An Overview on Cluster Head Election Techniques in Mobile Ad-Hoc Networks

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ABSTRACT
This paper will try to find out the way to identify or to select a best and optimised head to communicate among the clusters with education in data redundancy and also will help better band width utilisation. Wireless Ad-hoc network is formed by the set of wireless devices, which move randomly as well communicate with other nodes through radio signal. Ad-hoc networks logically depicted as a group of clusters by assemble together on the basis of different criteria like as a-hop and b-hop that are in close division with one another. Clusters are instituted by diffusing node specifications along the wireless links. Various heuristics employ have several policies to select cluster heads. Various policies of these are biased in approbation of some nodes. As a result at the end, these nodes should have greater authority and may deplete their energy speedily, resulting them to drop out from the network. So that, there is a requirement for process called load-balancing among selected cluster-heads to give all nodes the opportunity to present as a cluster-head.

Keywords
Cluster-head, Ad-hoc Network, WCA, NWA, EWCA

1. INTRODUCTION
Mobile Ad-Hoc Network (MANET) is a mobile network multi-hop wireless n/w, which does not required pre-existing centralized administration or infrastructure. Each and every node in this network is perform as a router, which means that each node is able to transfer the data to respective nodes. There are several applications of ad-hoc networks, as an example conventions or meetings, file transfer and electronic email, and emergency disaster reassurance personnel coordinating attempt after an earthquake or hurricane [1, 2]. Dynamic routing is one of the most major issue in MANET's. In complete structure exclusively depend on proactive and reactive routing algorithms that cannot perform well in a large scale dynamic MANET. That means, with the increment in size of the networks, clear routing schemes do not scale good in terms of representation. In order to solve these problems by clustering the number of nodes into an easily manageable group known as cluster [4,3]. The foregoing research on mobile ad-hoc network has big emphasize the use of clustering algorithm because clustering/grouping clarifies routing as well can improve the performance of scalability and flexibility in the network. Many clustering algorithms have been introduced to increase scalability as well flexibility, improve bandwidth utilization, and decreases delays for route strategies. In a clustering structure, the mobile nodes in an n/w are divided into many virtual zones (clusters). Each and every mobile node may be assigned a several status or activities, such as cluster-gateway, cluster-head, or cluster-member. The cluster-head could be used as a repository for the information of the cluster as well a coordinator of the cluster operations. Cluster-gateway is a boundary node in communication limit for one or more than one cluster. Summarized cluster knowledge is sent to the nearby cluster-heads through gateways [5, 6].

2. BACKGROUND
This part explain the basic cluster-head selection algorithm/ process for the one hop clustering.

2.1.Lowest-ID Algorithm
This algorithm was actually introduced in which each node is synchronised a distinct ID as well the clusters are formed according to the steps given below:

- Periodically a node (including itself) broadcasts the name of nodes that it can hear clearly.
- Cluster-head (CH) will be a node, which can only hears nodes with ID higher than itself.
- Cluster-head will be the lowest-ID node that a node hears is it's, till the lowest-ID particularly gives up its work as a cluster-head.
- Gateway is a node, which can hear two or more cluster-heads.
- Otherwise the particular node is an ordinary node.

Major snag of this algorithm/process are its bias nature towards nodes with smaller ids which may proceed to the battery power drainage of certain nodes, as well it does not attempt to equalize the load uniformly across entire the nodes.

2.2.Highest-Degree Algorithm:
The Highest-Degree Algorithm/process, also called as connectivity-based clustering/grouping algorithm, was originally introduced by Gerla and Parekh [12, 14], in which the state of a node is calculated based on its distance from others nodes. A node q is considered to be a nearest of another node p if q stay within the transmission limit of p. The node with highest number of neighbours (i.e., maximum state) is selected as a cluster-head. The nearby of a cluster-head be the members of that cluster as well can no longer participate in the selection algorithm. Any of the two nodes in a cluster are at most two-hops away till the cluster-head is directly connected to each of its nearby nodes in the cluster. As a short explanation, each and every node either becomes an ordinary node (neighbour of a cluster-head) or still remains a cluster-head.

Most important disadvantage of this algorithm are the number of participial nodes in a cluster, the throughput decreased and hence a increasing degradation in the overall system

performance is recognised, and another limitation or we can say drawback is the re-affiliation numbers of nodes are high due to node displacement as a result, the highest- stated node (the present cluster-head) may not be re-selected to be a cluster-head even though if it loses one nearby. All these disadvantages occur because this leads does not have any boundation on the upper bound on the count of nodes in a cluster.

2.3.Node-Weight Algorithm

The two algorithm, the first one is distributed clustering algorithm (DCA) and second one is distributed mobility adaptive clustering algorithm (DMAC). In this approach, each and every node is assigned weights (a real count above zero) depends on its suitability of being a cluster-head. A node is selected to be a cluster-head if its weight is greater than any of its nearby node's weight otherwise, it combines a nearby cluster-head. The smaller node id is selected in case of a toss. The DCA makes an estimation that the network topology does not differs till the execution of the algorithm completed. To substantiate the presentation of the system, the nodes were assembled by their weights which varied with their speeds but with negative slope. As a results, it is proved that the number of increment required is smaller than the Lowest-ID and Highest-Degree heuristics. Till the node weights were varies in each and every simulation cycle, calculating the cluster-heads becomes very expensive as well there are no optimizations or improvement on the system criteria such as throughput as well power control.

2.4.Weighted-Clustering Algorithm

The Weighted Clustering Algorithm (WCA) was previously proposed by M. Chatterjee [7, 5, and 9]. It takes 4 categories into consideration and makes the election of cluster-head as well maintenance of cluster much more reasonable. As shown in equation (1), the four main factors are node degree/states, distance summation to each its nearby nodes, mobility and resulting battery power respectively, as well their corresponding weights are w1 to w4. Other than this, it replace the clustering/grouping issues into an optimization/reduced problem since an objective work is formed.

$$W\,v = w1\,\Delta\,v + w\,D\,v + w\,Mv + w\,Pv \qquad (1)$$

WCA has proved its better performance as compared to all the previous process, it lacks a disadvantage in calculating the weights of all the nodes prior of starting the clustering algorithm as well in draining the CHs speedily. As a result, the overhead persuade by WCA is very large.

3. RELATED WORK

3.1.Enhancement-Weighted-Clustering-Algorithm (EWCA)

- Principles of Algorithm:

In introduced algorithm selection, cluster-head is adaptive called depends on displacing of nodes or changing the respective distance between the nodes as well cluster-head. Selection is recursive until each of node should be the member of any cluster or becomes a cluster-head. In the Load-balancing process, assume that there are a previously defined threshold count of mobile nodes that a cluster could cover. When the count of cluster's members is extreme large that can produce a small count of clusters which creates bottleneck of a MANET as well decrease system throughput. Moreover, very small cluster's member may generates a large count of clusters and after that resulting in extra counts of hops for transferring a packet from source hop to destination hop, and longer end-to-end will delay. If the size of cluster exceeds its previously defined limit, selection process is recursive to adjust the count of mobile nodes in that cluster.

Better communication is possible, if the distance between cluster member and cluster-head is within the transmission limits.

The approximate distance between nodes causes the consumption of the battery power and battery draining. It is called that max power is needed to communicate through a wide distance. Since cluster-heads have the additional responsibility to transfer packets from one to other nodes, they need more battery power than ordinary nodes.

Mobility is the most important obstacle for MANETs, and it is the major factor which would differs network topology. A good selecting cluster-head does not displace very speedily or quickly, the reason is when the cluster-head changes fast, the nodes can be replace out of a cluster as well are combined to another present cluster and that resulting in decreasing in stability of n/w. There are so many mobility models called as Random-Way-Point-Model (RWP), Random-Way-Point on Border-Model (RWBP), Random-Gauss-Markov (RGM) model, and Reference-Point-Group-Mobility model (RPGM). In our process algorithm we are going to use Random-Way-Point-Model [8, 10].

3.2.An Adaptive Broadcast Period Approach

In the paper, an appropriate distributed grouping or clustering algorithm represented which uses both energy and location metrics for cluster production. Our proposed results mainly points the cluster's stability, energy efficiency and manageability issues. As well as, our process algorithm alleviate the network from the not needed burden of control messages for broadcasting, mainly for mostly for static network topologies. This is succeed through accepting broadcast interval according to the mobile nodes and mobility pattern. The scalability, efficiency and competence of our entire process algorithm against different approaches have been introduced through simulation final results.

3.3.Reliable-Node-Clustering-for-Mobile-Ad-Hoc-Networks

In this presenting paper, author used probabilistic observations to guide introduced clustering algorithm to give more reliable clusters. With that we also use scatter search to present clustering while considering different Performance metrics. This experiment results show us that our clustering process produces more reliable clusters as compared to prior approaches.

3.4.Survey-of-Clustering-Schemes-in-Mobile-Ad-hoc-Networks

In this paper, authors introduced a study of few existing grouping or clustering approaches for MANETs that recently introduced in literature, which are classify as: Identifier-Neighbour-based clustering, Topology-based-clustering, Mobility-based-clustering, Energy-based-clustering, and Weight-based-clustering. We also include clustering definition, review present clustering process approaches, evaluate their activities by performance and cost, look out their advantages, as well as disadvantages, features as well suggest a best clustering perspective.

3.5.Efficient-Flooding-with-Passive-Clustering (PC) in Ad-Hoc Networks

In this paper author presents a novel clustering technology called as Passive Clustering that is able to reduce the repeated rebroadcast results in flooding. We reveals the efficiency of the introduced scheme in the AODV (Ad-hoc On-demand-Distance-Vector) routing scheme.

3.6.Inter-Domain Routing for Mobile Ad Hoc Networks

Inter-domain routing is very important element to allow interoperation among similar network domains operated by various organizations. Even though inter-domain routing process has been well appreciated in the Internet, there has been comparatively little support to the Mobile Ad-Hoc Networks (MANETs) space. In particular MANETs, the inter-domain routing issue is challenged by:

1) Dynamic-network-topology because of mobility.

2) Diverse intra-domain ad-hoc-routing-protocols.

In this paper, we are going to discuss enabling process for inter-domain-routing among MANETs, as well to handle the dynamic nature of MANETs. First of all we present the whole design barriers for inter-domain-routing in MANETs, and after that introduce the framework for inter-domain-routing in MANETs.

4. CONCLUSION

Clustering is one of the best solution for decreasing transferred routing packets in mobile ad-hoc network to accept itself because of its dynamic nature. Electing Coordinators for clusters is a research problem in the area of wireless ad-hoc networks. Cluster-head may be elected by calculating quality of nodes, that can be depends on mobility, connectivity, battery power etc. Significant and best performance improvement can be received by combining the effects of different performance categories. This paper represents a review of clustering.

5. ACKNOWLEDGMENTS

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