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Performance Metrics Optimization of Cluster Based Location Routing in VANET

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Abstract: In this paper we present optimization technique for efficient routing for VANET. VANET plays an important role in dissemination of traffic and necessity knowledge among vehicles moving on roads. This information is used by various vehicular applications like road safety applications, route enlightenment applications etc. The survey of routing protocols in VANET is meaningful and crucial for smart ITS. This paper explain the applications of various routing protocols for vehicular ad hoc networks. This paper consult with the main five types of protocols for VANET Topology Based, Positioned Based, Geo Cast, Broad Cast, and Cluster Based Protocols and mainly three types of optimization techniques i.e. Ant colony optimization, Particle Swarm Optimization and Honey Bee optimization.

Keywords: VANET, ITS, CBLR, RSU, OBU

I. INTRODUCTION

Vehicular Ad hoc Networks (VANET) is segment of Mobile Ad Hoc Networks (MANET), this means that every node can move voluntarily within the network coverage and stay connected [1]. A VANET is a technolog0079 that uses mobile vehicular nodes in a network to organize a mobile network. VANET turns each participating vehicle into a mobile node, making a network with wide range by allowing vehicles nearby 100 to 300 meters of each other to connect.

Wireless Ad-hoc network is defined as a network which doesn't have above-mentioned communication infrastructure. Network is formed by some nodes which are available[2]. In this type of network, determination of which nodes to transfer data to which node is done dynamically, build upon the connectivity of both devices. Ad-hoc network can use flooding data transfer. In Ad-hoc network all devices are consider equally all have same status.

The main goal of VANET is to provide safety and comfort for travelers, drivers and other road users. To accomplish this, appropriate electronic devices Road side units (RSUs) and On Board Unit (OBUs) are provided for the connectivity to the passengers with the Ad-Hoc Network. Each vehicle will act as a node in the Ad-Hoc network and can receive and transmit messages over the network [3].

Road sign alarms, Collision warning and traffic view will give the driver to decide the best path along the way to reach the destination. There are also other services like multimedia and Internet connectivity proficiency for passengers, all of which will be provided within the wireless coverage area of each car. Automatic parking and toll collection are other examples of VANET.

II. ROUTING PROTOCOLS

A routing protocol is a command set used by routers to determine the most appropriate paths into which they should forward packets in the direction of their proposed destinations. A router is an electronic device and/or software that connects at smallest two networks and forwards packets with them render to the information in the packet headers and routing tables. A routing table is a directory in a router that fund and updates the locations (address) of other network devices and the most dynamic routes to them in categorization to unambiguous routing. Routing is the process of moving packets across a network from one host to another.

Part of the job of the routing protocol is to specify how routers report changes and contribute info with the substitute routers in the network in order to update their routing tables, thereby acknowledge networks to vigorous adjust to growing conditions.

Routing in VANETs has been analyzed widely inward the past few decades. Because VANET is a specific kind of adhoc network, the main difference between MANETs and VANETs is the mobility design and suddenly growing topologies. The unremarkably used various adhoc routing protocols are first enforced in MANETs are tested in various scenarios and then analyzed to be used in a VANET environment. We want a technique that will delegate unique logical direction to vehicles withal available routing protocols don't assure that the allocation of equivalent logical direction must be dropped inward the vehicular networks.

Thus, in an exceedingly VANET atmosphere, various avail direction algorithms occupied in MANETs are rarely appropriate. VANET related problems like configuration, number of vehicles at indiscriminate times of the day, enumeration, mobility arrangement, and random change in vehicles incoming and demonstrative the network and also the incontrovertible reason is that the dimensions of the road are usually lesser than the transmission network; all these build the implementation of typical adhoc routing protocols unsuitable. Routing protocols for VANETs are generally classified in two different grouping according to their position allegation and the route update method.

They are:
Position Based Routing Protocol
Topology Based Routing Protocol
Broadcast Based Routing Protocol
Geo Cast Based Routing Protocol
Cluster Based Routing Protocol

A. Position Based Routing Protocol
In this, whenever a source node communicate with the destination node using their geographical position besides of its network address. The geographical position of the nodes taking part in communication between the neighboring nodes is made available in the way of transmitted beacons at regular time interval. It has three main components: beaconing, location services and forwarding. This protocol required the global positioning system (GPS) assistance so that it can decide the location of the various vehicular nodes. Without the help of any route discovery procedure, maintenance and even aware of various network topologies, the routing decision between source node to destination node is purely based on the destination's position dwell in the packet header and the position of the source node's neighbor. Examples of this routing protocol are Distance routing effect algorithm for mobility (DREAM) and greedy perimeter stateless routing (GPSR).

B. Topology based routing protocol
It uses the available information about the link that live in the system to on wards the packet from source node to the destination node.

These can be classified into three main divisions:
• Proactive Routing
• Reactive Routing
• Hybrid Routing

1) Proactive Routing Protocol
Protocol chooses the route path which usually lean on closest path algorithms [4]. It make use of standard distancevector routing protocols (e.g., Destination Sequenced DistanceVector (DSDV)) or link-state routing methods (e.g., Topology Broadcast based on ReversePath Forwarding (TBRPF) & Optimized-Link-State Routing (OLSR). The routing accusation among all vehicular nodes of a given network are updated & maintained in any respect times even though the paths aren't presently getting used. Path automatically updated. It occupies a major part of the accessible bandwidth used to maintain the unused routing paths, is the most downside of such approaches. Since a vehicular network is very dynamic, proactive routing algorithms are typically inappropriate.

2) Reactive routing protocols
Reactive routing protocols (in addition to known as on-demand routing) determine the routing path on requirement and the maintaining solely the routing paths which are in use presently, once solely a set of accessible routing paths currently in use at any time hence decreasing the overhead on the network [4]. Reactive routing is especially appropriate for the situation where data transfer among vehicles can exclusively use a really restricted variety of routes. Numerous reactive routing protocols have been developed like Dynamic supply Routing (DSR), Temporally Ordered Routing Protocol (TORA) and Ad hoc On-demand Distance Vector Routing (AODV).

3) Hybrid ad hoc routing protocols
This protocol break the network into two domains: local and universal. To get a higher efficiency and scalability, zone routing protocol (ZRP) results by combining local proactive routing protocols and total reactive routing protocols well-organized to decrease routing overhead and delay due to route determination process. The currently used routing paths of networks are still need to maintain by combining both strategies because it limits the change in topology within a given amount of time.

C. Broadcast Based Routing Protocol
Broadcasting routing protocol floods the packet by the whole vehicular network through all available nodes inside a broadcast domain. Whenever the destination vehicular node is outside the transmission range of source node then this method is used. These are mainly used for the safety related applications like sharing climate, traffic, road conditions through vehicles, emergency warning, numerous announcements and delivering advertisements. Many broadcasting routing protocols have been developed like Distributed vehicular broadcast protocol (DV-CAST), Position aware reliable broadcasting protocol (POCA) and Density aware reliable broadcasting protocol (DECA).

D. Geo Cast Routing Protocol
It uses mobicast messages to communicate with the vehicles. Its main factor of consideration is time and the main intention is that the communication enclosed by vehicles within prescribed region at a particular time which is known as zone of relevance (ZOR t). Whenever the destination node belongs to the additional ZORs then communication is fulfill by applying the zone of forwarding (ZOF). The vehicle appear in the middle ZOF has the responsibilities to forward the data packet to the additional ZORs. Its numerous cases are like IVG, DG-CASTOR

E. Cluster Based Routing Protocol
In this, numerous vehicles having parallel peculiarity like velocity, order etc. are grouped well-organized to form a cluster in the network. To manage the communication through numerous nodes within cluster or with other clusters, a cluster head is necessary. If the packet to be directed in the equivalent cluster then it is done by using the direct path, but when the destination node is apart from the cluster at that time the cluster head create a virtual

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network infrastructure which provide scalability. Clustering for bare (ready to) inter vehicular communication network (COIN) and LORA_CBF are main cases of this routing techniques.

III. CBLR PROTOCOL

CBLR is a reactive and cluster based routing protocol. In Cluster-based routing protocols the vehicles are near to each other form a cluster. Each cluster has one cluster-head, which is responsible for inter-cluster and intra-cluster management functions. Inter-cluster communication is performed using cluster-headers, whereas Intra-cluster nodes can

A. Formation of cluster head:

1) For the formation of cluster, every node broadcasts a Hello message and waits for predefined time to get reply.
2) If a node receives a reply message from a cluster header before the timer expires, it becomes a cluster member. Otherwise, it becomes a cluster header.
3) Each cluster header maintains the addresses and geographic locations of the cluster members and gateways nodes in the table, and it also maintains the Cluster Neighbor Table that contains the information about all neighboring clusters.
4) When a source wants to send any data to the destination, initially it checks whether the destination is in the same cluster or not. If it is available in the same cluster, it sends the packet to the closest neighbor. Otherwise, the source stores the data packet in its own buffer and start the timer and broadcasts Location Request (LREQ) packets.
5) Only gateways and cluster-heads can re-transmit the LREQ packet to minimize the number of retransmissions. After receiving a request, each cluster-head checks whether the destination is a member of its cluster or not.

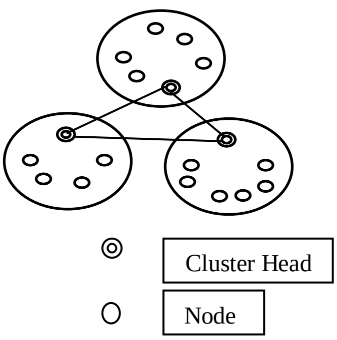

Fig-1 CBLR Network Formation

6) If it is a cluster member, then cluster header sends a Location Reply (LREP) packet to the sender, based on the information present in the cluster neighbor table and LREQ packet .It retransmits packets to its adjacent cluster-head after receiving LREQ.
7) CBLR is most preferable for high mobility networks because it updates the location of the source and destination, whenever the data transmission starts.

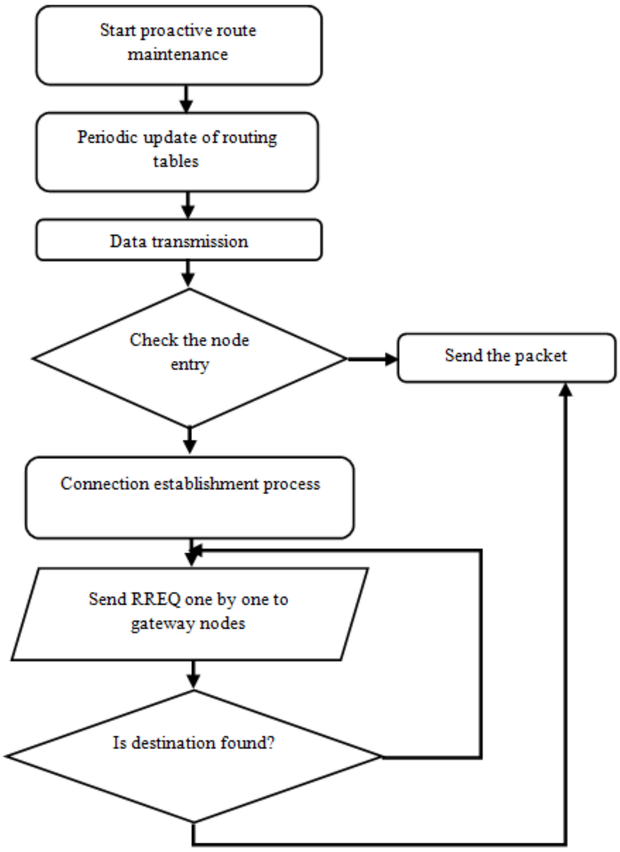

Fig-2: Flow chart of proposed algorithm

IV. BEE COLONY OPTIMIZATION

A colony of honey bees can extension itself over elongated length (up to 14 km) and in multiple directions simultaneously to make use of a large number of available food sources. A colony thrive by troops its foragers to good fields. In principle, flower chunks with a large amount of honey or pollenize which can be collected with less effort should be travel to more bees, whereas chunks with less honey or pollenize should receive fewer bees. The foraging process starts in a colony by scout bees and they are sent to search for the promising flower chunks. Scout bees randomly move from one patch to another. During the harvesting season, colony continues its exploration, by keeping population as scout bees. When they return to the hive, those scout bees that found a patch which is rated above a definite threshold (metrical as a compounding of some constituents, such as sugar content) collect their honey or pollenize and and so tour to the “dance floor” to execute a dance which is known as the waggle dance. This dance is important for colony communication, and contains important information regarding a flower patch: the direction in which it will be establish, its length from the hive and its caliber rating (or fitness). This information is beneficial for the colony. The colony sends its bees to flower chunks precisely, without using any of the guides or maps. All individual’s cognition of the exterior environment is collected and gathered from the waggle dance. This dance allows the colony to appraise the relative meritable of different chunks according to the caliber of the food they provide and the

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amount of energy necessary to harvest it. Following waggle dancing, the dancer (i.e. the scout bee) tour back to the flower patch with the follower bees that were waiting inside the hive. More follower bees are sent to more promising chunks which allows the colony to gather food quickly and efficiently. While harvesting from a patch, the bee monitor its food level. This is required to decide the next waggle dance when they return to the hive. If the patch is still good as a food source, and so it will be publicized in the waggle dance and more bees will be recruited to that source.

V. SIMULATION RESULT

Here the performance evaluation of the proposed scheme using the network simulator (ns2) is presented. The objective is to appraise the relevant of contents and its act upon broadcasting to the entire network. Because, drivers far aside from this place might not be curious because no actions are necessary from them to avoid such a dangerous situation. The relevant value increases when the length diminish between the vehicle and the place where safety data was bring forth, and vice versa. Simulation parameters affiliated to mobility and traffic scenarios are first described. In this study, a pragmatic mobility scenario is utilized to conduct simulations. The simulation parameters are represent in Table 2.
We have done simulations several time with different values of parameters, such No of nodes (30, 35, 40, 45, 50, 55, 60, 65)

Simulation Parameter	**Value**
Network range (m x m)	300 x 300
Transmission range (m)	400
Number of nodes	30, 35, 40, 45, 50, 55, 60, 65
Nodes speed (m/s)	5, 15, 25
Geographical area (m)	400
Bandwidth (Mbps)	2
Message size (bytes)	1000
Simulation time (s)	100

Table 1: Simulation Parameter

In the study we are able to optimize delay, throughput, PDR and jitter.

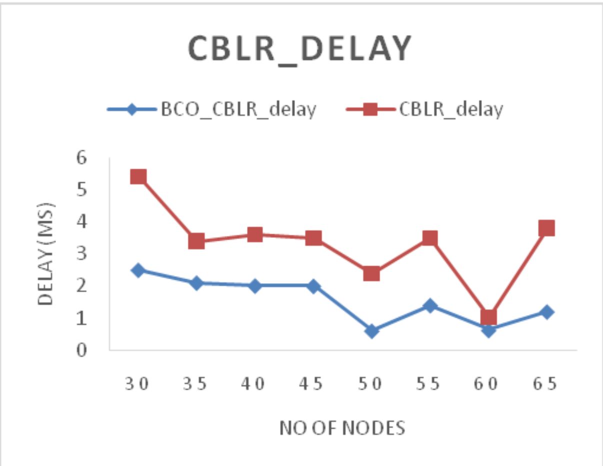

Fig-3: CBLR Delay with and without BCO

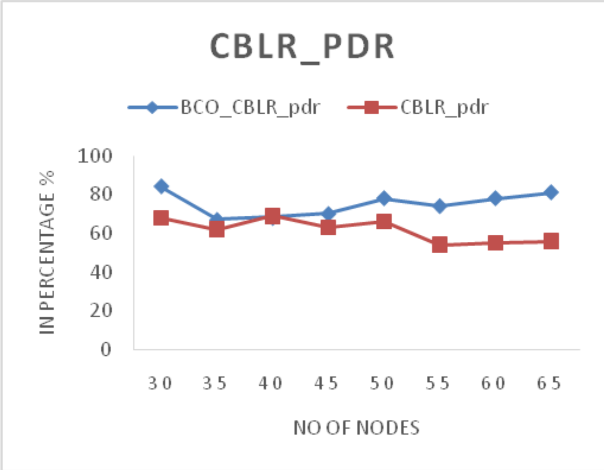

Fig-4: CBLR PDR with and without BCO

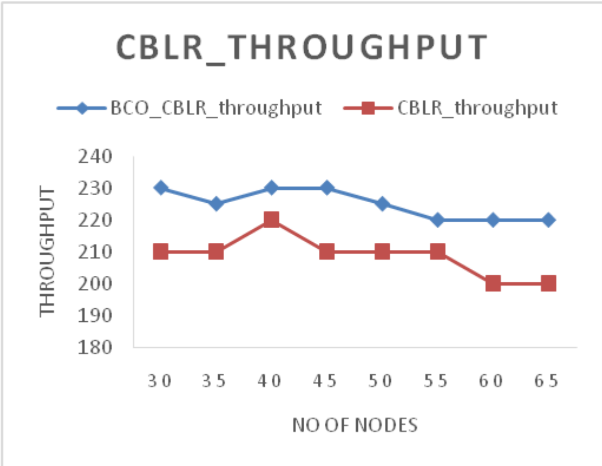

Fig-5: CBLR Throughput with and without BCO

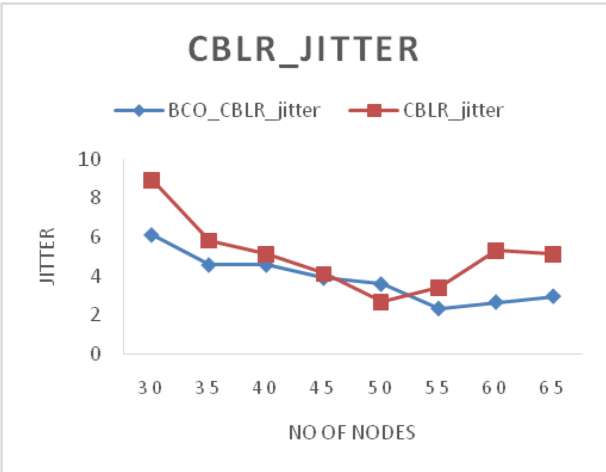

Fig-6: CBLR jitter with and without BCO

VI. CONCLUSION

In this paper, an entropy dissemination design inspired from Bees' communication principles is introduced. The main goal is to contribute each vehicle accompanying the prescribed entropy about its surrounding and assist drivers to be aware of troublesome road situations. Simulations are done and results are reported to show the benefit of

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using Bees' communication performance for entropy dissemination in VANETs. Vehicles are disabled to re-disseminate received messages, and they can substitution exigency entropy with each other via RSU. If vehicles observe an abnormal situation on the road they inform the closest RSU by incite exigency illuminate; afterwards, RSU disseminate them if their relevance value is positive. Future work acknowledge the resemblance of the proposed dissemination approach with other work from the literature. Packet drop per 1000 packets is 30 and average Delay is 40 ms from average time of 100 sec.

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