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RESEARCH ARTICLE

A SURVEY OF WEIGHT BASED CLUSTERING ALGORITHM.

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Abstract

A MANET is a group of self-governing mobile nodes which can interact over relative bandwidth and power constrained wireless links. As the nodes mobility are high so the network topology changes faster and dynamically. In MANET there is no architecture. Routing functionality such as route finding, topology finding, and message delivery from source to destination are performed by node itself as there is no centralized network. In this paper we will study various weighted clustering algorithm which boosts the ability of network and decreases the routing overheads in order to bring more resourceful and effective routing in MANET .There are basically two mechanisms in every clustering algorithm (1)Cluster Formation (2)Cluster Maintenance. In cluster formation, cluster heads are nominated among the node available in a network to form the hierarchal network. In cluster maintenance, a exclusive mechanism is needed so that cluster head can keep up all the changes performed in a network when any cluster changes occurred due to mobility of nodes.

Introduction:-

Along with the advancement of internet and communication skill, MANETs have attracted wide research effort in recent years, in the past, many approaches were proposed to carry out the problem coming in path routing, node clustering, and many others in MANETs. A mobile ad-hoc network is a collection of network which collectively forms a network as we need. In MANET all nodes are mobile i.e. they frequently change their position the all nodes are connected with each other through a wireless medium. To send a data packet in a network they uses routing protocol. Routing protocol provide route from source to destination so that data can be sent easily.

In MANET there are three routing protocol, Proactive, Reactive, Hybrid. In Proactive routing protocol or table driven routing protocol each node maintain the routing table in which info of every node and their path is maintained, whenever any topology of node is changed it is immediately modernized in table and accelerated to all node. So that every node must have updated table and every node is responsible if any change is done it must be updated in a routing table. Some of the proactive routing protocols are DSDV, WRP. In Reactive routing protocol or on demand routing protocol there is no routing table, when a source node wants to interconnect with other node in a network the route discovery process is triggered. The route maintenance is used to maintain the route and find the error between the routes. Some of the reactive protocols are AODV, DSR. In hybrid routing protocol it includes the property of both reactive as well as proactive routing protocol. ZRP is one of the hybrid routing protocol.

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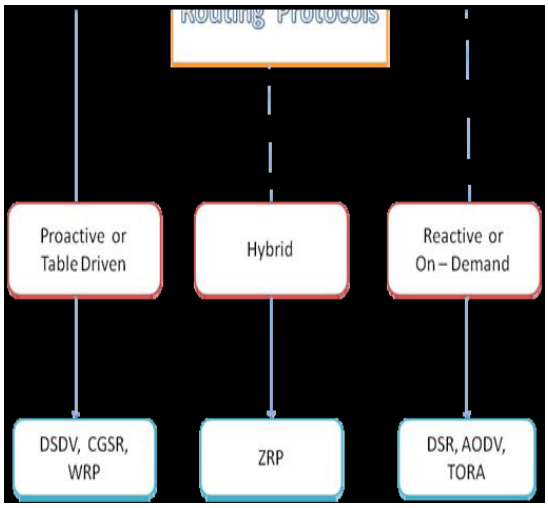

Fig.1:- (Routing Protocols in MANET)[4].

In routing in a network includes large number of nodes which is a major problem. To overcome this overhead we use clustering.

Clustering Types And Its Advantages:-

In cluster a nodes are grouped according to their location and weight in mobile ad-hoc network. As we create these small groups from outsized number of nodes so they are more stable and responsive also. The nodes in a cluster establish their connection using broadcast message. When nodes in cluster moves from one cluster to other then it needed to update the data, as the node resides in cluster there is no need to change entire network.

The cluster head, gateway, and nodes in a cluster are the major parts which drive an important part in clustering, Cluster head and gateway are backbone of architecture of clustering. There is node in a cluster which act as cluster head and other nodes are treated as cluster member. There is a procedure to select a cluster head. Cluster gateway is a common node between two cluster which neither a cluster head nor a cluster member. CH provides a link between two cluster which helps to transfer data from one cluster to other.

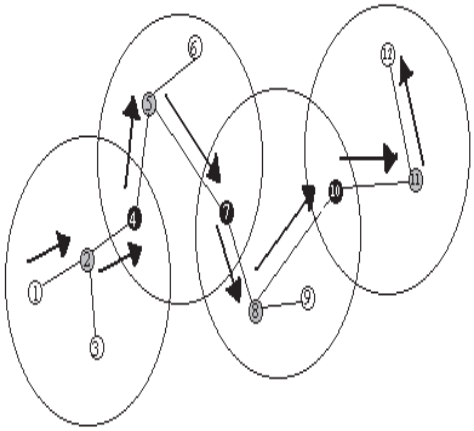

Fig 2:- (Cluster Structure in MANET)[4].

In a cluster there are two types of communication, Intra-cluster communication and Inter-cluster communication.
In Intra-cluster communication, the communication is 1-hop communication with each cluster member. Therefore, cluster head will directly interconnect with member nodes. But member nodes can't directly communicate with other nodes of cluster.

In Inter-cluster communication, the communication is multi point relay which selects the cluster head through which data packet is transferred. Due to this it reduces the amount of nodes involved in forwarding the data packet and reduces the utilization of battery and increases the efficiency.

Types Of Clustering[4]:-

- DS-Based clustering: Finding a dominating set to reduce the number of nodes participating route search. Ex Connected DS.
- Low-Maintenance clustering: Providing a cluster infrastructure for upper layer application. Ex Least cluster change.
- Mobile-Aware clustering: Utilizing mobile nodes mobility nature for cluster formation and its care. Ex MOBIC.
- Energy-Efficient clustering: It avoids the unnecessary utilization of energy and provides better consumption of energy. Ex Energy based DS.

Advantage Of Clustering[4]:-

- Provides the topology information: As the quantity of nodes in cluster is lesser than in nodes .So it provides the topology information.
- Clustering is more efficient and stable also.
- Clustering also provide high bandwidth.
- It also provide efficient routing.
- In clustering we can reuse the resources.

Weight Based Clustering Algorithm:-

Weighted clustering algorithm(WCA)[1]:

It is coined by M. Chatterjee which includes four parameters for cluster head selection. They are:

1. Degree Difference (Δv): It is calculated as $|dv - \delta|$ for every node v. Here, dv denotes degree of a node and δ is a pre-defined threshold.
2. Distance Summation (Dv): It is defined as the sum of distances from a given node to all its neighbors.
3. Mobility (Mv): It is taken by computing the running average speed of every node during a specified time T.
4. Remaining Battery Power (Pv): It is a measure of how much battery power has been consumed.

WCA selects the cluster-heads according to the weight value of each node. The weight associated to a node v is defined as: $Wv = w1\ \Delta v + w2\ Dv + w3\ Mv + w4\ Pv$ ---------- (Eq. 1)

The node with the minimum weight is selected as a cluster-head.

The weighting factors are chosen so that $w1 + w2 + w3 + w4 = 1$

The cluster-head selection algorithm finishes once all the nodes become either a cluster-head or a member of a node.

Adaptive Weighted Cluster Based Routing Protocol (AWCBRP) [2]:-

Due to the mobility of nodes Topology changes and breakage of exiting paths occurs repeatedly. A routing protocol should quickly adapt to the topology changes and efficiently search for new paths with minimal power consumption.

An adaptive weighted cluster based routing protocol for mobile ad-hoc networks improves speedily to the topological changes and efficiently sets up the routing process.

In this approach, the cluster head selection is performed by assigning a weight value based on the factors Energy Level, Connectivity and Stability.

Cluster heads are selected based on the following weighted sum $W = w1\ D1 + w2\ D2 + w3\ D3$ ---------- (Eq. 2)

Where D1 is the power level of the node, D2 is the connectivity factor and D3 is the stability index and w1, w2 and w3 are the weighting factors. Cluster head has the least W value.

After the determination of cluster head and its cluster member, they will be recognized as “considered". Every unconsidered node goes through the election process. After the selection of “considered nodes” the election algorithm will be finished

WCA with Mobility Prediction [3]:-
A modified version of the Weighted Clustering Algorithm (WCA) is proposed for the cluster formation and mobility prediction for cluster maintenance. The cluster formation is done as in WCA. Mobility Prediction, a quantity is applied to predict whether a node moves along with all its 1-hop neighbors has been done for the cluster maintenance.

Cluster-head (CH) Selection: Election is based on the weight values of the nodes & the node having the lowest weight is chosen as CH.

Cluster Formation: 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 cluster-heads Election is based on the weight values of the nodes and the node having the lowest weight is chosen as CH.

Cluster Maintenance: In this phase, the two distinct types of operations are defined as: the battery power threshold property and the node movement to the outside of its cluster boundary.

Conclusion:-

In this paper we have performed a survey on various weighted clustering algorithm. We have examined that to find a cluster head in clustering there are various algorithm. Various matrices are used to find cluster head based on their weight values of node and other parameters. This paper can help you to know how to find cluster-head using various clustering algorithm.

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