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Advanced Multihull Nodes Search in Vehicular Ad Hoc Network using Prolonging Clustering

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Abstract: Clustering is an important research topic in wireless networks, because cluster structures can facilitate resource reuse and increase system capacity. Ad hoc networks consist of wireless hosts that communicate with each other in the absence of a fixed infrastructure. Such networks cannot rely on centralized and organized network management. A slight change in the speed of cluster head nodes has a great influence on the cluster members and even causes the cluster head to switch frequently. we present a robust self-stabilizing weight-based clustering algorithm for ad hoc networks. The robustness property guarantees that, starting from an arbitrary configuration, after one asynchronous round, the network is partitioned into clusters. The communication in VANET is at greater risk because the messages are broadcasted and a wireless medium is used for data propagation. For secure communication among these vehicles, clustering algorithms are preferred. The proposed algorithm intends to create stable clusters by reducing reclustering overhead prolonging cluster lifetime, and shortening the average distance between cluster heads and their cluster members. Many clustering schemes have been proposed by the researchers which can be classified into either mobility based clustering or non-mobility based clustering algorithms. This technique takes the distance and velocity as a parameter to create relatively a stable cluster structure. We also developed a algorithm for super cluster-head selections.

.**Index Terms:** Clustering; Affinity propagation, Classification of clustering techniques, Vehicular ad hoc network, multi-head, head election, mobility.

1. INTRODUCTION

Many researchers have been focusing their studies to develop the Intelligent Transportation System (ITS). A VANET application is to improving the roads safer and passengers comfort applications [1] . In these networks, mobile routers may move arbitrary often the network's topology may change rapidly and unpredictably. Ad hoc networks cannot rely on centralized and organized network management [2]. We introduce a new clustering approach with the aim of increasing the stability of the network topology and a optimal super cluster Head selection algorithm to improve the network life time [3]. The main intention behind this technology is that vehicles can actually communicate with each other, perceive risks and respond more quickly than human reflexes allow [4]. Several clustering algorithms have been proposed for mobile networks. However, they have some weaknesses when applied to our data sharing application [5].

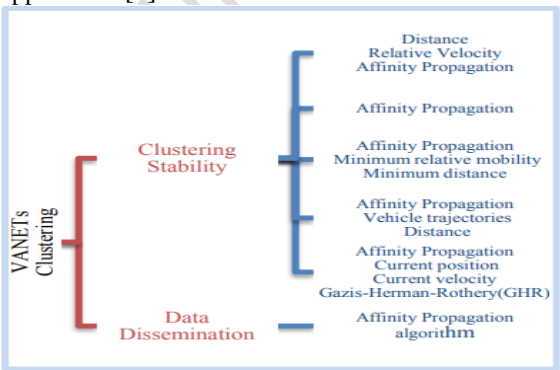

Fig No .1 Clustering based on Affinity propagation in VANETs

2. RELATED WORK

A clustering algorithm includes two technical parts: cluster establishment and cluster maintenance. In cluster establishment, we need to identify the role (CH, CG, or CM) of each node in the network. The election of CHs is a core technique [6]. The clustering algorithm proposed the lowest ID used in MANET with a new modification [7]. The leadership duration and the direction in the lowest ID algorithm are used to determine the node to be a cluster head. The leadership duration (LD) is defined as the period the node has been a leader since the last role change [8]. In a data sharing application, it is fairer for CMs that a CH is nearer the center of a cluster, because the hop count of a data transmission path from a CM to the CH is similar [9]. Clusters with nodes having diverse moving directions are unstable, so we restrict all nodes in a cluster to have the same moving direction. Therefore, each node records only those neighbors that drive with the same direction as it in its neighbor nodes [10]. In order to avoid these kind of problems many solutions have been proposed of which clustering is one of the solution technique. Clustering reduces the messages count and increases the connectivity in the network [11]. This approach is called position based prioritized clustering (PPC) and uses geographic position of nodes and the priorities associated with the vehicles traffic information to build the cluster structure [12].

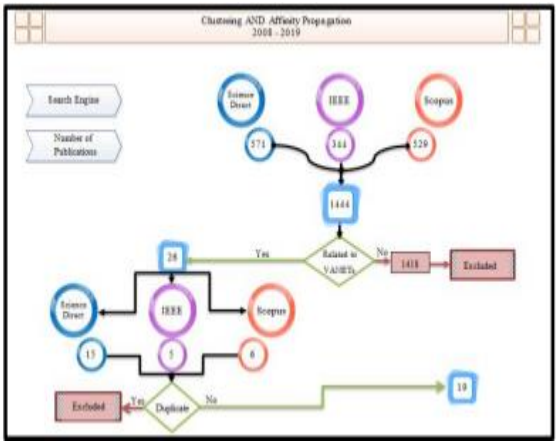

Figure 2: Selection criteria and evaluation framework

3. SYSTEM MODEL

Protocols under this category consider mobility characteristic of vehicles as one of the parameters for selecting clusters and cluster heads in the network [13]. Some of the direction based clustering schemes focus on direction of vehicle for selecting effective clusters for the vehicular network. The clustering algorithm proposed basically the lowest ID used in MANET with a new modification. The leadership duration and the direction in the lowest ID algorithm are used to determine the node to be a cluster head [14]. A system should react gracefully to the input changes preserving a safety predicate in the presence of the input changes. The safety predicate is chosen to ensure that the system still performs correctly its task during the period of convergence [15].

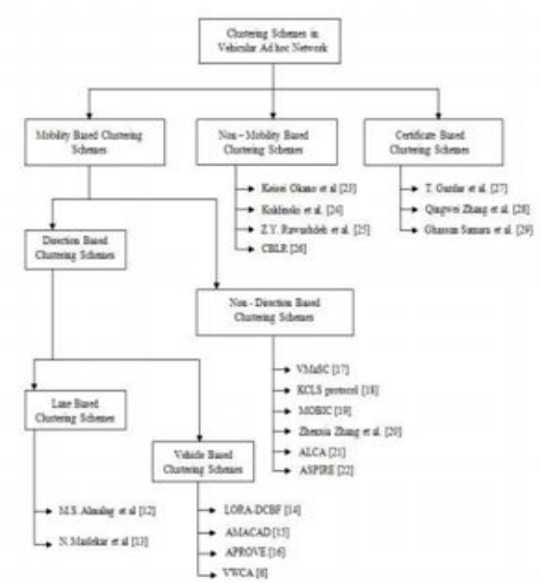

Fig No .3. Direction Based Clustering Schemes

4. PROPOSED METHOD

The vehicles move with diverse speed equipped with the DRSC (Dedicated Short Range Communication). Vehicle positions are provided by the GPS. In proposed algorithm the vehicles that move in the same direction are considered to be neighbors [16]. Vehicles is the same road way and transmit information or receive information. Communication from the source node is either directly reach the destination intermediate node which may be a router road side unit [17]. The fundamental idea of Affinity Propagation is used in the proposed algorithm for clustering and the Cuckoo search (CS) optimization algorithm is used to discover the super cluster head. In every iteration iv algorithm, each node i check this condition to set the Chong flag. This flag is used by the neighbor nodes of i to consider i as a potential cluster head. The broadcast of responsibility and availability packet is outlined in the following Procedure [18].

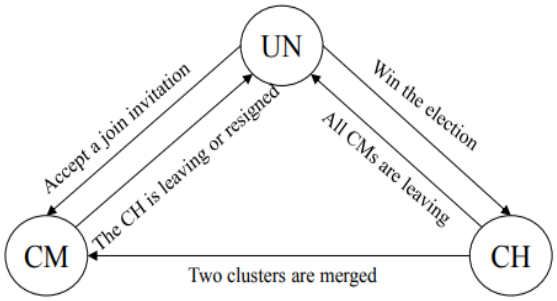

Fig. 4. Role transition diagram in a single-head cluster

1. Calculate responsibility, $r(i,j)$ for each neighbor j
2. Update the responsibility with damping factor
3. Store responsibilities, $r(i,j)$, in the array Ri
4. Calculate availability, $a(j, i)$ for each neighbor j
5. Update with damping factor
6. Store availabilities $a(j, i)$, in the array Ai
7. Determine if converged to CH status
8. Broadcast the RESP packet: $\langle Ri \rangle$
9. Broadcast the AVAIL packet: $\langle Ai , CHcnvg \rangle$

Cluster head is selected in the proposed work. Cuckoo search is a met heuristic algorithm inspired by the bird cuckoo, these are the birds. It lays its eggs in the nest of another host bird nest. If the host bird identifies the eggs that are not their egg then it will either throw that eggs away from its nest or simply leave its nest and build a new nest [19].

5. CLUSTERING ALGORITHM

The design of our single-head clustering algorithm is explained. Then, the multi-head version is introduced assumptions are made: Each mobile node has a unique ID and is equipped with a GPS device [20]. In a data sharing application, it is fairer for CMs that a CH is nearer the center of a cluster, because the hop count of a data transmission path from a CM to the CH is similar. Clusters with nodes having diverse moving directions are unstable, so we restrict all nodes in a cluster to have the same moving direction [21]. In the cluster establishment phase, three node roles are used: UN (Undecided Node), CH, and CM. A UN is a node that is not currently belonging to any cluster.

1) Initialize each node to be a UN.
2) Each node broadcasts new packet per BI.
3) A node i starts the CH election as |UN_NUMi ≥| UN_BOUND.
4) A new CH broadcasts a JOIN_INVITE packet to its neighbors.
5) A UN joins to a cluster when it receives a JOIN_INVITE packet from a CH that is driving with the same direction as it. This UN replies a JOIN_REPLY packet to the CH.

The multi-head version is extended from the single-head version. We first construct clusters using the single-head algorithm. The selected CH in each cluster is called a master CH (MCH). We select some CMs from a cluster to be slave CHs (SCHs). Therefore each multi-head cluster contains one MCH and several SCHs.

6. EXPERIMENTAL RESULTS

The proposed algorithm is implemented in NS2 total simulations are performed with 500 vehicles on a highway. Every simulation ran from 500s but only last 200s. In a dynamic environment the mobility of the nodes taken into consideration that improves the stability of the cluster cluster member and cluster header is increases the cluster performances. The proposed algorithms stability performance far exceeds that of MOBIC. MOBICs lesser stability performance could error in the mobility metric and cluster member suitability.

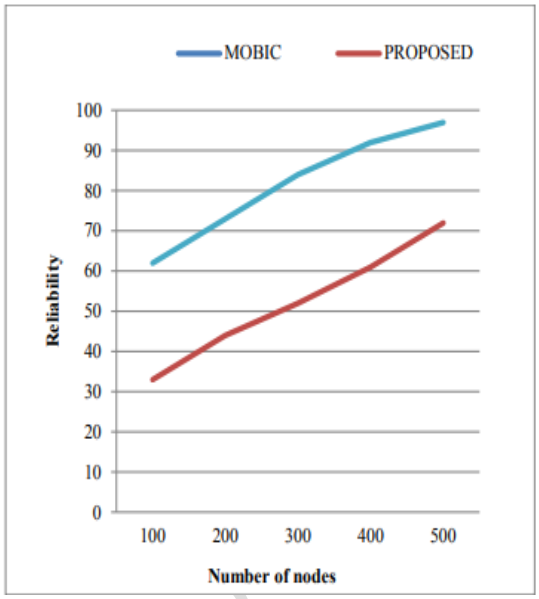

Figure No. 5 Reliability of the network better than the MOBIC by the proposed algorithm.

7. CONCLUSION

Traditional clustering algorithms developed for mobile ad hoc network are difficult to implement for vehicular ad hoc network as the nodes in this network are highly mobile. The mobility based clustering schemes is classified based on direction of vehicles namely direction based clustering schemes and non-direction based clustering schemes. Our proposed algorithm can select a given number of cluster heads with a uniform distribution in space. Since node mobility has a great influence on cluster maintenance, both node position and node mobility are considered in our cluster head election. In future we will consider more applications for our multi-head clustering technique. The cooperation behavior among multiple cluster heads need to be further discussed and evaluated. This article survey is motivated by detecting the essential weaknesses of current clustering algorithms such as: vehicle mobility, less strong to link-failures, dynamic topology and vehicle direction consideration.

8. REFERENCES

[1] K. Liu, J. K. Y. Ng, V. C. S. Lee, S. H. Son, and I. Stojmenovic, "Cooperative data scheduling in hybrid vehicular ad hoc networks: VANET as a software defined network," IEEE/ACM Trans. Netw., vol. 24, no. 3, pp. 1759–1773, Jun. 2016.

[2]. N. Maslekar, M. Boussedjra, J. Mouzna, and L. Houda, "Direction based clustering algorithm for data dissemination in vehicular networks," in Vehicular Networking Conference (VNC), 2009 IEEE, 2009, pp. 1–6.

[3]. R. Mehra, R. S. Bali, and P. Kaur, "Efficient clustering based OLSR routing protocol for

VANET," in 2016 Symposium on Colossal Data Analysis and Networking, CDAN 2016, 2016, pp. 1–7.
[4]. M. H. Albowarab, N. A. Zakaria, and Z. Z. Abidin, "Software Defined Network : Architecture and Programming Language Survey," Int. J. Pure Appl. Math., vol. 119, no. 18, pp. 561–572, 2018.
[5]. M. Faeq Ali, N. Haryati Harum, and N. Azman Abu, "An Intelligent Radio Access Technology Selection For Vehicular Communications," 2017.
[6]. R. S. Hande and A. Muddana, "Comprehensive survey on clusteringbased efficient data dissemination algorithms for VANET," in International Conference on Signal Processing, Communication, Power and Embedded System, SCOPES 2016 - Proceedings, 2016, pp. 629–632.
[7]. G. Karagiannis et al., "Vehicular networking: A survey and tutorial on requirements, architectures, challenges, standards and solutions," IEEE Commun. Surv. Tutorials, vol. 13, no. 4, pp. 584–616, 2011.
[8]. S. Al-Sultan, M. M. Al-Doori, A. H. Al-Bayatti, and H. Zedan, "A comprehensive survey on vehicular Ad Hoc network
[9] Yuyi Luo, Wei Zhang, Yangqing Hu, 2010 "A New Cluster Based Routing Protocol for VANET", IEEE Wireless Communications and Trusted Computing, 2010.
[10] Shea, Christine, Behnam Hassanabadi, and Shahrokh Valaee, 2009, "Mobility-based clustering in VANETs using affinity propagation."Global Telecommunications Conference,
[11] H Su and X Zhang, "Clustering-based multichannel MAC protocols for QoS provisionings over vehicular ad hoc networks", IEEE Trans Veh Technol., 56(6), 3309-3323, 2007.
[12] Mohammad S. Almalag and Michele C. Weigle, "Using Traffic Flow for Cluster Formation in Vehicular Ad-hoc Networks", IEEE 35th Conference on Local Computer Networks (LCN), 631-636, 2010.
[13] N. Maslekar, M. Boussedjra, J. Mouza and H. Labiod, "A Stable Clustering Algorithm for Efficiency Applications in VANETs", 7th International Wireless Communications and Mobile Computing Conference (IWCMC), 1188-1193, 2011.
[14] Sadaf Momeni, Mahmood Fathy and Nasser Mozayani, "Vehicular Ad-Hoc Networks Clustering", In: proc. of Advanced Satellite Mobile Systems, 299-304, 2008.
[15] Mildred M. Caballeros Morales, Choong Seon Hong and Young-Cheol Bang, "An Adaptable Mobility-Aware Clustering Algorithm in Vehicular Networks", In: proc. of Network Operations and Management Symposium (APNOMS), 1-6, 2011
[16] Y. Gunter, B. Wiegel, and H. P. Grossmann, "Cluster-based medium access scheme for VANETs," in Proc. IEEE Intelligent Transportation, pp. 343-348, September 2007.
[17] The network simulator.
[18] Topologically integrated geographic encoding and referencing.
[19] P. Basu, "A Mobility Based Metric for Clustering in Mobile Ad Hoc Networks", International Conference on Distributed Computing Systems Workshop, 413-418, 2011.
[20] Zhenxia Zhang, Azzedine Boukerche and Richard W. Pazzi, "A Novel Multi-hop Clustering Scheme for Vehicular Ad-Hoc Networks", In: Proceedings of the 9th ACM international symposium on mobility management and wireless access, 19-26, 2011.
[21] Neeraj Kumar, Naveen Chilamkurti and Jong Hyuk Park, "ALCA: agent learningbased clustering algorithm in vehicular ad hoc networks", International journal on Personal and Ubiquitous Computing archive, 17(8), 1683-1692, 2013.

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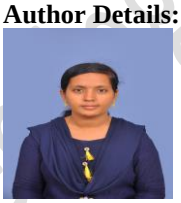

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