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# An Improved Load Balancing Technique in Weighted Clustering Algorithm

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***Abstract:*** Ad hoc Networks (MANET), is a planned toward oneself system of mobile nodes joined by remote connections. The topology of MANETs is dynamic in nature so to keep up stability a cluster based methodology will be used here. Load balancing is used to balance the load among the nodes present in a cluster with the help of cluster head. So, in this research paper, various techniques of selection of a cluster head are discussed.

***Keywords***: WCA, CH

## I. INTRODUCTION

Ad hoc network is a wireless network without infrastructure. It is a multi-jump system having no default router available. In ad hoc system, possibly every node itself is a router that forwards the traffic for the benefit of others. These systems are typically legitimized by situations where you would prefer not to deal with the infrastructure. Ad hoc systems primary peculiarities: decentralized, don't depend on prior framework, every node takes part in directing by sending information to neighbor nodes and quick system topology changes because of nodes' development.

### *A.* Basic types of Mobile Ad Hoc Network

A vehicular ad hoc network (VANET) is a type of MANET that are being used to provide the communication between the vehicles and road side equipments. An Intelligent vehicular ad hoc network (InVANET) works same as VANET but they behave smartly in case of collisions. An internet based MANET (iMANET) is a wireless network that consist of multiple devices connected via wireless links with the nodes and to a fixed internet gateway.

### *B.* Applications of MANETs

Crisis – administration sort of uses – With the assistance of specially appointed system we can create the base in hours. Educational Purpose- MANETs can likewise be connected in the instructive field. We can actualize the virtual classrooms with the assistance of versatile specially appointed system. Entertainment – These can also be implemented in the entertainment field like in multiple user game.

### *C.* Load balancing in MANETS

In networking, load adjusting is the technique for dispersing workloads crosswise over various resources where resources can be machines, a gathering of machines, and so on. In essential terms, Load adjusting is to separation the measure of work that a machine needs to do between two or more machines so that the more work done in same measure of time. In MANETs, because of dynamic nature of system topology, incessant portability, data transfer capacity limit, constrained battery force steering in MANET is a testing undertaking. Load Balancing is a key device utilized as a part of MANETs to enhance execution. With burden adjusting, MANETs can minimize movement clogging and burden unbalance.

D. Clusters: A cluster is an accumulation of versatile nodes that are nearly identified with one another. The gathering of groups structures a system. They can likewise be characterized as approximately coupled machines cooperating. There are few sorts of clusters: Grid bunch, Load adjusting cluster and high accessibility cluster. Load adjusting clusters used when multiple machines are connected together to share the computational workload. Compute Clusters – This cluster design is usually referred to as Beowulf Cluster. Tightly-coupled compute clusters are designed for work that might traditionally have been called "supercomputing".

## II. RELATED WORK

In [1], an upgraded weighted clustering algorithm is proposed for the strength of nodes between the clusters. A cluster head is chosen to minimize the overhead utilized for the arrangement of cluster and upkeep. The overhead produced by this calculation is excessively high so to defeat this element an upgraded rendition of WCA started to be. There are fundamentally two stages: cluster arrangement and cluster maintenance. In cluster arrangement stage, a cluster head is chosen from a gathering of nodes in a group. The decision of cluster head is focused around number of parameters like level of a nodes, separation from alternate nodes, versatility and battery power. The second stage is cluster support. In cluster support, we need to manage the circumstances like a node moves outside from it group extend because of versatility component and the battery utilization of a cluster head. At the point when a node moves outside its range then it needs to discover another cluster head.

 

In [2], the algorithm is utilized for the selection of a cluster head on the premise of a few parameters like level of a nodes, force transmitted, portability and battery power. Battery is an alternate issue that must be thought seriously about. The battery force of the nodes having less separation from the cluster head can be less however the battery force of cluster head ought to be high. To enhance the execution of the framework degree can likewise be a component. The cluster head chose should not move much of the time so that re affiliations should not happens over and over. Portability is an essential variable in the cluster head arrangement. In [3], a cluster is structured by isolating the all the nodes introduce in a system as little gatherings of nodes. In this paper, various cluster head calculations are examined like Lowest ID calculation, Highest ID calculation, K-Hop ID network grouping calculation, Adaptive cluster load equalization strategy, Max-Min d-group calculation, Mobility based metric for clustering, Mobility based d-jump grouping calculation, Weighted grouping calculation, A dispersed weighted grouping calculation, An effective weighted bunching calculation and correlation among all calculations.

In [4], the author proposed a versatile invoked weighted clustering algorithm for the race of cluster head. To tackle the issue of re-affiliations in WCA because of versatility this algorithm is composed.

In [5], the author proposed an alternate change over WCA. The fundamental reason for this algorithm is to give the stability to the nodes and build the lifetime of the nodes display in the system. In this algorithm, a few confinements had been connected on the prerequisite of the battery control on cluster head when cluster is arranged over and over. This enhances the execution as far as re affiliations and throughput.

In [6], the primary objective of this algorithm is to create clustering methodology focused around multi-jumps and system portability. This will upgrade the directing process and produce a little number of stable cluster head. The race of cluster head is based upon a few QOS characterized criteria. To make the cluster steadier the idea of clustering interim is included which speaks to the interim at which every node begins the figuring of densities. The main change of this algorithm is to measure the execution at diverse interims of grouping and the second change is carried out by expanding the cluster size to minimize their number.

In [7], here a load balancing heuristic is proposed for the expansion of the life of a cluster head to expand the throughput before the retirement of a cluster head and go to other cluster. This will disperse the load among the nodes display in the system. This produces bigger cluster head term while diminishing change and expanding strength and choice of cluster head on the premise of level of network is between a determined reach.

In [8], the author proposed a distributed cluster race algorithm is presented. It relies on interest disseminated clustering algorithm for portable specially appointed systems. The obligation of the cluster head is to produce groups and keep up cluster's topology. The accumulation of cluster heads is called as predominant situated. The primary obligation of cluster head is to distribute assets to different nodes introduce in a cluster. The portable nodes can move effectively in light of their element topology and that will influence the soundness of the cluster.

## III. PROPOSED WORK

In this research, there will be improvement in the performance of weighted clustering algorithm by taking battery power, distance and mobility as parameters. The selection of cluster head is based upon the distance and battery. This can be done with the help of two techniques: one is taking that node as a cluster head which will be present in the center of the cluster so that the distance between the cluster head and all other nodes will be least. The second technique to choose a cluster head is to calculate distance between the nodes by using any mathematical formula like Euclidean theorem. The second parameter can be the battery power. A threshold value of battery can be set for the node to be present in a cluster so that the nodes having less battery will discarded. A cluster head should have high battery power as compared to other nodes present in the system. There is one more parameter that can also be taken into consideration is the Reputation system.

**Proposed algorithm**

1. Firstly, two cluster heads will be elected from the cluster with the help of cluster head election procedure.
2. One cluster head will be active and other one will be in idle state.
3. If the active cluster head will goes down or move away from its cluster then the idle cluster head will become active.
4. The shifting of cluster head from active to idle will be done by a sink node. The sink node has all the information about the selected cluster heads.
5. This will reduce the number of re-affiliations that is a disadvantage of previously designed weighted clustering algorithm.

**Cluster head election procedure**

1. Find the distance with all the neighbors of a node in a cluster using the Euclidian formula.
2. Choose four nodes with the least distance among all the other nodes in a particular cluster.
3. This distance parameter will take care of the mobility of the nodes.
4. The second parameter will be battery. Now out of the four nodes, two will be selected on the basis of battery

 

power. The nodes having more battery will be selected. A threshold value of battery power will be set for the cluster head to be in active state.

**Sink node selection parameters**

- Battery should be high.
- Mobility should be low.
- Distance does not matter but should be within the transmission range of the cluster.

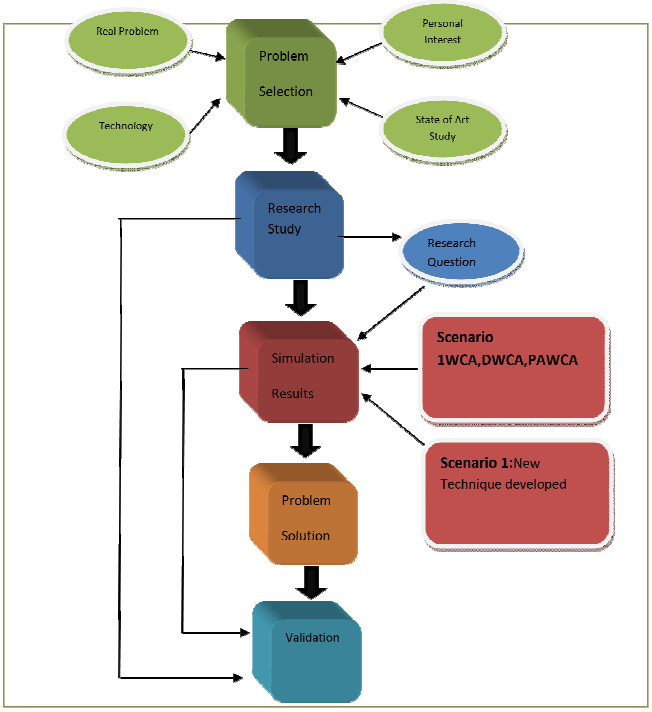


Fig 3.1. Research methodology

## IV. RESULTS AND DISCUSSIONS

We reenact an arrangement of N nodes on a 50× 50 network. The nodes could move in all conceivable headings with relocation differing consistently between 0 to a greatest value(max_disp), every unit time.

A. Experimental work

Experiments are carried out in MATLAB.MATLAB, which remains for Matrix Laboratory, is a best in class numerical programming bundle, that is utilized widely as a part of both the scholarly world and industry. It is an intuitive system for numerical calculation and information visualization that alongside its programming capacities gives an exceptionally valuable apparatus to all ranges of science and building. Not at all like other scientific bundles, for example, MAPLE or MATHEMATICA, can't MATLAB perform typical controls without the utilization of extra Tool compartments. It remains notwithstanding, one of the main programming bundles for numerical calculation.

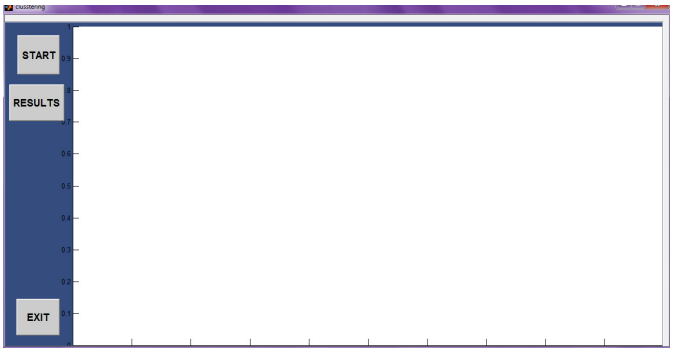


Fig 4.1.GUI

This figure is the first starting gui of the experiment work. In this figure, there is a start button, exit button and results button.

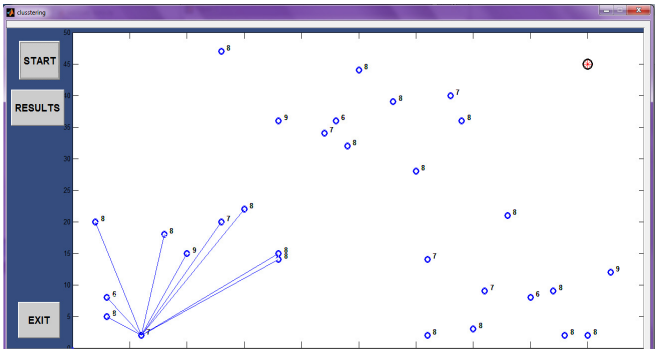


Fig 4.2.GUI of cluster interaction

In this figure, when start button is pressed, the nodes starting deployed in the network. In general, we can deploy N number of nodes here the value of N is 30. The nodes are starting synchronization among each other.

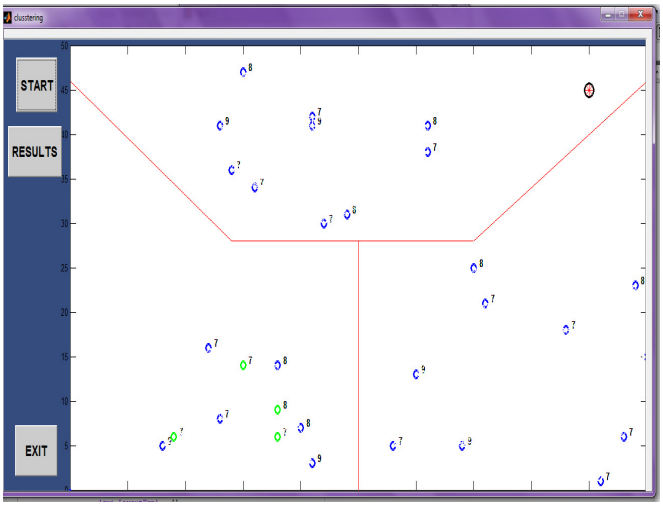


Fig 4.3.Selection of cluster heads

 

In this figure, the nodes are divided into the clusters using the k-bin algorithm. Then, the first parameter is distance. The distance is calculated using the Euclidian formula. The four nodes having less distance will be colored as green in every cluster.
Then, the second parameter is battery power, out of four nodes, two will be selected as the cluster heads based on this parameter i.e the nodes having more battery power and red in color.

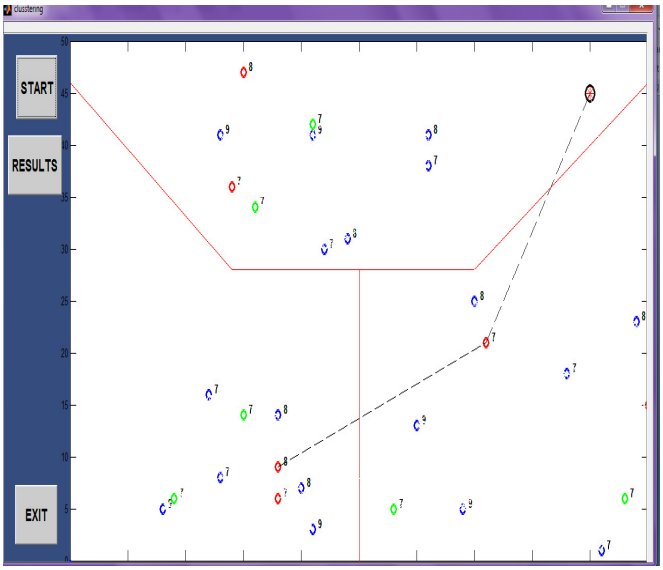


Fig 4.4.Synchronization with sink node

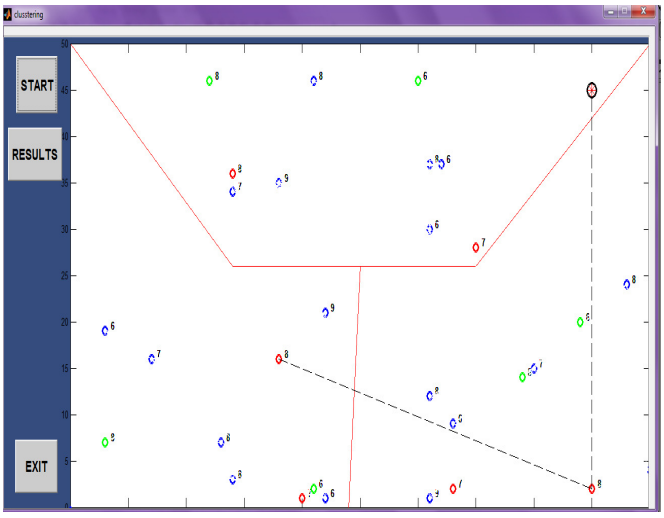


Fig 4.5.Shifting of cluster head

In above figures 5 and 6, two cluster heads are selected in each cluster. One cluster head is active and the other one is in idle state. There is a sink node that carries all information about the cluster heads and has the responsibility of assign the active cluster head and idle cluster head. When the battery goes down of the active cluster head then the idle CH will become active.

### *B. Data Analysis and Interpretation*

To gauge the execution of our calculation, we recognize two measurements:

- The quantity of cluster heads
- The quantity of re-affiliations

Each time a prevailing set is distinguished, its cardinality gives the quantity of cluster heads. In WCA, the re-affiliation tally is augmented when a hub gets separated from its cluster head and turns into an individual from another bunch inside the current overwhelming set. The prevailing set overhaul happens when a hub can never again be a neighbor of any of the current cluster heads. These two parameters are concentrated on for differing number of nodes (N) in the framework, transmission extent and most extreme dislodging In our recreation tests, N was changed somewhere around 20 and 60, and the transmission reach was differed somewhere around 0 and 70. The nodes moved arbitrarily in all conceivable bearings with a greatest relocation of 10 along each of the directions. At each time unit, the nodes move a separation that is consistently conveyed somewhere around 0 and max_disp. Hence, the greatest Euclidean dislodging conceivable is
$10\sqrt{2}$. We accept that every cluster head can deal with at most $\delta = 10$ nodes (perfect degree) in its group regarding asset assign.

### *C.* Performance Evaluation

This part delivers the performance changes from the previously designed weighted clustering algorithm and the new proposed algorithm. This also provides the comparison between the two algorithms.

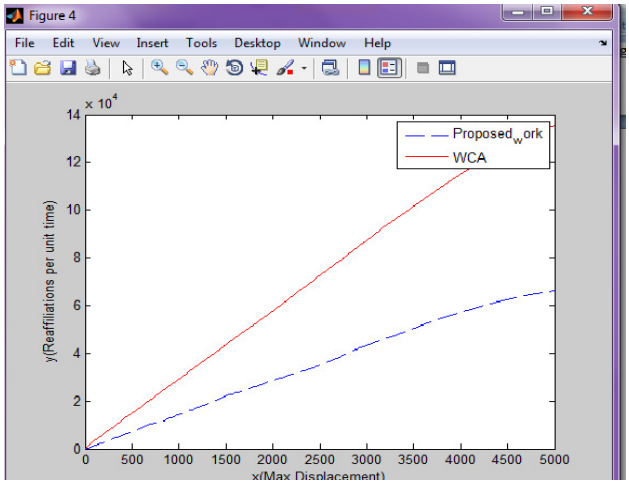


Fig 4.6.Re-affiliation graphs

 

In the above figure, the re-affiliation per unit time has been decreased in our proposed methodology that is disadvantage of the WCA. This occur because we don't need to select the cluster head again and again when a cluster head goes down or it will move away from its cluster due to mobility. In our algorithm, there are already two cluster heads selected and shifting from active to idle state will be done by the sink node. Here the number of re-affiliations occurs is almost the half of the number obtained in the WCA. There is variation in the maximum displacement and constant transmission range.

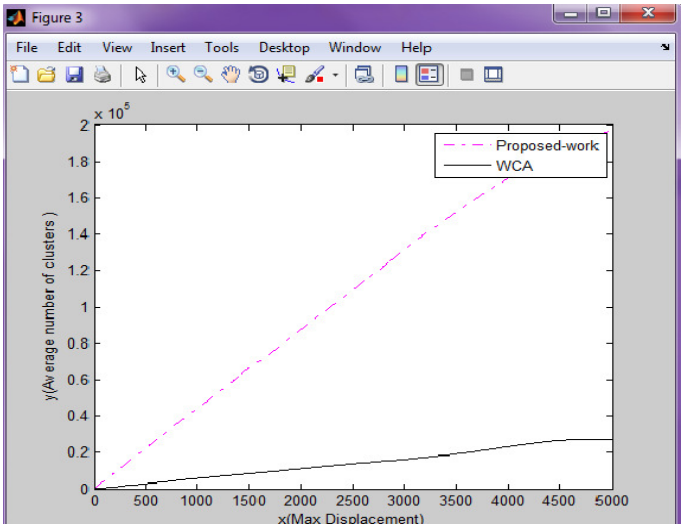


Fig 8.Average number of cluster head

This figure shows that the variation of the average number of cluster head with respect to displacement.

## V. Conclusion and Future work

In any system, the fundamental objective is to exchange the information between the different nodes. However before the real transmission of information the overhead data is exchanged from a source to end of the line and information stream between the different nodes. In this way, if the system is colossal and dynamic in nature the control data that is utilized to exchange the information will be expanded. To beat this cluster based structures are utilized that will diminish the overhead and build the execution additionally.

We proposed a clustering calculation for the decision of productive cluster head to adjust the load between the portable nodes in a cluster. The calculation planned will be versatile with the element topology of the ad hoc systems.

In this paper we enhance the performance of the previously designed WCA by reducing the number of re-affiliations in the network. Our proposed algorithm tries to distribute the load among the nodes present in each cluster with the help of the cluster heads. Simulation experiment helps in evaluating the performance of the algorithm. We simulate the experiment in Matlab.

Finally, we get the output performance which is much better than the previously designed algorithm.

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