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A CB-OLSR Using Artificial Bee Colony Mechanism for Efficient Communication in VANET

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ABSTRACT: Vehicular ad hoc network (VANET) is the most desired network that are under growing interest of research due to its benefits and development of a Intelligent Transport System (ITS). Appling a better communication in VANET is a question mark because of its high mobility and limited coverage of wifi. In this type pervasive networks high mobility generate frequent topology changes and network decentralization. Therefore, the communication among the vehicles is a challenging task and is very crucial to give efficient routing strategy for classification of VANET. In this paper we are dealing with communication and routing strategies in VANET. We propose a cluster based approach in the network using techniques of OLSR protocol which exchange the routing information also with that we added a routing algorithm that is Artificial Bee Colony (ABC) Algorithm that finds best route from the source to the destination based on the quality (QOS metrics). In this paper we have considered following metrics like Lifetime, PSNR, Control Overhead, Frame Success Ratio, Packet Delivery Ratio, End-to- End Delay, Throughput. By analyzing the performance and simulation result, it is identified that the method can improve the performance of routing in VANET by selecting the quality based route based on QOS metrics.

KEYWORDS: VANET, OLSR, Cluster, Artificial Bee Colony Algorithm.

I. INTRODUCTION

Vehicular ad hoc networks (VANET) are self-configuring network same as the Mobile ad hoc network (MANET) where the devices are changed to vehicles [1, 2, 3, 4]. These networks are with changing topology and high mobility. VANET can provide comfort to drivers, communication among vehicles and also road safety. The benefits of VANET lead to deployment of Intelligent Transport System (ITS). A VANET network is interconnected with vehicles that are able to communicate each other and transfer the important information. The main objective of these networks is give good and available services to humans while on road. However road safety and traveling comfort applications are seeking many benefits.

The topology created by the vehicle is highly dynamic and is significantly non-uniformly distributed. To offer a real time application to vehicles, it is needed to give better routing not only that optimal path is also needed for a better communication. To obtain a quality assured path for communication the routing strategy needs to be excellent. The traditional algorithms that are used in MANET are not that possible in this network due to its high mobility.

The traditional routing protocols that are used for MANET shows its performance poor when it s used in VANET. The problems behind these protocols like ad hoc on demand distance vector (AODV) and dynamic source routing (DSR) when applied to VANET network the routes will be instable. An established route which is fixed to succession of nodes (traditional node-centric view of routes) between the source and destination will lead to the disconnection or

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breaking up of routes in the network. As VANET mobility is very higher so that it cannot maintain the routes also the packets are dropped. Due to the route failure which significantly happens increases the overhead and lead to low delivery ratio and high transmission delay.

The characteristics of VANET are more similar to the MANET some of the characteristics are high mobility, Rapidly Changing Network Topology, Unbounded Network Size, Frequent Exchange of Information, Wireless Communication, Time Critical, Sufficient Energy, Better Physical Protection[5].

The proactive routing protocol like OLSR which designed for MANET can be applied to VANET due to some of its features [7]. In this paper we are using the concept of OLSR and Artificial Bee Colony algorithm to create a optimal and quality based path for communication from vehicle to vehicle. The clustering technique is used in which there are cluster head election and selection of MPR that plays the role of communication gateways between the clusters. Artificial Bee Colony algorithm is added because it presents the best route the source and the destination and comply the QOS metrics.

The paper is organized as follow in section 2, we briefly identified the related work. In section 3, a detailed description of the proposed system is added. In section 4, we defined the result and simulation work of the proposed system in detail with performance results and simulation experiments. In section 5, finally we have added the conclusion with the advantage of the proposed system, its drawback and the future work for the future research.

II. RELATED WORK

The research studies over routing for VANET have been carried out in different field in general as well as cluster based technique in particular. The traditional algorithms are mostly not suitable in VANET due to its mobility need to satisfy the mobility of the network. In this section we review some existing studies that adopt the clustering technique.

Optimization is a technique [5] tends to improve maximum result under given condition. As we know for large network having large traffic there has been used cluster based routing protocol to improve the performance of network [5]. In this paper they have consider VANET to play and vital role for road side safety and to solve the emergency situation. Communication between vehicles is done by using routing protocol in this paper they have introduce a cluster based routing protocol i.e. CBLR and HCR [5]. Also they apply Bee Colony Optimization techniques on this protocol to achieve maximum results.

In [6] they have defined the network with a new intelligent algorithm to perform the vehicle to vehicle communication. Each vehicle can pass the information to other regarding the path, speed etc [6] and also includes the information of accident status. In this proposed work, it is said that if a vehicle is met with a collision it will inform all other vehicles to take a better decision. In this proposed work [6], as a vehicle get some collisions or accident it will inform to other vehicles about its status so that they can perform the decision regarding the route change at earlier stage.

In paper [7], they aim at defining and solving an offline optimization problem to efficiently and automatically tune OLSR, which used by many authors for VANET as it present many features for it. In [7] more details about the use of OLSR in VANETs are provided by defining an optimization problem to tune the OLSR protocol. This done by obtaining the best fits configuration automatically, optimization issues are defined by quality or fitness function.

In [8] work they are comparing the performance of ABC algorithm with that of differential evolution (DE), particle swarm optimization (PSO) and evolutionary algorithm (EA) for multi-dimensional numeric problems. The simulation results of this paper show that the ABC algorithm performance is comparatively efficient and the performance of ABC is analyzed under the change of control parameter values [8] and it is mentioned by honey bee behavior.

In paper [9], they have addressed the problem of clustering in VANETs using Quality of Service Optimized Link State Routing (QoS-OLSR) protocol. There are several clustering algorithms where mobility-based algorithms avoid the Quality of Service requirements that are important for VANET safety. In [9] paper the solution is a new QoS-based clustering algorithm that considers QoS requirements and high speed mobility constraints. The aim of this paper [9] is to form a stable cluster and maintain the stability during communications and link failures which are achieved by using Ant Colony Optimization for MPRs selection. The algorithm offers reduction of control overhead and also the stability of the network.

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III. PROPOSED SYSTEM

In our proposed work we form the communications based on Cluster based Routing mechanisms. With this cluster based routing mechanisms we have to elect a set of optimal cluster-heads with the help of Cluster Head Selection procedures and dividing the networks into clusters as well as form the nodes with the clusters and provide the vehicular specialization to all nodes to move around all locations around the regions. In this approach we use MPR Cluster Selection Process, in which MPR nodes play the role of communication gateways between different clusters. All communication between clusters must transit through corresponding MPRs. One cluster consist of one or many MPRs. When clusters are formed and cluster heads are selected for each one of them, the algorithm of determining MPRs kicks off. Apart from this we add the Routing Provision called Artificial Bee Colony (ABC) algorithm, which is presented here to find the best route between given source and destination and which comply with given QoS metrics. ABC operation is inspired by the behavior of bees in their search for food and by their strategy for pinpointing various routes from their hive to various food locations.

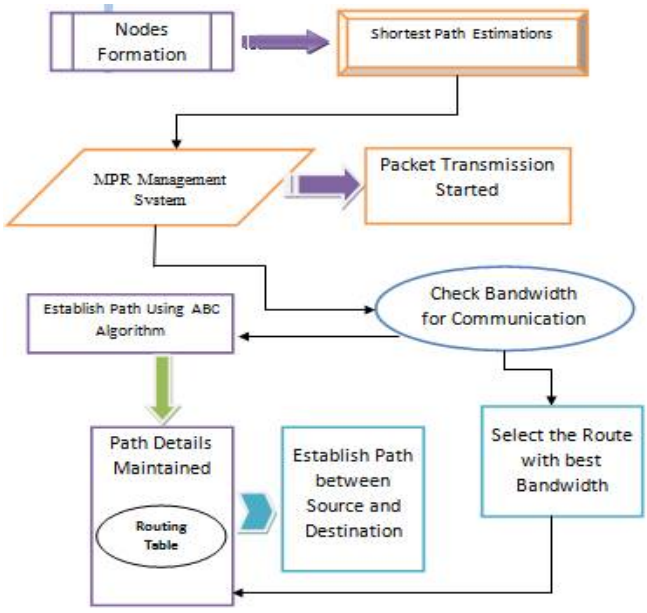

Fig 1: System Architecture

A. CLUSTER HEAD ELECTION

In this we describe the model used by nodes (vehicles) for electing the cluster head. To improve the quality of service of the clusters, CB-OLSR use several QoS metric. The cluster head knows the other nodes in the cluster with all its details obtained through the Hello message. Nodes give an attention to link expiration as it leads to the cluster stability.

B. ROUTING TABLE

The routing table in CB-OLSR is situated at the cluster head, which is responsible for discovering the network and exchanging the data. The entry of the routing table, represents a route from a destination, which is evaluated according to the quality. Multiple routes to a destination can be there in the routing table which is evaluated by quality therefore the route with best quality to transmit the data packets.

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C. ROUTE DISCOVERY

When the node wants to send the data to other cluster then the source node send the request to the cluster head. If we didn't find any route in the table then the cluster head releases a scout to discover the route to destination. In this the scout moves from cluster head to MPRs and reaches the destination, and the routing table is updated.

IV. RESULT AND SIMULATION WORK

The experiment is done using network simulator to show the efficiency of the proposed system. The performance of the protocol in VANET was simulated and succeeded to find the best route. The figure 2 represents the graph generated from different scales of life time of the network.

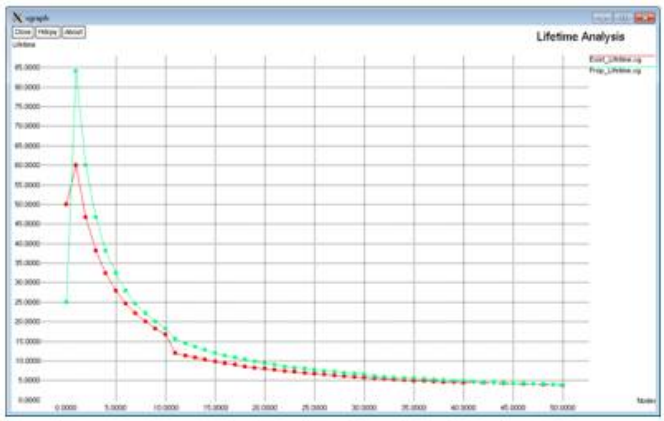

Fig 2: Life Time Analysis

The proposed result shows that the protocol can increase the

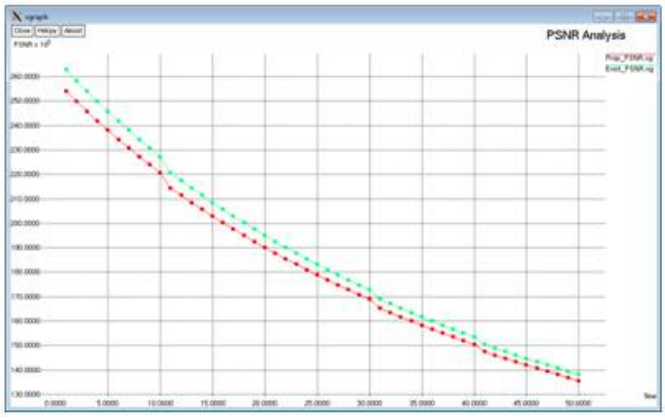

Fig 3: PSNR Analysis

life time of the network. The figure 3 represent the PSNR analysis which shows some improvement.

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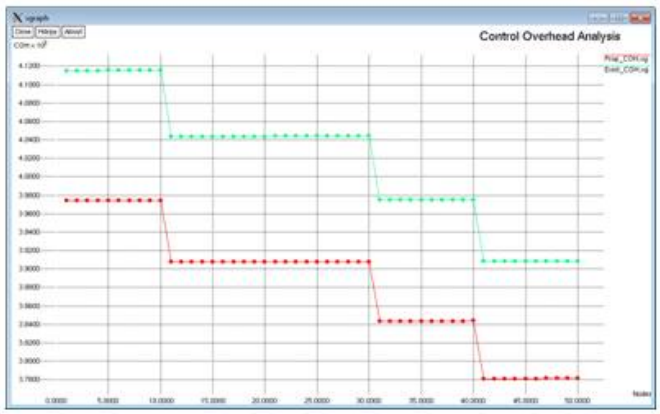

Fig 4: Control Overhead Analysis

The figure 4 represents the control overhead analysis. The overhead of the VANET is always in a greater way as it is of high mobility.

Fig 5: Frame Success Ratio Analysis

The proposed result in figure 5 shows the frame success ratio analysis which is done in the VANET network.

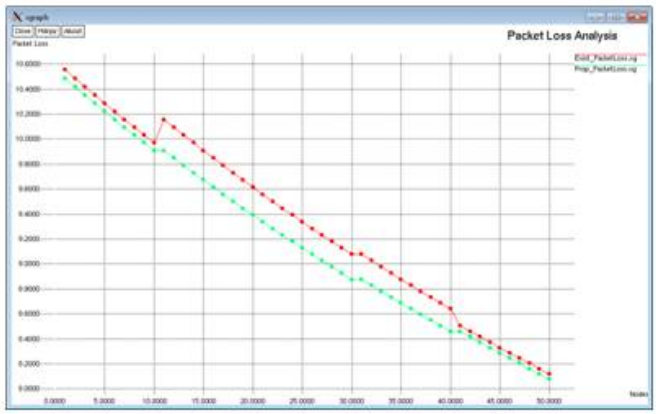

Fig 6: Packet Loss Analysis

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The proposed result shows the packet loss in figure 6 it is shown that the packet dropping is comparatively less in or proposed system.

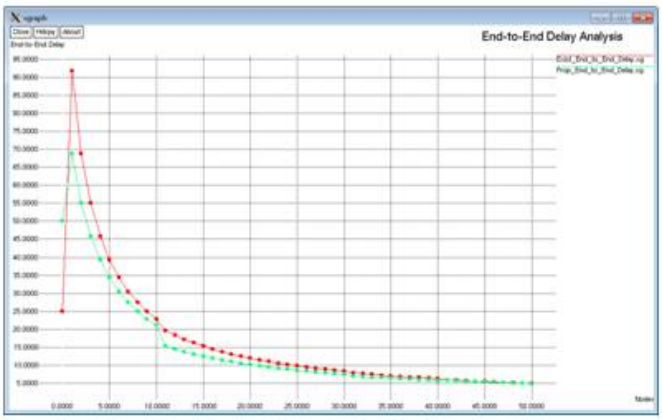

Fig 7: End-to-End Delay Analysis

This figure 7 shows the proposed result of End-to-End delay analysis of the proposed architecture.

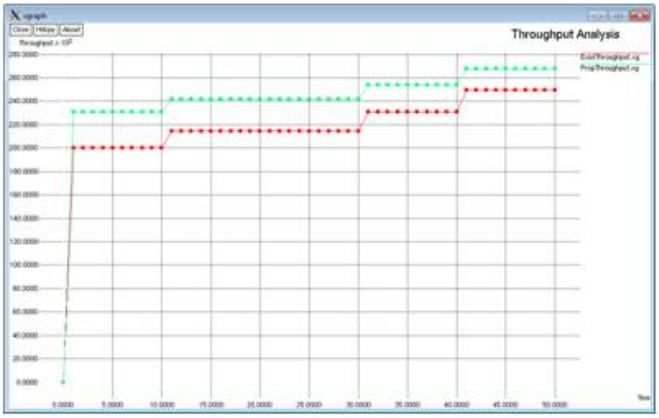

Fig 8: Throughput Analysis

This figure 8 shows the throughput analysis of the proposed architecture.

V. CONCLUSION

The result that we have given in the previous section shows that the proposed system performs a better routing and communication system by delivering maximum number of data packets. The proposed system has decreased the end-to-end delay increased the lifetime of the network. In future, we can give some more security system to get far better network as VANET is also affected by attacks.

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