally spread on a 1000m * 1000m area

To compare its performance we compared both algorithms on basis on two metrics symbolizing the stability of the dominant set: the number of updates of the dominant set, the number of handovers of a node to another cluster, here we finds out that MBPWCA is better than the WCA for better stability of dominant set.

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