To Support Stable Service by Centre Clustering Mechanism in Mobile Ad-hoc Network

Shu-Ching Wang, Hsin-Hung Pan, Kuo-Qin Yan*, Yu-Lung Lo
Graduate Institute of Informatics,
Chaoyang University of Technology
168 Gifeng E. Rd., Wufeng, Taichung County, Taiwan 413, ROC
{scwang; s9533903; kqyan; yllo}@cyut.edu.tw http://www.cyut.edu.tw/~kqyan
*Corresponding author to provide phone: 886-4-2330-000; fax: 886-2374-2331

Abstract: - In recent years, people are more reliant on wireless network services in order to obtain latest information at anytime, anywhere. For wireless networks, the allowance of several mobile devices to send data among one another effectively has become an important research topic. In this paper, a mechanism for the designation of clustering and cluster manager is given by mobile Ad-hoc network. The proposed mechanism adopts the center manager to improve the stability of network topology, assists Mobile Host within the working area, and takes advantage of message exchange.

Key-Words: - Mobile ad-hoc network, Center-based, Hierarchical manage, Manager selection

1 Introduction

The mobile life brings convenience and value of immediate acquisition of important information. This increases the needs of wireless network services. The main purpose of wireless network services is that at anytime and any location, anyone can obtain the most useful information, to help people or solve various difficulties. For example when disasters occur, the information through the wireless equipment can be gotten immediately to reduce loss. However, most structures of wireless networks all rely on the wired mode and framework to connect with each other. This indicates that network structures are still constant and are limited within the range of the signal of the base station, and it takes much cost to build this wireless network environment; it also cannot be build right away when it is urgently needed. However, wireless network development until now has already become a necessity for people. In the past, the communication of mobile host (MH) is build by constant relay stations in traditional wireless network structure. However, fixed relay stations are easily damaged because of external factors (for example wars, disaster and so on), and causes the MH to be unable to communicate. Therefore, many experts start to take "the non-infrastructure network structure," and the most representative network environment is the Mobile Ad-hoc NETwork (MANET). This is because the MANET environment can satisfy people at any time, any place to obtain the most recent information under a "non-infrastructure network structure." The MANET is a point-to-point network structure. It appears important especially on the battlefield, when the disasters occur; or when one is unable to connect to the backbone network. Each mobile node (MN) is moveable under the MANET structure, and the message is transmitted between MN.

The MANET structure combines with MNs as shown in Fig. 1. Under such construction, each node does not need any equipment as base station, and can form a network by dynamic link with each other. Each MN may also move freely, and link with one another by multi-hop wireless links [5]. Each MN may act similarly to router to assist other nodes forward their packets in the network. As a result of the MANET's characteristic, it is very useful under the specific environment, such as in war, disaster rescue, reconstruction after earthquakes, or exploration in unknown regions, and so on [5]. However, also because MNs can move everywhere freely, the network topology will be changed dynamically.

Currently studies on the MANET topic, for example, in the network topology, quality of services (QoS) and so on, still encounter many difficult problems because of the MANET characteristic. The most important question that needs to be solved is the stability of network

topology. Because the communication structure of MANET is designed mostly on the mobile devices with a limit to electricity resources. Therefore, when the power of the device is used up, the MN to represent the device in the network will disappear. In order to make the MANET adapt in each kind of bad communication environment, the MANET needs to allow the mobile device to move freely in network and to build temporary connection links to carry on the communication. Therefore, it often makes MNs disappear or suddenly damaged in the network. This influences to the entire topology of MANET and the quality of communication serious. However, the stability of network topology needs to be considered.

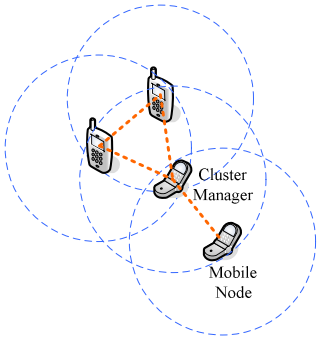

Fig. 1 The structure of MANET

In addition, when MANET is in the stage of forming the entire network topology, it also easily causes signal disturbance, collision, or broadcast storm in the wireless network, because of too many broadcast packets of MN transmitted in the same time. Sometimes the MNs may be too few, which causes the deliver path for packets in MANET to be insufficient, which reduces the transmit bandwidth in network, or to cause the communication quality bad. Another possibility is that the disaster makes network nodes disappear or forms a difficulty or complex links structure in the wireless network. This will cause the stability of wireless network to reduce quickly, making the network idle or clogged up and so on.

In this type of network environment, the cluster managers (CM) share to forward packets of all nodes, it may be because of the massive workload that causes the CM to be paralyzed, and even affects transmission of packets in the overall network. Luckily, in MANET, nodes will frequently gather because of the common goal or characteristics, and then combine to form groups. For instance, nodes in campus will form small groups somewhere. Therefore, the group characteristic of nodes in MANET is used in this study to build small groups under this environment, and choose the CM in each group to form a hierarchal management structure, to maintain the stability of MANET.

Because of the fast development of network technology, the network links are different. However, in the studies of related clustering and the question of CM election in the past, they did not consider how to cluster as well as establishment of the capability of CM to promote the potency when there are many MNs in a MANET [3,4,6,7,10,11]. When there are many MNs in a MANET, if each MN wants to send its packets out at the same time, it not only will have collision, but also will cause the CM to be busy with the processing lot of messages, so that it will cause network efficiently to be low. In this study, a clustering and manager election mechanism is proposed that according to the centre of the MANET, and there are many MNs in the network. The merit of taking the centre of network as the basis is that the characteristic of centre may let the CM selected most approach the position of MNs most crowded in the network. Therefore, it can cover nodes in group in the better scope. Moreover, if it is discovered that the quantity of nodes in one group after cluster had been still over the ability which CM can bear. The group will be divided depending on the position of CM at this time, then cluster and elect a new CM in down level group, to maintain the transmission efficiency of the overall network.

In summary, the goals of this study are (1) divide network into suitable scale that can be handled by a CM; (2) cluster network by centre clustering, expect that the CM's covering scope be good; and (3) the hierarchical manager may reduce the waste of bandwidth, and increase transmission efficiency. In short, this study will design a clustering and hierarchical manager election mechanism based on a MANET environment that has many MNs in it.

Section 2 in this article is a literature review; the relational research about MANET is discussed. Section 3 is our research method. The detail of centre clustering and manager election mechanism is in Section 4. In addition, Section 5 is the conclusion and the future works of research.

2 Literature Review

A wireless network with a structure of multi-cluster and multi-hop has the ability to fit the change of topology in the network. In addition, the specific node with names cluster manager (CM) is used to form the cluster of network and maintain the topology of network. CM will distribute and control resources of all MNs that are in its cluster. However,

because of each MN has the characteristic in dynamic, so that MNs will cluster and dismissing to affect the stability of network. Therefore, how to cluster and choose a suitable CM to keep the stability of the network is an important issue. Selection of the most suitable CM is a NP hard problem [3], but this kind of problem is mostly solved by heuristic in existing solution. However, it does not have the related research attempt to keep the stability of network [3,6]. A good cluster network structure, when MNs are moving or changing in network, should as far as possible keep the stability of network. Otherwise, the re-clustering and massive information exchange in clusters will increase network's burden and computation cost.

In Johnson's study [9], he proposed that segment network in many small regions by clustering method. In the study by of Chlamtac and Farago [6], they proposed a virtual cellular network that corresponds to the standard mobile phone network to a multi-hop packet radio network. When it has demand of processing or transmitting data, any node could become CM. In addition, the other MNs will register and join the nearer CM to form a cluster. The cluster will change dynamically because of network's activity. The comprehensive survey in the past-related research results was mostly to attend to the network clustering technology [3,4,8,10,11]. Therefore, they neglect the factor of the node's efficiency in network, but it initiates many scholars' discussions in this type of network. Gerla *et al*. [8] proposed how to minimize the latency of the network when its capacity of transmission is biggest by interlinking MNs. In addition, the CM election method proposed in Basagni [3], Chlamtac [6], and Gerla [8] did not consider the MN's factor of remaining power and load balance. in the weighted clustering algorithm (WCA) proposed by Chatterjee *et al*. [5], although it improved many shortcomings, the speed factor was generated by simulation, so this results in difficulty if it was unable to get the related information from positioning systems like GPS in actual utilization. However, if each MN adds positioning equipment like GPS, it will add to the cost. In addition, in research proposed by Chatterjee *et al.* [5], it also did not consider the clustering mechanism and the operation when the CM fails for some reason in other situations.

There are many studies about how to elect CM in MANET in the past [1,2,4,7,8]. They could be classified into three kinds: (1) Highest-Degree heuristic, (2) Lowest-ID heuristic, and (3) the Node-Weight heuristic. The first two kinds are clustering algorithm that developed are based on structure of link-cluster [1,2,7]. Its idea is that if two MNs can communicate directly, then it will form an edge between two MNs (i.e. one MN exists in other MN's transmission region) in the imaginary network model. In addition, the third kind of method appoints each MN appropriate weight first, and then elects CM by comparing weights of MN with neighbor MNs. In past studies [4,8], the author used simulations that puts MNs moving by any speed and direction in a square scope to compare the efficiency of above three kind of methods.

Studies relating clustering and cluster manager election in the past did not consider how to improve efficiency by clustering and cluster manager election in a transmission region that had massive node quantity. Therefore, this paper will focus on studying the clustering and cluster manager election method in MANET with massive network nodes.

3. Research Method

It often contains many small networks in MANET, and it has many MNs in each small network. Each MN possibly distributes or gathers at the different place, and needs to transmit information between each other. Therefore, how to cluster and elect cluster manager effectively in this environment is an important point for the maintenance of stable network topology. The goal in this study is to discuss how to cluster and build a hierarchal management mechanism in such network environment. In the past, there are many scholars that discussed different clustering and manager election methods [3,4,5,7,8,10]. With different methods, there were different results of clustering and cluster manager election. If we want to reach the clustering and manager election, whether the mechanism is good and considered complete is very important. Therefore, an appropriate mechanism to solve both problems is established. In this study, a centre clustering mechanism (CCM) base on the centre of network under MANET structure is proposed. The advantage of being based on centre of cluster is it can let the CM cover more MNs, so it can cover MNs in network by better scope. Moreover, if there are too many MNs in cluster that are over CM's capability, it will divide the cluster to sub-clusters depends on CM's position and elect new sub cluster managers in sub-clusters. It will achieve the goal of hierarchal management, and will maintain the overall effective in network transmission.

The environment in this study is MANET, and there are many MNs in different ability, electric power and communication scope in the network. In this study, the moving speed of MNs does not to be

considered. The reason for this is that MNs cannot get moving speed by itself in real network. Although it had the related studies that consider the moving speed of nodes in the past, but the moving speed was produced by assumption data or indirect gets data by equipment like GPS at so on. However, we ask to have practicality in this study, therefore the mobility of MN is considered, but the relative affects are neglected that cause by the MN's moving speed.

The clustering mechanism in this study contains follow four steps:

Step (1): First, to calculate the centre location of the network.

Step (2): Then, to find some MNs that are close to the centre of network, and elect suitable cluster manager by computing capability of these nodes attributes.

Step (3): When the message quantity transferred by CM in cluster is bigger than bandwidth utilization percentage (BU%) set up by the user, CCM will divide the cluster into four sub-clusters base on CM's position, and compute the transmit loading of network in each sub-cluster. If the transmit loading in each sub-cluster over 25% of CM's bandwidth, it will repeat the Step (1) to (3) in the sub-cluster. This guaranteed the bandwidth of CM in cluster can shoulder information exchange, and does not increase the CM's quantity because of the fewer nodes in cluster.

Step (4): To build the hierarchal structure for transmitting messages depends on the relationship between parent and child of CMs in clusters.

By these four steps, the better CM in network depend on centre of cluster is found, and the MNs in the network area may be divided into different clusters to share the load of messages transmission by more quantity of CM.

In addition, the structure of messages transmission in network in this study that we proposed is separated into three steps respectively is:

Step (1): If the message-sending MN and receiver MN are at the same cluster, then the message will transmit directly between two MNs to reduce the loading of CM.

Step (2): If the message-sending MN and receiver MN are at different clusters, then the send MN will send a message to the CM in its cluster first. Moreover, the CM will forward the message to its upper CM by hierarchal structure. Finally, the message will be sent to receiver MN by CMs forwarding between clusters.

Step (3): If the receiver MN's location outside the whole transmission region of message-sending MN, the message will transmit to the CM at uppermost layer, then the message will be sent to the receiver MN by message exchange between CM located at each uppermost layer.

In brief, this study is based on MANET. The first step is to compute the center of network, then elect the suitable manager node that close the center of network and capability computed by MNs attribute values. Build the hierarchal structure for message delivering by the parent and child relations between clusters. In addition, the delivery way of messages has a standard that depends on the location of message-sending MN and receiver MN. Finally, the CCM method will reduce the waste in bandwidth, and promote the transmission efficiency.

4. The centre clustering and cluster manager electing mechanism

The basic idea in CCM that proposed in this study is to elect MN in best capability as CM after each data exchanges and comparisons, and clusters will form gradually. Finally, each MN will be assigned into a unique cluster. This is the clustering mechanism. There are three steps in clustering mechanism. It includes: (1) Clustering when MANET initialize, (2) Clustering after MN move in or out the cluster; and (3) Processing when CM fails.

4.1 The construction of hierarchal management

First, the centre of network is computed and CM is elected recursively in MANET. Then, to calculate the quantity of each MN depends on the CM's capacity and loading. Finally, the mechanism will involve clustering and building the network structure in hierarchal management.

When computing the network centre, we assume that there are total i nodes in j groups. The position of each node N_{ji} is (X_{ji}, Y_{ji}), and the position of centre of group j (CX_j, CY_j) can be computed by formula (1):

$$CX_j = \frac{\sum X_{ji}}{i} \quad CY_j = \frac{\sum Y_{ji}}{i} \tag{1}$$

After obtaining the position of centre of network j, then the CM based on centre of cluster can be chosen. Because of the characteristic of centre is the

distance between centre and MNs around it is shortest. So coverage will get better when MNs are closer the centre, and the CM should be the MN that is closest to the centre. Therefore, the distance d_{ji} between each MN and centre is computed by formula (2), and a MN is elected as CM that has shortest distance to centre.

$$\min\ d_{ji} = \sqrt{(X_{ji} - CX_{ji})^2 + (Y_{ji} - CY_{ji})^2} \qquad (2)$$

But if the CM is chosen only by the distance between MN and centre, then it has the possibility to choose the MN that in low power, degree of busy, or low bandwidth et so on to affect the transmit efficiency, although the distance between the MN and centre is shortest. Therefore, the factors such as the remaining power, degree of busy, and bandwidth of MNs are considered when CM is elected to avoid such situations [5]. Therefore, the percentage of the surplus power (e), degree of busy (b), communication capacity (c), and the distance to centre (d) will be transformed into a capacity value (p) according to the formula (3) in this research , which will be delivered to the MNs surrounded as the basis of cluster manager election, while the weight values w_1, w_2, w_3, and w_4 will be defined in accordance with the important of each item of factors for meeting the various needs. Then the MN that has the highest capability is chosen as CM in network.

$$p = (e)*w_1 + (1/b)*w_2 + (c)*w_3 + (1/d)*w_4$$
$$\Sigma w_i = 1 \qquad (3)$$

The clustering mechanism in this study will choose N MNs depending on the user requirements first, then compute the capability of each MN by formula (3), and elect the MN in best capability as a CM. When the CM of cluster has been elected, the loading in transfer of CM needs to be considered in order to avoid the CM that we choose cannot take over works on messages forwarding. Therefore, in this study, we draw up when the bandwidth used in packet exchanges of CM over BU percentage of its total bandwidth, then CCM will segment the cluster to four sub-clusters based on the position of CM in cluster. CCM will reassign the CM's ID to MNs in the cluster to achieve the goal of clustering. Then, the total bandwidth loading of MNs in sub-cluster reaches 25 percentage of CM's total bandwidth then CCM will be re-elected new CM in sub-cluster to manage the message transmission in sub-cluster.

The advantage that clustering by bandwidth loading of CM is it can cluster and elect CM depending on the quantity of MNs in network. Because of the quantity of transmitted messages will be bigger in the cluster with more MNs, then the requirement quantity of clusters and managers get bigger. It can give all MNs the equal backbone for transmitting message in network. Shown in Fig. 2 is the recursive clustering algorithm by centre of network that proposed in this study.

After the child cluster establishment, the CM in child cluster will know which the managers in its parent clusters are by exchanging messages. The hierarchal management structures that are built in this way are used to manage MNs and transfer data in whole network. When the sending MN and receiving MN of messages are both in the same cluster, then they will communicate directly to reduce loadings of CM. However, if the sending MN and receiving MN of messages are in different clusters, then the sending MN will send its data to its CM in cluster first, and the data will send to receive MN by forwarding between CMs in clusters. If the message sending MN and message receiving MN in different management scope, then the data will be sent to the CM in top-level and sent to the message receiving MN by forwarding between CMs in top-level clusters. The whole structure of hierarchal management shows in Fig. 3.

```
Function ClusteringByCenter (Cluster j)
  Compute the position (CXj,CYj) of centre in
  Cluster j.
  Find N MNs that nearest the centre of Cluster j.
  Compute the capability in N MNs with MN's
  attribute by formula (1), and choose the MN that
  has best capability as CM.
  Let CM knows the manager's ID that at up and
  down level of it.
  If loading of bandwidth > BU% of CM then
     Divide the cluster into 4 sub-clusters by the
     CM's position.
     If total of bandwidth loading > 25%
     bandwidth of CM then
          Set sub-clusters number j1~j4, and give
          the number to each MNs in each sub-
          cluster
          ClusteringByCenter(j1~j4)
     End if
  End if
End Function
```

Fig.2 The algorithm of centre clustering

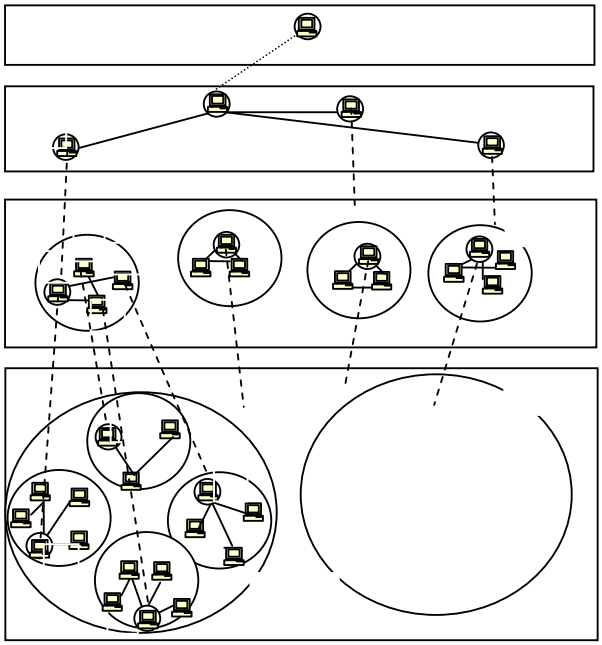

Fig. 3 The hierarchal management structure of network

4.2 Experimental Results

This section will describe the program implemented in this study and the experiment results. In the experiment, the environment of topology is designated as an area of 1000*1000. Attributes of each MN contain the node number (Node_ID), horizontal position (Pos_X), upright position (Pos_Y), motion angle (Direction), moving speed (Speed), transmission region (Range), relative electric power % (Energy), relatively degree of busy % (Busy), and relative bandwidth % (Bandwidth). Besides the node number, random number producers in NS2 generate other parameters and 1000 nodes. We assume that MNs could communication directly in network, therefore, the transmission region of nodes does not affect the experiment, Table 1 shows the sampled data for the experiment that produced by NS2.

Table 1 Sample parameter of nodes in the experiment

Node_ID	Pos_X	Pos_Y	Direction	Speed	Range	Energy(%)	Busy(%)	Bandwidth(%)
1	401	757	204	3	67	26.69	87.79	98.73
2	841	910	41	8	100	13.09	19.49	78.44
3	587	512	125	4	93	25.66	74.66	53.62
4	628	283	30	5	44	83.96	75.02	55.38
5	456	558	285	9	58	70.83	37.59	66.6
6	893	693	234	9	42	97.94	58.9	74.82
7	959	301	38	1	69	51.17	62.8	64.07
8	43	662	178	9	40	31.07	85.24	81.93
9	809	353	115	3	97	91.36	65.17	81.8
10	925	706	248	2	55	55.82	58.1	69.19
11	992	839	234	4	58	26.84	81.47	60.74
12	638	168	62	1	77	52.56	58.84	85.85
13	665	737	300	10	94	69.61	57.12	65.12
14	160	978	339	2	88	76.07	46.46	75.34
15	652	538	28	5	71	37.8	70.81	87.48

Use Borland C++ Builder to develop all emulators in the experiment of this research. Some values such as the MNs quantity used for the experiment, clustering range, weighted range, etc. all that will be defined by the users, Fig. 4 illustrates the interface of the emulator.

Regarding the comparison of the clustering, the HCM method is chosen which is famous and integrated with this research. However, the proposed clustering method in this study can get more stable network topology by compare with HCM clustering method.

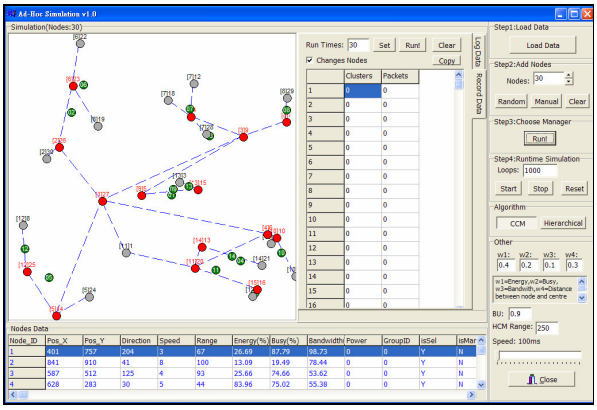

Fig. 4 The user interface for simulation program

The experimental design in this study will be divided into the following three kinds by different MNs quantity, and compared with HCM method. The fourth weight values (w_1~w_4) that we set up in CCM method are w_1 (the percentage of the surplus power) is 0.4, w_2 (degree of busy) is 0.2, w_3 (communication capacity) is 0.1, w_4 (distance between the centre of cluster and MN) is 0.3, and the BU (Bandwidth Utilization) of CM is 0.9. However, the experiments in this research are divided three parts as follows, with 30 times of repeated experiments and each run of simulation carries on 30 times packets transmission between nodes for getting result that is more practical. The experimental design description is as follows:

Experimental design 1: There are different quantities of MNs of 20, 40, 60 and 80 in network, and simulates the CCM method 30 times repeatedly. Each time the required MN quantity is chosen from MNs table randomly to run the simulation, and record the forming cluster counts and counts of packets forwarded by CM.

Experimental design 2: There are different quantities of MNs of 20, 40, 60 and 80 in network, clustering scope of HCM is 150, and simulates the two methods 30 times repeatedly. Each time the

required MN quantity is chosen from MNs table randomly to run the simulation, and record the forming cluster counts and counts of packets forwarded by CM.

Experimental design 3: There are different quantities of MNs of 20, 40, 60 and 80 in network, clustering scope is 150, and simulates the CCM and Non-clustering methods 30 times repeatedly. Each time the required MN quantity is chosen from MNs table randomly to run the simulation, and record the counts of packets forwarded by CM.

4.2.1 Results of experiment 1

There are different quantities of MNs of 20, 40, 60 and 80 in network, and simulates the CCM method 30 times repeatedly. Each time, the required MNs quantity is chosen randomly from MNs table to run the simulation, the number of clusters is recorded, and the number of forward packets by CM is counted. The average number of clusters formed is shown in Fig. 5, and the comparison with the average number of forward packets by CM is shown in Fig. 6.

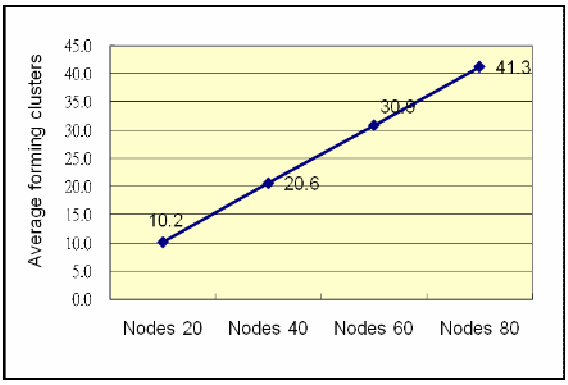

Fig. 5 The average number of clusters formed in experiment 1

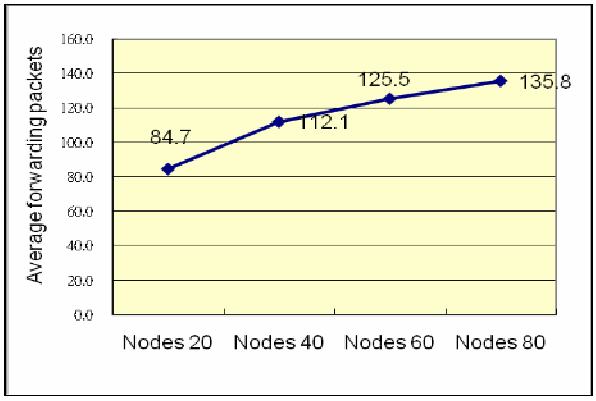

Fig. 6 Compare with the average number of forward packets by CM in experiment 1

The experiment results are shown in Fig. 5 and Fig. 6, because the CM will separate its group into sub-groups when the quantity of data transfers over CM's capability in this study. Therefore, when the number of MNs increases, it will increase the number of CMs and groups. In opposition to the CM's quantity increase, because the management level increases, the quantity of packets transferred by CM has the obvious rise, and both numbers grow up close linearity.

4.2.2 Results of experiment 2

There are different quantities of MNs of 20, 40, 60 and 80 in network, clustering scope of HCM is 150, and simulates the two methods 30 times repeatedly. The required MNs quantity is chosen randomly from nodes table to run the simulation, the number of forming clusters is recorded, and the number of forward packets by CM at each time is counted. The average number of clusters formed is shown in Fig. 7. The comparison of the average number of forward packets by CM is shown in Fig. 8. In addition, the comparison of average remaining power of CM is shown in Fig. 9.

According to the simulation results shown in Fig. 7 to Fig. 9, CCM method will form more groups when MN quantity increases. This is because of the CCM method considers the capability of CMs, and more groups will be clustered by CCM method when the load of CM is over its capability. Otherwise, the HCM method did not consider whether the CM could shoulder the group's current network capacity [12]. Although the HCM method gets fewer cluster numbers, it is easy to reduce the CM's life because of network's overload over CM's capability. It will cause the CM unceasing change and let the network become unstable. By the number of overall average transfer packets, although CCM method forms more clusters, but the difference between CCM and HCM is not huge in comparison to transfer packets of CM. From this result, we can prove that the increase number of clusters does not increase the loads in network, and the remaining power of CM in CCM method will higher than HCM. Therefore, the CCM method should prolong the life of CM in a long-term, and then make network topology more stable.

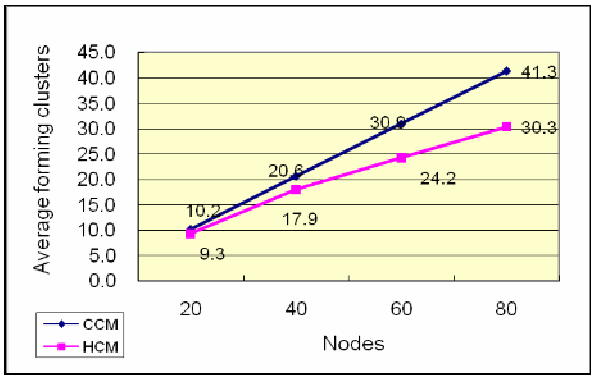

Fig. 7 The average number of clusters formed in experiment 2

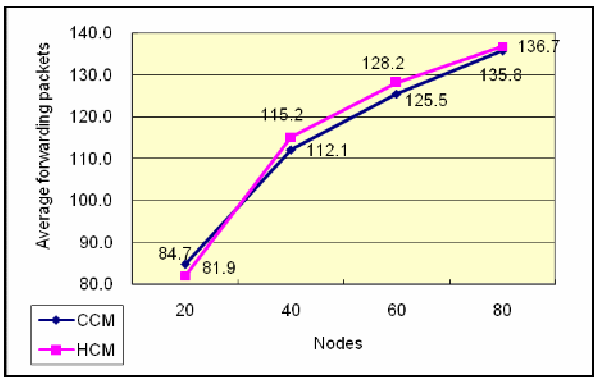

Fig. 8 Compare with the average number of forward packets by CM in experiment 2

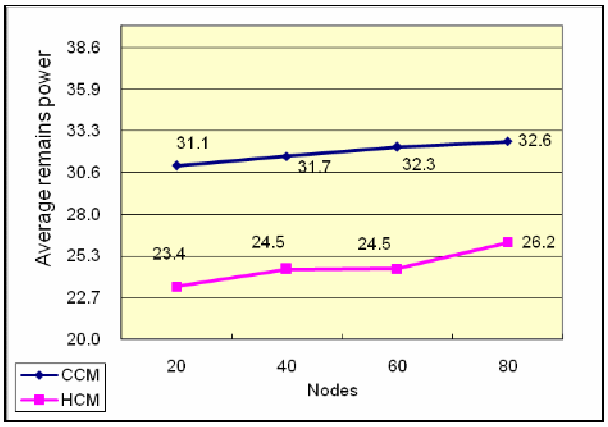

Fig. 9 Compare with average remaining power of CM in experiment 2

4.2.3 Results of experiment 3

There are different quantities of MNs of 20, 40, 60 and 80 in network, clustering scope is 150, and simulates the CCM and Non-clustering methods 30 times repeatedly. Each time, the number of required MNs quantity is chosen from MNs table randomly to run the simulation, and the number of forward packets by CM is recorded.

From the result shown in Fig. 10, because of the clustering is not considered in traditional MANET, so the number of forward packets by MNs will grow up with the number of MNs. However, in CCM, the each MN is formed into a cluster and managed by a CM, and the transmitted packets are only forwarded by CM. Therefore, the number of average forward packets still gets fewer; even there are more MNs in network.

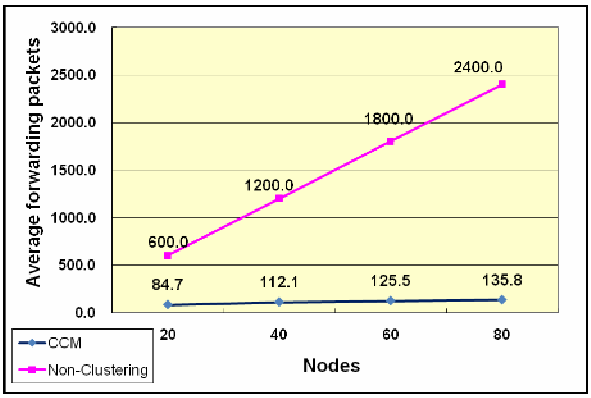

Fig. 10 Compare with the average number of forward packets by nodes in experiment 3

5 Conclusion

This study discusses the clustering and manager election mechanism according to the centre of network, and solves possible problems by integrating methods of similar research. To propose a more comprehensive method that allows this mechanism to be simpler, more feasible, and more effective.

Formerly many clustering and manager election methods did not consider the loading of manager in MANET [3,4,5,7,8,10]. Therefore, this study focuses on the discussion of clustering and manager election mechanism and tries to reduction the clustering size to a possible loading of manager. Moreover, the factors of the percentage of the surplus power, degree of busy, communication capacity, and the distance to centre are used to elect the CM. By the experimental result, we discuss that no matter how many MNs in the network there are, the clustering method in this study also can maintain network stability. Beside this, our method in this study will get more stable in network topology and fewer transfer packets of CM by compare with other clustering method. Therefore, the CM may have longer existence time.

With the hierarchal management mechanism in this paper, when the wireless network's security is challenged, the mechanism cannot only lock

criminal intentions immediately, and can avoid paralysis that affects the overall message transmission in network. Moreover, the mechanism can also reduce information quantity in the wireless network. By using the centre clustering and hierarchal manager election mechanism, the customers can be clustered according to the consumer behaviours, and enables the goal of marketing to be separated in the market to reduce the enterprise costs invested in marketing.

In the future, we will discuss that how to compute the MNs quantity handed by CM by its capability, and clustering network base on different capability of CM, and extend problems or solve methods in dynamic network environment.

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