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VEHICLE INTERNET ACCESS USING SEGMENT RESIZING AND ANT COLONY OPTIMIZATION ALGORITHM FOR MOVING VEHICLES

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Abstract:

VANET (Vehicular ad-hoc Networks) is a network with high mobility and it has a random network topologies. In VANET, vehicles communicate among themselves and with the devices (access points) on road and highways through internet or cellular data network. The important characteristic of VANET is the high moving vehicles on the road and this speed impacts the delivery of the data in the network formed. So, the main issue we are considering is routing of data in highly mobile network. In this work, we have explained a technique of metaheuristic known as Ant Colony Optimization (ACO). ACO is found to be suitable for routing and many researchers found it suitable for VANET. Its characteristic of pheromone trail makes it more efficient in terms of routing.

Keywords: Vehicular ad hoc network; routing; ACO.

1. INTRODUCTION

In the present era, cars and other private vehicles are used on a higher amount and due to which a higher possibility of accidents on roads has raised

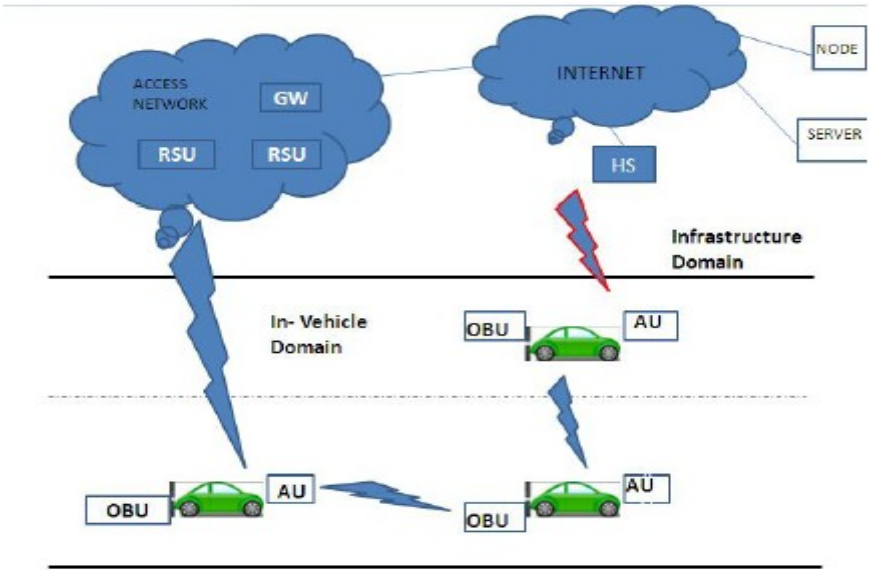

Fig.1. VANET Communication architecture

These arising problems of accidents and congestion on roads have been confronted by some of the modern society [25]. VANET is a wireless network which provides communication between two

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vehicles using a Dedicated Short Range Communication (DSRC), it is an IEEE 802.11a standard for low overhead operation to IEEE 802.11p.

In VANET, the communication allows vehicles to share different information like safety information, post-accident investigations, traffic congestion and other safety related information. The other information like traveler information and position related information are considered in non-safety information. VANET are network consisting of different vehicles communication among themselves on road or highway in urban areas . Here, In VANET vehicles are considered as mobile nodes.VANET consists of access points and vehicles, in vehicles the main components are AU (Application unit), OBU (On Board Unit). OBU is a device which provides the services to the driver, the application may reside on OBU or RSU.

2. VANET ROUTING PROTOCOLS

In VANET routing protocols, mainly they are classified in two types first is routing information and the other is transmission strategies. Transmission Strategies: In this class of routing protocols delivery of information from a source to a destination node are classified in four types: unicast, broadcast, multicast and geocast. Where geocast is a special type of multicast transmission is used by the protocols to get the location of node and neighbor nodes [24].

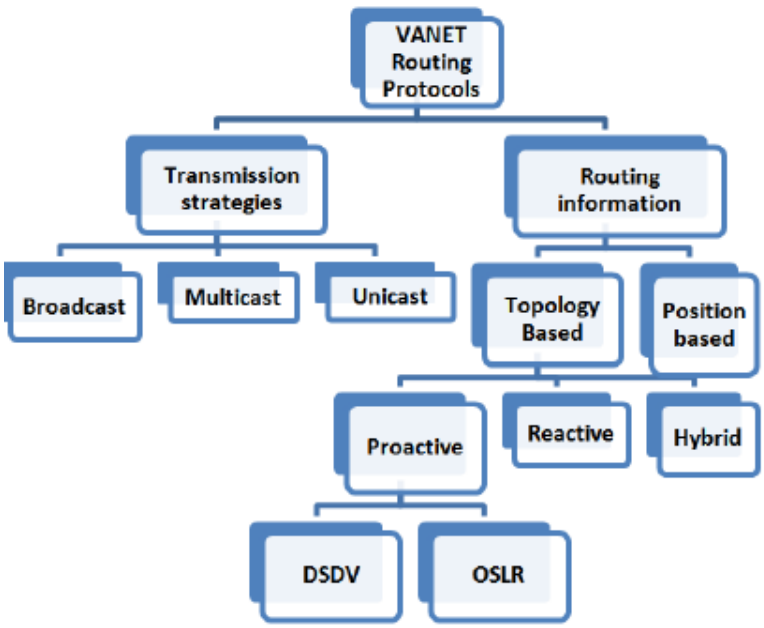

Fig.2. VANET routing protocols

Routing information: It is used in packet forwarding, it mainly focuses on topology-based and graphic based routing. It is further classified as topology based and position based protocols. In Position based routing protocol, source sends data packet to destination using its geographic process rather than its network address. GPS (Global Positioning System) assistance from source to destination. In topology based routing protocol , it uses link information which is stored in routing table as a bases to forward packets They are further divided into proactive and reactive protocols. The main protocol used is AODV, DSV, DSR and other protocols.

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3. RELATED WORK

Sergio Luis O. B. Correia et al [1], the author has proposed a new algorithm named MAR-DYMO which is derived from the traditional DYMO protocol, MAR- DYMO (Mobility Aware Ant colony optimization Routing –Dynamic MANET On- demand) routing protocol makes use of Ant colony optimization and the characteristics of ants are being deployed in VANET.The ACO is used to make use of speed and position of the vehicle as a heuristic function and to help the routing decisions based on it. The two main mechanisms of ACO are pheromone deposit, which is used when exploring the routes and the the level of pheromone is deposited on each node/vehicle and the node updates their routing table with count of hop and pheromone level. Ronan Doolan et al [2],

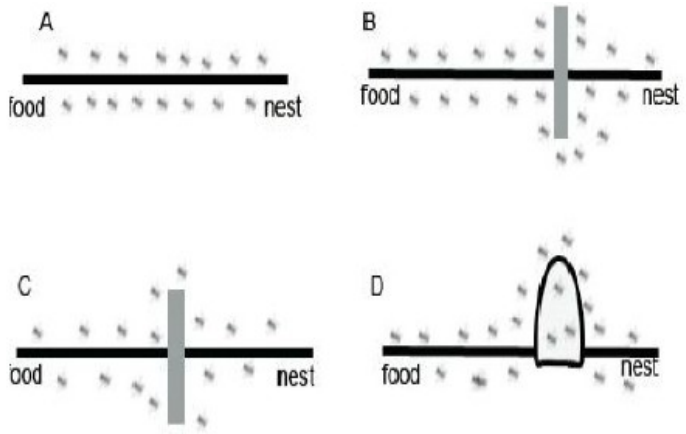

Fig.3.Ant behaviour

In this paper author focuses on the traffic congestion throughout the week. In this paper Author proposes A Ant-based algorithm in which pheromone count for every road is used and an iteration based algorithm is used to lower the congestion on congested roads. The architecture of the proposed algorithm consists of vehicle model which gives information like speed and position of individual vehicle, Road model which gives the information about roads driving on, the current traffic model contains information about the instantaneous traffic information in the area and the time-dependent traffic model gives the information about the roads throughout the day. Using this architecture an algorithm is prepared and reiterating it the congested roads are made lighter. Rodrigo Silva et al [3], the author gave AntRS algorithms which are used for two main objectives 1) for faster delivery of messages and 2) with a low probability of disconnections. In this approach a given network with N vehicles randomly scattered in a square area of side L and the best path is to be established between different vehicles and a reference vehicle and it is desirable to find the best path between a message source and destination. The artificial ants are sent from the source randomly and they will select the best route based on the probabilistic equation and the pheromone trail found on the path .Three scenarios are considered in this paper 1) a static VANET without obstacles, 2) static VANET with obstacles and 3) dynamic VANET with obstacles. The simulation results are promising and find out best paths with the use of ant agents and considering the obstacles too. Hao Dong et al [4], In this paper, an improved AODV protocol with ACO algorithm is used in VANET .The basic information like speed and position of the vehicle are used as heuristics information and using it a better route selection is done. By different modification of pheromone evaporation rate the nodes in the network can choose better route in two main discover steps with higher possibilities .The experimental results show that the new protocol has more effective performance than traditional AODV and it could find

optimum route more quickly. The results also show that handoff frequency is reduced in given time. It also improves the routing path duration and the transmission efficiency of message.

4. ANT COLONY OPTIMIZATION

The member of clusters are selected only if they are moving in the same direction .The trust value of CH is calculated to ensure that the vehicle is not malicious and it decides the level of confidence of a vehicle on neighboring vehicle. The trust metrics which are helpful to calculate trust value of a vehicle are Traffic rule obey(TRO), Data packets forwarded(DPF), Data packet procession(DPP),Control packet forwarded(CPF),Control packet procession(CPP).Dynamic transmission range keeps a stable connectivity and for that dynamic transmission range is considered in it. Alisson B. Souza et al [6], the author gave an algorithm based on multicasting trees and using the ant colony routing gave a new protocol for multicasting MAV-AODV (Multicast with Ant colony optimization for VANET based on MAODV), which is similar to a multicast protocol named MAODV (Multicast- AODV). The beacon messages are used to verify its position related to other nodes. The estimated link lifetime is an important issue to be considered and is calculated according the spatial distance between nodes and also range of the communication, so that the multicast group transmission becomes efficient. Sumeet Sekhon et al [7], In this paper the author used the metaheuristic technique named Max-Min Ant system of Ant colony optimization. The accident information on the road should be flooded to the roads and cities, this task is done using sensors of WIMAX. The optimal path is selected using the bio-inspired algorithm which is followed by all the vehicles in the row. It tends to follow the path on which the the amount of pheromone trail is found more and a decision is taken as the upcoming vehicles come to know about the collision or accident information on the road. S. Cloudin et al [8], author gave a new protocol named SI- DYMO (swarm intelligence-DYMO) derived from the metaheuristic technique Ant colony optimization is used. In this work, autonomous clusters are used in which there are cluster heads, gateways and cluster members. There are two kind of clusters considered in this work, they are intra clusters and inter clusters. The path selection procedure between the clusters is carried out by ACO and the data forwarding is done by SI-DYMO. Basically, ACO procedures are carried out in DYMO protocol. Jamal Toutouh et al[9], in this paper author gave a parallel particle swarm intelligence based protocol(pPSO) to solve the problem of AODV routing optimization problems in VANETs. It uses the master-slave paradigm to evaluate all the swarm particles. Monte –carlo method is used for analyzing the results, the results of PSO and pPSO are compared. It was found from the work that PSO (Particle Swarm Intelligence) obtained better results than sequentially optimized by Garcia nieto.

CONCLUSION AND FUTURE WORK:

We studied the VANET and the communication architecture of the VANET, how two vehicles using DSRC communicates which each other. In this survey we studies how ACO is being implemented in many ways and how it optimizes the solutions. Many met heuristic techniques are their which can be used for optimizing the solutions. In this survey we came to know that out of all metaheuristic technique like Evolutionary Algorithm (EA), Differential Evolution (DE), PSO (Particle Swarm Optimization) [10], and different other techniques are there and on comparing all of them in terms of Optimization PSO were most suitable for VANET dynamic and autonomous environment. Mainly for VANET, ACO is suitable for routing optimization and the decisions related to routing. The ACO approach not only works well in VANET but also in MANET, we surveyed some papers in which ACO works at its best for route discovery and route maintenance phase for both the Ad-hoc

networks.ACO is multipath iterative distributed algorithm, which gives multipath from a source to destination node. The techniques derived from ACO like MAR-DYMO, Ant- DYMO, E-DYMO, PIACO-AODV, SI-DYMO, TACR and other hybrid techniques which are derived from ACO was found to be useful for VANET and MANET for selection of the best path and maintaining that path for future nodes to visit it for optimal path. For Future work, the different other hybrid ACO approaches can be made and they can be applied to the VANET environment.

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