



## Performance Comparison of Swarm Intelligence Algorithm in MANET

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**Abstract**— A mobile ad-hoc network (MANET) is formed by a cluster of mobile hosts, each installed with a wireless transceiver, without the assistance of base stations. Various Clustering algorithms have been proposed to partition the network into small and manageable clusters and hence provide efficient resource management which enhances network performance. Ant Colony Optimization (ACO) is inspired by the foraging behaviour of real ant. ACO is meant to find optimal and shortest routing solution for many difficult problems such as Travelling salesman problem, Graph colouring problem... etc. In this paper, a new approach of clustering has been introduced based on ACO. This approach leads to formation of clusters which partition the network into number of non overlapping clusters. An algorithm based on ACO for the selection of Cluster Head and Gateway node is also proposed.

**Keywords**— ACO, RREQ

### I. INTRODUCTION

Mobile unplanned Network (MANET) is associate degree infrastructure-less network that consists of a set of wireless mobile hosts to create a brief network while not the help of any base station. Since information measure is restricted in an advertisement hoc network, it is very important to construct a virtual backbone consisting of solely a set of nodes that have the privilege to forward packets. Such a virtual backbone known as spine plays a very important role in routing, broadcasting and property management in wireless unplanned networks. an endeavor ought to be created to stay this backbone skinny and connected [2]. The preferred methodology that developed to supply resource management over mobile unplanned networks is agglomeration. This technique supported partitioning the network in smaller and manageable teams every cluster known as cluster. agglomeration offers many edges once it used with MANETs like it enhances routing method and quality, Stabilizes dynamic

Constellation, helps to perform additional economical resource allocation, provides gradable routing design. This techniques dividing nodes of a self-organized network like painter into variety of overlapped or disjointed clusters. in step with Cluster based mostly network theme, we've got 3 forms of mobile node in painter

1. Cluster Head: is outlined as an area organiser for its cluster. Cluster Head keeps in regular contact with member nodes and entree nodes of neighbor clusters. It performs inter-cluster routing, information forwarding and lots of alternative operations.

2. entree Node: could be a mobile node that acts as a communication medium between the clusters, will access neighbor cluster and forward info between clusters.

3. Cluster Member or normal Nodes: is that the one neither a Cluster Head nor entree. A cluster member wont to communicate with the Cluster Head of its cluster and update its table info per its corresponding cluster Head.

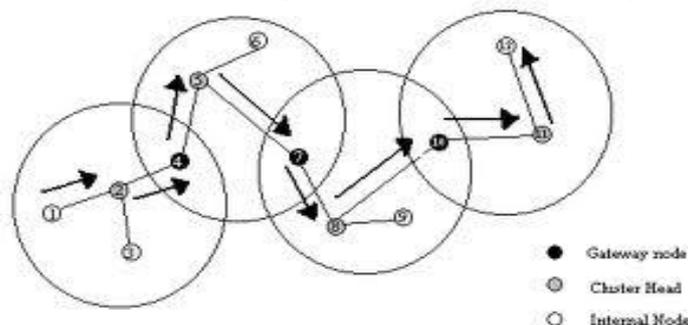


Fig.1 Cluster heads, Gateways and ordinary nodes in MANET [3].

A brief introduction to clump mechanism has been mentioned in section II. Route discovery method of associate on demand cluster primarily based routing is delineate in section II-A, and the way a routing is administrated is explained with the assistance of fig two in section II-B. In section III basic introduction of AC is given. In section IV a brand new optimized approach supported hypertension

Colony optimisation has been introduced for formation of non overlapping cluster And an formula mistreatment ACO is planned for locating cluster Head and entrance way node.

## II. CLUSTERING MECHANISM

Clustering techniques is intended by process structural partitioning of nodes within explicit network as shown in fig. 1. This mean; for explicit network, the nodes can classified to outline set of clusters supported specific techniques to specify [3]:

1. Cluster formation part.
2. Cluster maintenance part.

According to agglomeration ideas in painter, cluster of many mobile nodes type cluster and out of those classified nodes one node should be electoral that leads the full cluster referred to as Cluster Head (CH) and is accountable for the resource demand and distribution member nodes of the cluster. Remaining nodes of cluster square measure the member nodes conjointly referred as normal Nodes (CN) except Cluster Gateways (CG) or entry nodes that square measure the nodes that act as a communication medium between quite one clusters.

The painter is maintained and managed by partitioning the network into clusters. supported bound criteria or property a way used for grouping the nodes based mostly is understood as agglomeration. The implementation of agglomeration schemes in painter helps in up the routing by reducing the dimensions of the routing table and decreasing transmission overhead by change the routing tables when topological changes occur. Cluster based mostly routing may be a reactive routing. Reactive routing is additionally referred to as on-demand routing. Reactive routing has 2 main processes concerned in it -route discovery and Packet routing [4].

### A. Route Discovery

If a node must realize a route to a different destination node, 1st it should discover a route that\s required to succeed in the destination node then route the packet to it node. not like proactive routing, methods square measure maintained solely till they\re required .Route Discovery is that the mechanism whereby a node A want to send a packet to a destination D obtains a supply route to D. the same as alternative painter protocols, the approach S finds a route (or multiple routes) to D is additionally done by flooding, however, thanks to the agglomeration approach the amount of nodes that square measure disturbed square measure a lot of less generally. primarily in Route Discovery, cluster heads square measure flooded in rummage around for a supply route. To perform Route Discovery, the supply node A sends out a Route Request Packet (RREQ), with a recorded supply route listing solely itself at the start. Any node that forwards this packet can append its own ID during this RREQ. every node forwards a RREQ packet just the once and it ne\er forwards it to a node that has already appeared within the recorded route. In CBRP, the RREQ can continuously follow a route with the subsequent pattern to succeed in destination D: A CH1,G1,CH2,G2,G3,CH3 ..... D[5].

### B. Packet Routing

Ordinary nodes square measure cluster members however they are doing not have neighbors happiness to completely different clusters. entry nodes square measure nodes in a very non-cluster head state set at the boundary of a cluster. they\re used for routing to a node from a distinct cluster. Networks choose a collection of nodes which will function the backbone of the network. A network will contain variety of clusters and every cluster has cluster head and cluster members, that square measure at one hop aloof from the cluster head. The cluster Head of 1 cluster is connected to a different cluster directly or through the entry nodes [4]. The entry nodes and therefore the cluster heads along manage the routing mechanism of the network. In MANET, whenever a knowledge packet is send to a destined node we\ve got to hold out a route discovery method. in a very route discovery a route request packet (RREQ) is flooded over the network. during this every and each node of the network participate that lead large information measure and energy uses. Finally it reduces network performance. so as to utilize our most scarce resources (energy, information measure etc), agglomeration as a best far-famed answer was planned. In agglomeration based mostly routing solely 2 nodes that participate in flooding of route request packet (RREQ). Those square measure Cluster Head (CH) and Cluster entry (CG). thence the less the amount of nodes taking part in routing call the a lot of the network performance can increase. Routing mechanism is show in following fig2.

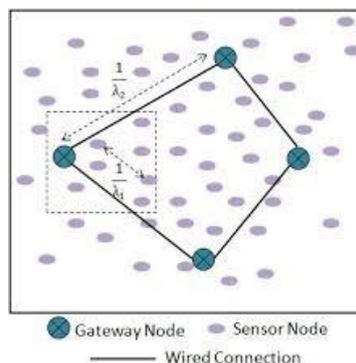


Fig.2 Flooding of RREQ packet over cluster head(CH) and gateway node(GN) to find route from source node a to destination node D.

### III. ANT COLONY OPTIMIZATION

Ant Colony improvement (ACO) is associate adaptational technique to search out partial answers for the issues wherever distinctive actual solution is either tough or not possible. ACO is galvanized by the hunt behaviour of ants. once ants explore for food, they wander arbitrarily and upon finding food come back to their colony whereas giving birth a chemical substance referred to as secretion on the trail . several ants could travel through completely different routes to constant food supply. The emmet that travel the shortest path to the destination reaches initial to the destination and so once it starts moving back to its nest it follows constant path because it is that the solely path with high secretion concentration. so once it moves back to the nest it any will increase the concentration of secretion thereon path .Subsequently a lot of ants area unit attracted by this secretion path, that reinforces the trail even a lot of. Ants area unit straightforward agents that act via indirect communication called stigmergy. Stigmergy is associate indirect style of communication wherever individual agents leave signals within the surroundings and alternative agents sense them to drive their own behaviour. this kind of communication is native whereby straightforward agents act regionally while not having any international data. Since these bio-inspired networks area unit ascendable, it'll be useful for any analysis conjointly [4].

ARA [1] is one amongst the emmet colony improvement based mostly routing algorithmic program that works in associate on demand method. It sets up multiple methods between supply and therefore the destination. At begin of session, Forward ants are going to be broadcasted by sender to any or all its neighbors. every Forward emmet incorporates a distinctive sequence variety to avoid duplicates. A node receiving a Forward emmet for the primary time creates a record consists of destination address, next hop, secretion worth in its routing table. The node interprets the supply address of the Forward emmet as destination address, the address of the previous node as next hop, and computes the secretion worth reckoning on the quantity of hops the Forward emmet required to succeed in the node. once the Forward emmet reaches destination, the destination node extracts the data so destroys the Forward ants. A Backward emmet is made and sent towards the supply node, the trail is established and information packets area unit sent. information packets area unit wont to maintain the trail ,so overhead is reduced.

### IV. PLANNED APPROACH

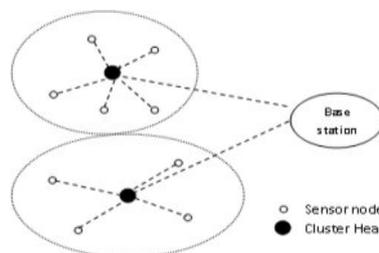
Although there area unit variety of approach gift for cluster formation in Adhoc networks however they suffers from limitation like overhead attributable to transmission of huge variety of packets .Here we tend to area unit presenting a replacement approach which might divide the whole networks into non overlapping clusters.

The algorithmic program for cluster formation may be explained as follows

1. at first every node can broadcast a forward emmet packet with a hop limit of 1(neighbour node) .With each node acceptive atmost one forward emmet and rejecting the forward emmet packets received subsequently.
2. each node {which can|which can|which is able to} be obtaining a forward emmet as in step one will turn out a backward emmet packet back to the supply. thus resulting in the formation of disjoint clusters as shown in fig.
3. when step two the Cluster Head may be determined by investigation the quantity of backward emmet received on every node within the cluster. The node with most variety of backward emmet packet are going to be the Cluster Head.
4. therefore every node within the cluster may be allotted a Cluster Head id love the id of the cluster head determined from the step three.

The entrance for bury cluster transmission of packets may be determined by mistreatment following steps.

1. The Cluster Head can broadcast a forward emmet packet with a hop limit following condition  
Cluster Head id (Sending node) != Cluster Head id (Receiving node)
2. If the condition within the step one is met then a backward emmet is made from the receiving node back to the supply and therefore the id love the supply of backward emmet are going to be set to the id of entrance node for transmittal packets between 2 clusters.



a) Formation of clusterheads

Fig.3. a) Formation of cluster head b) Gateway discovery for inter cluster communication

### V. CONCLUSION

Clustering algorithm comes with number of benefits and enhances the performance of network due to less bandwidth utilization. Cluster Head (CH) and Cluster Gateway (CG) forms the main backbone of the cluster based network. Hence a new optimized approach based on Ant Colony Optimization has been introduced for formation of non overlapping cluster and an algorithm using ACO is proposed for finding cluster Head and Gateway node.

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