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An Optimal Technique in VANET Routing Using Metaheuristic Approach

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Abstract- For accurate network performance analysis of routing protocols and access technology for VANET (Vehicular Ad hoc Network), realistic road map scenarios are required. This paper refers to analysis of network performance for VANET.[1,3] Simulation of routing protocols for VANET using realistic road map scenarios provides accurate results and can be useful for design and deployment of VANET applications. For VANET, speed of mobile nodes affects the routing path stability. It is important to use real world mobility models; so that the results obtained from the simulation of VANET routing protocols correctly reflect the real-world performance. In this paper, analyses the performance in terms of throughput, packet delivery ratio, packet loss and overhead. Routing protocols like OSPF are used for performance analysis. it supposed to handle high traffic rate as well as frequent interrupt in connection. It should consume less power and utilize bandwidth efficiently. At the same time, the VANET nodes must be simple, cheap, smaller in size and efficient enough to handle traffic. In VANET system Vehicles need to communicate with the other node, for that node continuously sending RTS-CTS signals. As if number of signals increases, there is high probability of collision. Collision damages data packets .so it requires retransmission, in this we use different routing protocols through which overhead can be reduced. Effect of flooding can be suppressed by eliminating or dropping certain nodes. Hence, reliability of communication can be improved. [5]

Index Terms— Vehicular ad-hoc network (VANET), Ant colony optimization, Routing Protocols, Performance Parameter, and Simulators etc.

Introduction

A Vehicular Ad-Hoc network is a form of Mobile ad-hoc Networks, to provide communication among nearby vehicles and between vehicles and nearby fixed equipment i.e. roadside equipment. The main goal of VANET is providing safety and comfort for passengers. Each vehicle equipped with VANET device will be a node in the Ad-hoc network and can receive & relay other messages through the wireless network.[6,8] Collision warning, Road signal arms and in place traffic view will give the driver essential tool to decide the best path along the way.

In this paper, analyses the performance in terms of throughput, packet delivery ratio, packet loss and overhead. We give Ant colony optimization algorithm to find an optimal path for given program input parameters. Our results show significant improvement of performance metrices and compare it with other model to analysis it in terms of throughput and delay time.

Real World Components Of Vanet:

1. Vehicles: Vehicles are the nodes of vehicular network. VANET address the wireless communication between vehicles (V2V) and between vehicles and infrastructure access point (V2I) [7].

2. Infrastructure: Infrastructure related to outside environment include road side base station. Base stations are the roadside unit and they are located at dedicated location like junctions or near parking spaces.[9]

3. Communication channels: Radio waves are a type of electromagnetic radiation with wavelengths in the electromagnetic spectrum longer than infrared light.

Related Work

Zhang.Y, Han.Y, Wu.P[1] presented a novel approach is proposed in this paper to detect community structure in opportunistic networks. This approach uses Maximum Connection Probability (MCP)and established in two phases. Firstly, an algorithm is proposed to derive the MCP of any node to other nodes. Secondly, the community structure derived from the MCP is identified using a divisive algorithm. Simulation is conducted based on walking day movement model to evaluate the approach.. Zhu.H, Dong.M[2] presented an Vehicular networks consist of highly mobile vehicles communications, where connectivity is intermittent. Due to the distributed and highly dynamic nature of vehicular network, we propose an innovative scheme, named ZOOM, which automatically choose the most appropriate mobility information when deciding next data--relays in order to minimize the end--to--end delay. Our algorithm uses locally collected contacts to

predict the future contact opportunities between vehicles. Khekare.G, Sakhare.A[3] shifting focus towards improving the onroad safety rather than improving the quality of the roads. As you all known about the fact that The total number of vehicles in the world has experienced a remarkable growth, increasing traffic density which results in more and more accidents.we find a solution to this problem by introduces a smart city framework i.e. Intelligent Traffic Lights (ITLs) that transmit information about traffic conditions that will help the driver to take appropriate decisions. Zhou.H, Huang.L[4] To increase the security in VANET, heuristic ant colony optimization is introduced with few known opponents and with unknown opponents. Vehicular Communications (VC) aspire to improve safety and efficiency of transportation systems. Daraghmi.Y, Yi.C[5] optimize reliability and time criticality metrics in data communication protocols for VANET, novel ideas are needed. A general framework has attempted to bring ideas for data dissemination in vehicular networks. This framework could be serve as a platform that preserving the optimal performance. Rodrigues.J, Farahmand.F[6] This paper proposes a VDTN routing protocol, called GeoSpray, which takes routing decisions based on geographical location data, and combines a hybrid approach between multiple-copy and singlecopy schemes. Xiao.M, Wu.J[9] presented Mobile social networks (MSNs) are a kind of delay tolerant network that consists of lots of mobile nodes with social characteristics. Recently, many social-aware algorithms have been proposed to address routing problems in MSNs. However, these algorithms tend to forward messages to the nodes with locally optimal social characteristics, and thus cannot achieve the optimal performance. Lai.P, Guo.B, Kuo.Y[13] presented an opportunistic networks in which data are delivered by dissemination-based routing approaches using the store-carry-and-forward concept. users in an area usually demand similarcdata, called “locality of demand”, and this area is referred to as a community.This paper presents a community-based data dissemination (ComD) scheme to improve the data delivery efficiency in the opportunistic network. Chim.T, Yiu.M[16] In this paper, We proposed a VANET-based Secure and Privacy preserving Navigation (VSPN) scheme. We utilized speed data and road conditions collected by RSUs to guide vehicles to desired destinations. To protect the privacy of the drivers, the query (destination) and the driver who issues the query are guaranteed to be unlinkable.

Shapley Value Centrality: The Shapley Value (SV) is a fundamental normative solution concept in coalitional games. One of its applications is in the domain of networks, where the Shapley Value is used to measure the relative importance of individual nodes.[11] Given a scenario where agents are allowed to realize collective payoffs through mutual co-operation, the SV postulates a fair method to evaluate each agent’s individual contribution.

```
Input: Weighted graph G(V;E;W), dcutoff > 0
Output: SVs of all nodes in G for game g
foreach v € V(G) do
        DistanceVector D = Dijkstra(v,G);
        extNeighbors(v) = ϕ;; extDegree(v) = 0;
        foreach u € V(G) such that u ≠ v do
                if D(u) _ dcutoff then
                        extNeighbors(v).push(u);
                        extDegree(v)++;
                end
        end
end
foreach v € V(G) do
        ShapleyValue[v] =    1 / 1+extDegree(v) ;
        foreach u € extNeighbors(v) do
                ShapleyValue[v] += 1 / 1+extDegree(u) ;
        end
end
return ShapleyValue;
```

Following flowchart explains the procedure of VANET Application:

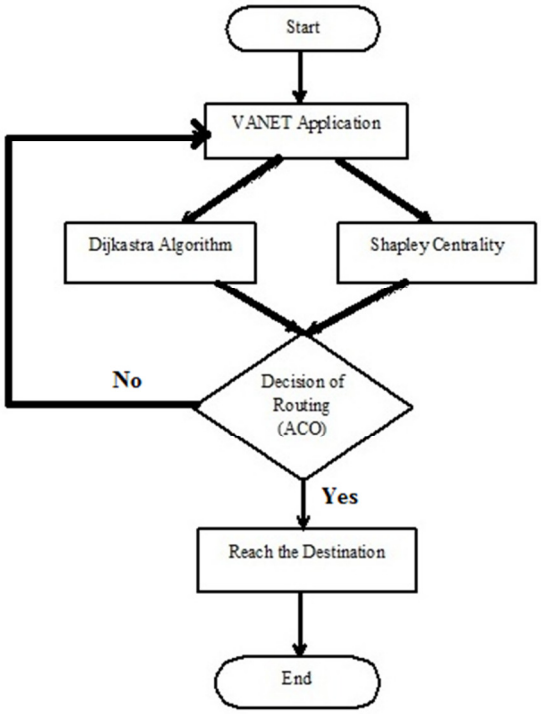

Fig 1: Flowchart

Figure 1 shows the general flow of operations involving duration of the vanet application. Firstly,We deploying an vanet application. We find the nodes that have a shortest distance between them using dijkstra’s algorithm and shows network connectivity using shapley value centrality.[13,14] Then we take a decision by using Ant Colony Optimization(ACO) to compute an optimum value. If we are able to find an optimum value then automatically

we reach our desired destination. Otherwise this process is repeated iteratively until we reach the desired destination.

Performance Mertices- In this paper, we analysis the four parameters i.e. throughput, dropped packet, delay and overhead. The performance of an VANET model is compared with that to conventional model based on the previous stated parameters.[15]

Research Methodology The optimization decision in vanet is taken by using ACO(Ant Colony Optimization) algorithm and analysis the Throughput, Dropped packet, delay and overhead. It has been found that in previous work

- process is offload manual by user which is automatic,
- Offloading decision depend on the previous task, that's why maintain the previous task information which take more time for processing.
- predict the offloading which is depend on the predict in model and it give some time error when take wrong prediction.
- maximum offloading decision is static is not depend on the task .

We deploy three Algorithms:

Dijkstra's Algorithm

Dijkstra's Algorithm is an algorithm for finding the shortest paths between nodes in a graph, which may represent road networks. Let the node at which we are starting be called the initial node. Let the distance of node *Y* be the distance from the initial node to *Y*. Dijkstra's algorithm will assign some initial distance values and will try to improve them step by step.

Shapley Value Centrality

The Shapley Value (SV) is a fundamental normative solution concept in coalitional games. One of its applications is in the domain of networks, where the Shapley Value is used to measure the relative importance of individual nodes. Given a scenario where agents are allowed to realize collective payoffs through mutual co-operation, the SV postulates a fair method to evaluate each agent's individual contribution.

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                end
        end
end
foreach v € V(G) do
        ShapleyValue[v] =    1 / 1+extDegree(v) ;
        foreach u € extNeighbors(v) do
                ShapleyValue[v] += 1 / 1+extDegree(u) ;
        end
end
return ShapleyValue;
```

Ant Colony Optimization

ACO is a metaheuristic algorithm. Metaheuristic is a set of general algorithmic framework which is nature inspired and they are designed to solve complex optimization problems[13].In computer science, the ant colony optimization algorithm (ACO) is a probabilistic technique for solving computational problems which can be reduced to finding good paths through graphs.

ACO scheme:

```
Initialize pheromone values
repeat
        for ant k ∈ {1,...,m}
                construct a solution
        endfor
        forall pheromone values do
                decrease the value by a certain
        percentage {evaporation}
        endfor
        forall pheromone values corresponding to
    good solutions
        do
                increase the value
        {intensification}
        endfor
```

until stopping criterion is met (predefined maximum number of iterations has been executed)

Experiment

An ONE simulator is chosen as a simulation platform, as it is a simulation framework aimed at opportunistic network.[9] The maximum no of nodes are used 400, waiting time for simulation is 15000 ms, total number of host is 6 and number of nodes in each group is 15.

Result- Figure2 and 3 shows the graph between conventional model and actual model in terms of parameter values.

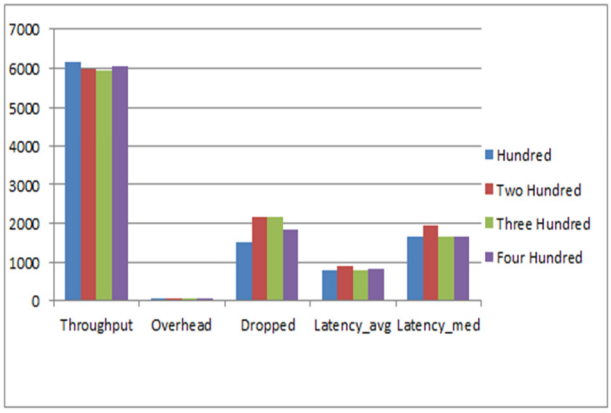

Fig 2: outputs of actual model

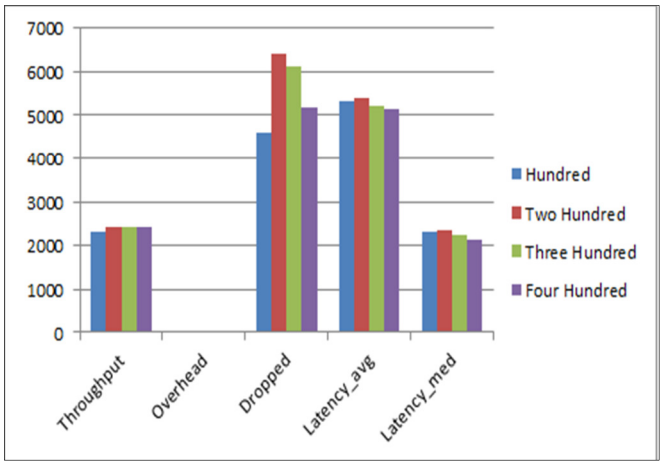

Fig 3: outputs of conventional model

Experimental results show that our vanet model can significantly improve the values of performance parameters in actual model.

Conclusion and Future Work

We studied the VANET and the communication architecture of the VANET, how two vehicles using OSPF communicates which each other. In this survey we studies how ACO is being implemented in many ways and how it optimizes the solutions. The above stated algorithms enable efficient centrality computation for many real-world applications including the analysis of social networks, information diffusion and internet/web phenomena. In future, we will enhance this work by using different types of centrality in place of shapley centrality i.e. betweeness centrality, closeness centrality etc. The different other hybrid ACO approaches can be made and they can be applied to the VANET environment.Also enhance the decision making process by using neural networks. VANET technology has a great potential in facilitating road transport safety and other communication application in real scenario. Substanial research in the area of security is required to make the vanet deployment possible in the near future.

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