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Energy Efficient Multi-Casting Optimization Connection Strategy for further most Destination Selection in VANET's

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Abstract: In the advance technology of vehicular Ad-Hoc Networks (VANETs), the vehicles are divided into multiple lanes and then the route discovery is performed by using three algorithms like Spanning Path Tree, Minimum Spanning Tree and FSSC algorithm. SPT algorithm finds multiple routes and the multiple routes are found based on number of neighbor nodes. SPT algorithm finds the best route which has the lowest distance between source nodes to destination node. MST algorithm finds the best route based on the number of hops. FSSC algorithm finds the route by first finding the various directions like North, South, East and West. From each of the neighbor the forward node is found based on the closest distance with respect to destination node. This process is repeated until destination vehicle is reached. The three algorithms are compared with respect to packet delivery time, Throughput, Energy Consumption and Packet Delivery ratio.

Keywords: *Vehicle Ad-Hoc Network, route discovery, quality of services.*

I. INTRODUCTION

Vehicular Ad- hoc Networks (VANETs) can provide scalable and cost-effective solutions for applications such as traffic safety, dynamic route planning, and context-aware advertisement using short-range wireless communication. An efficient routing protocol needed to make the network function properly for these applications. Wireless Ad-hoc networks are decentralized networks created on the fly by hosts located in proximity of one another is no longer just a research concept.

Due to the network attitude it requires minimal effort to setup an Ad- hoc networks are suitable for a wide range of applications military application such as battlefields communications and disaster recovery operations.

In recent years, most new vehicles come already equipped with GPS receivers and navigation systems. Car manufacturers such as Ford, GM, and BMW have already announced efforts to include significant computing power inside their cars [5, 6] and Chrysler became the first car manufacturer to include Internet access in a few of its 2009 line of vehicles [7]. This trend is expected to continue and in the near future, the number of vehicles equipped with computing technologies and wireless network interfaces will increase dramatically. Wireless ad-hoc network Standardization is already underway for communication to and from vehicles. The Federal Communication Commission (FCC) in the United States has allocated a bandwidth of 75MHz around the 5.9GHz band for vehicle to vehicles and vehicles to road side infrastructure communications through the Dedicated Short Range Communications (DSRC) [8] services.

The emergence of vehicular networks would enable several useful applications for both safety and non-safety related, such as automatic road traffic alerts dissemination, dynamic route planning, service queries (e.g., parking availability), audio and video file sharing between moving vehicles, and context-aware advertisement (e.g., [9, 10, 11]).

To deploy the application services, there are three types of communications involved in Ad-Hoc networks including cellular network, Vehicle to roadside infrastructure and Vehicle- to- vehicle communications.

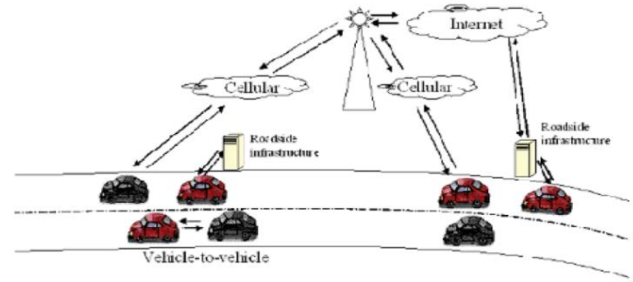

Figure 1: Ad-Hoc network Communication infrastructure.

III. EXITING METHODS

In the previous approach Shortest Path Tree (SPT) in Urban Vehicular Networks is used which first finds out a set of vehicles within the range and then among those set Coverage Area Vehicle (CAV). One among the CAV is chosen randomly in order to move forward and the new vehicle becomes the originator and then CAV is computed for the new source vehicle. Now the field Vehicle In Route (VIR) is computed and then compared with CAV and similar vehicles between the two entities are removed and then one among new CAV is picked. The process is repeated until the Destination Vehicle is reached.

The previous approach has the following disadvantages:

1. The SPT algorithm needs computation of GPS based Vehicular Routing Tables (VRT) but the vehicles will contain vehicles which are in range of both fraunoh offer and Fresnel regions. Hence Computation cost is high.
2. The SPT algorithm will have large overhead due to maintenance of vehicular routing tables for each of the node. Hence Overhead is more.
3. The SPT algorithm will take more time for delivering the packets as the propagation is needed for both transmission of Control packets on either side i.e. Source Vehicle to Destination Vehicle and back.
4. The SPT algorithm is not suitable for Highway Traffic conditions.
5. SPT requires retransmission of packets.

IV. PROPOSED METHODS

In the proposed approach two algorithms are proposed namely "Minimum Spanning Tree *(MST)*" and "Farthest destination Selection and Shortest path Connection" (FSSC) are proposed. MST algorithm will first find the IN vehicles and then if the IN vehicles contains the Destination Vehicle (DV) then stop the process. If the DV is not present then a vehicle is chosen which has high density. If multiple vehicles have the maximum and same density then the vehicle which has low vehicle ID is the next vehicle is the forward vehicle. This process is repeated until the destination vehicle (DV) is reached. FSSC Routing (MR) will find the ECFV (Ecliptically Curve Fitting Vehicle) and then will choose one neighbor in each of the North, South, and East & West direction. The process is repeated until the destination is reached.

There are lot of algorithms in the literature namely Shortest Path Tree and Minimum Spanning Tree which provides a series of steps which can improve the packet delivery ratio. However the algorithms suffer from complexity, delay and hops. Relay node is responsible for communication between vehicles on two different locations /roads. In this work we make use of Modified FSSC algorithm which performs the route discovery based on directional mapping of destination node which increases the accuracy and reduces the delay. Parameters such as End to End Delay, Number of Hops, Energy Consumption, Throughput and Routing Overhead are measured for SPT, MST and Modified FSSC algorithm and it is proved that Modified FSSC algorithm is the best.

The algorithms such as randomized routing algorithm will find the random routes between source nodes to destination node and then the route which has the lowest delay will act as the best route. The algorithm suffers from problems like the energy consumption and the number of hops. SPT algorithm finds the route which has the minimum distance from source node to destination node. MST algorithm finds the route which has the minimum hops from source node to destination node. The algorithms have many disadvantages like multiple route discovery and does not take into consideration the direction of moment for the vehicles. Therefore an algorithm is required which picks the forwarding vehicle in such a way that the closeness is more with respect to various directions and distance with respect to destination.

V. SYSTEM ARCHITECTURE

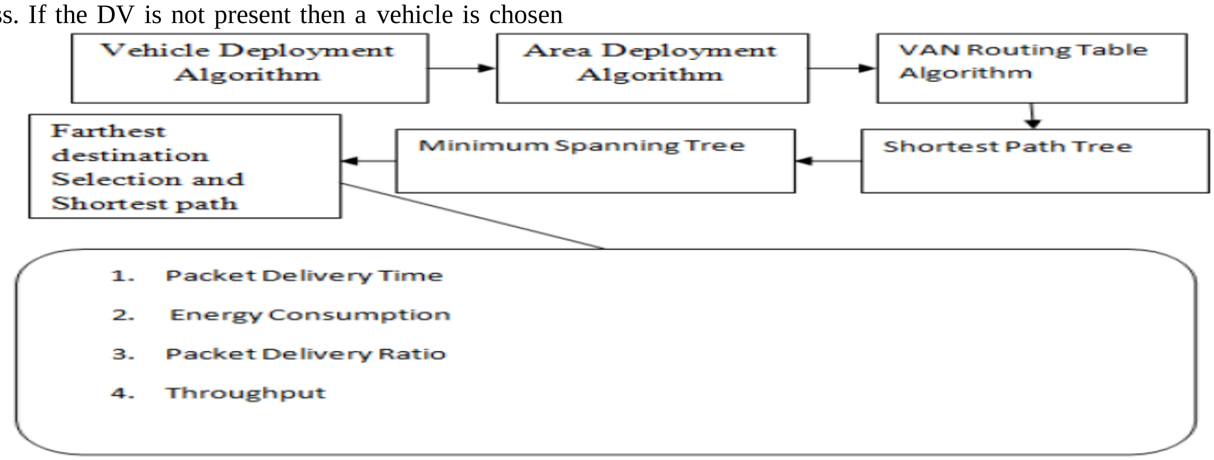

Figure 2: System architecture of the proposed work.

A. Vehicle Deployment Algorithm

Vehicle Deployment Algorithm is used to deploy the vehicles in the given area between X_{min} to X_{max} & Y_{min} to Y_{max}

Where:
X_{min} = the minimum limit;
X_{max}= the maximum area limit;
Y_{min}= the minimum y area limit;
Y_{max}= the maximum y area limit;

B. Area Deployment Algorithm

The proposed algorithm is used to distribute the vehicles across multiple areas in the given network. For each area vehicle deployment algorithm is called and vehicles are placed in the area. Like this process is repeated for all the areas in the network.

C. Spanning Tree (SPT)

SPT is used to deliver the packets from the source vehicle to destination vehicle. The SPT algorithm will first generate the Vehicular Routing Tables (VRT). VRT consist of local vehicles in the Fresnel zone and few vehicles of frauhoffer zone. Fresnel Zone is the vehicles which are present within the range of 'R' and then vehicles are the set which are present in Fraunhoffer region which are in the range of 'R' > R & < 2R.

MST algorithm does not require VRT. MST algorithm main strength is based on the forward factor which involves REPLY TIME, Distance and AWGN Noise of the vehicles. The next forward vehicle will be picked based on which neighbour vehicle has the maximum forward factor. FSSC Routing is an algorithm which is based on dividing the area surrounding to each vehicle based on an ellipse and then the vehicles are chosen which has the co-ordinates a, b. For each edge vehicle is chosen. This process is repeated until the Destination Vehicle is reached.

VI. STANDARD VANET NETWORKS

Two categories of draft standards provide outlines for vehicular networks. These standards constitute a category of IEEE standards for a special mode of operation of IEEE 802.11 for vehicular networks called Wireless Access in Vehicular Environments (WAVE). 802.11p is an extension to 802.11 Wireless LAN medium access layer (MAC) and physical layer (PHY) specification.

A. Road Side Unit (RSU)

Computing device located on the roadside that provides connectivity support to passing vehicles.

B. On Board Unit (OBU)

The On Board Unit is a system that collects driving information, and is intended for insurance companies to apply a bonus system for drivers that drive safely (i.e. who obey traffic rules and who adapt their driving behavior to the actual road/weather conditions).To make the On Board Unit attractive to the drivers, additional functionality can be added. For instance traffic information about road conditions ahead or alerting emergency services in case of an accident. The OBU evolution comes from two different correlated paths: connectivity and processing capacity. The former will be defined by the amount and types of ports available to connect with other devices while the latter is the capacity of the CPU to manage complex functionalities.

C. Relay Nodes

Multipoint relays (MPR) are nodes in Wireless ad hoc network that do the job of relaying messages between nodes. They also have the main role in routing and selecting the proper route from any source to any desired destination node.

VII. MODULES OF THE PROPOSED METHOD

A. Area interest formation / Lane formation

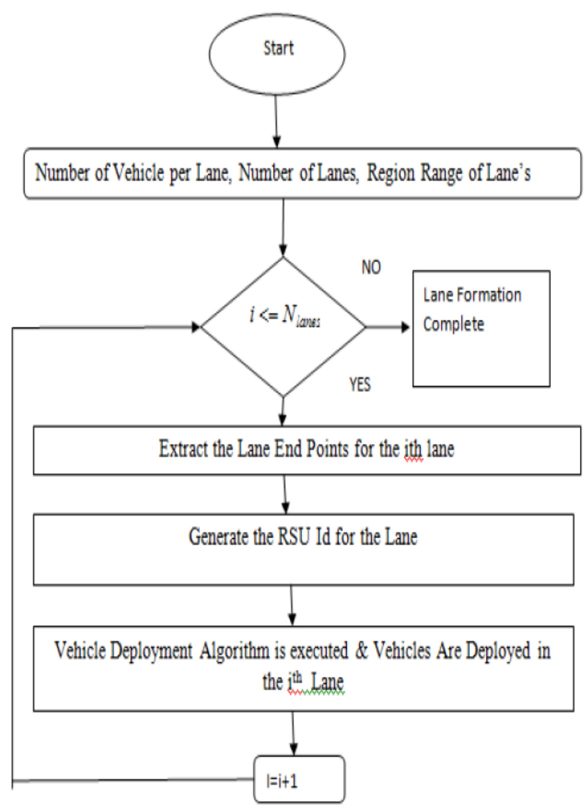

Figure 3: Four way Lane formation.

B. Vehicle Deployment Algorithm

This module is responsible placing the vehicles in the given area.

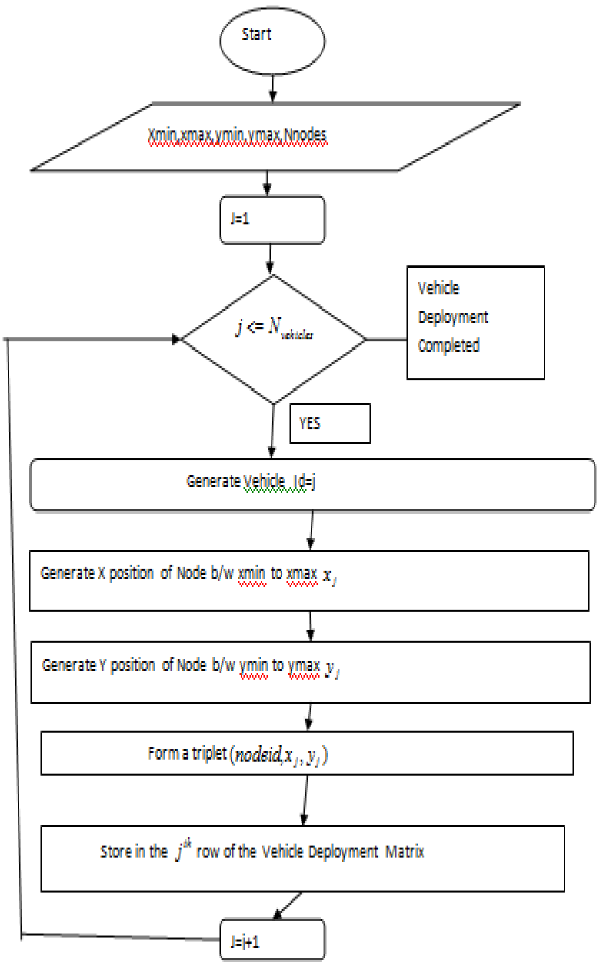

Figure 4: The vehicle deployment algorithm

C. Shortest path tree for multiple routes Discovery process:

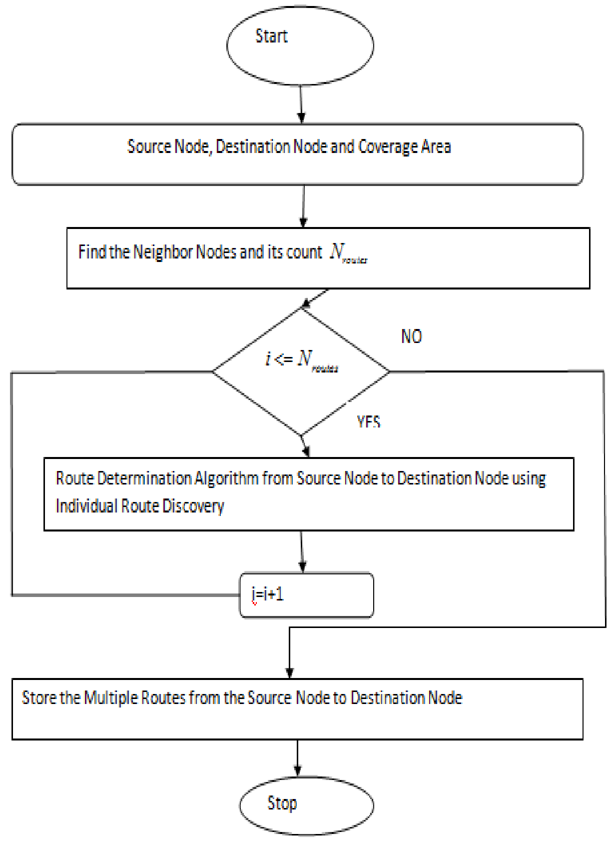

Figure 4: Multiple route discovery process

D. Individual Route Discovery Process

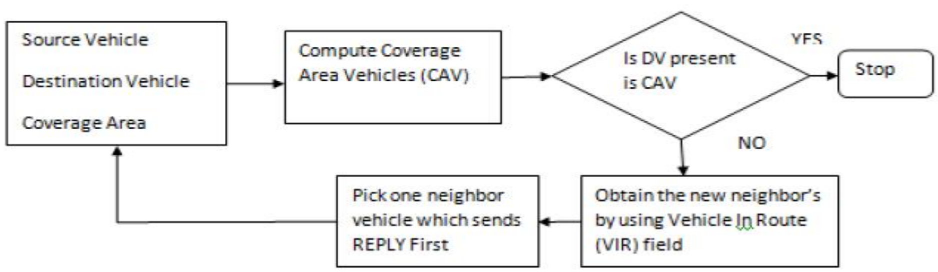

Figure 5: SPT algorithm flow chart.

F. Best Route Discovery Process

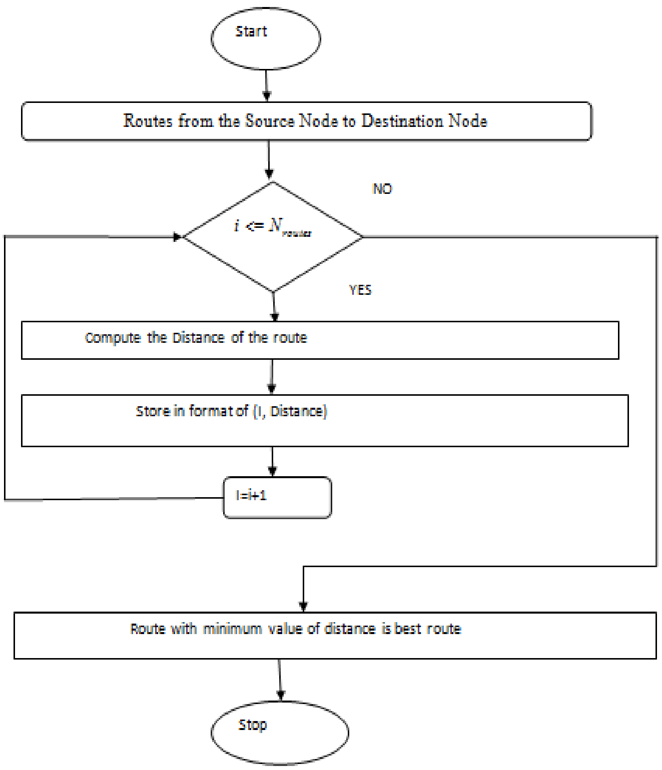

Figure 6: Best route discovery.

G. Minimum Spanning Tree

MST algorithm does not require VRT. MST algorithm main strength is based on the density of the vehicles. The next forward vehicle will be picked based on which neighbour vehicle has the maximum density.

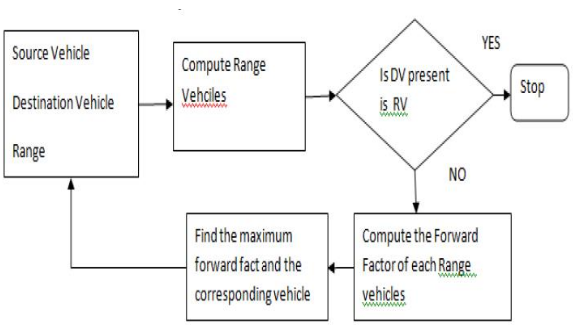

Figure 7: MST Algorithm flowchart.

H. FSS Routing Algorithm

FSSC Routing is an algorithm which is based on dividing the area surrounding to each vehicle based on an ellipse and then the vehicles are chosen which has the co-ordinates a,b . For each edge vehicle is chosen. This process is repeated until the Destination Vehicle is reached.

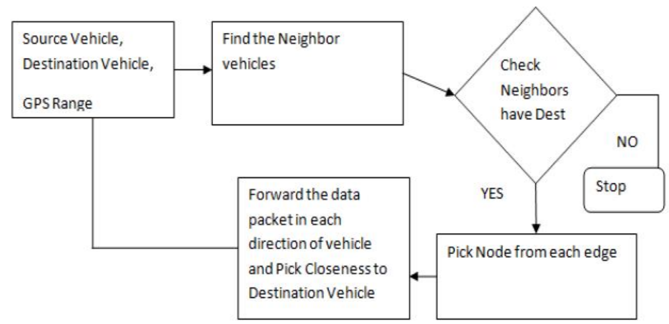

Figure 8: FSSS algorithm flowchart.

COMPARISON RESULTS

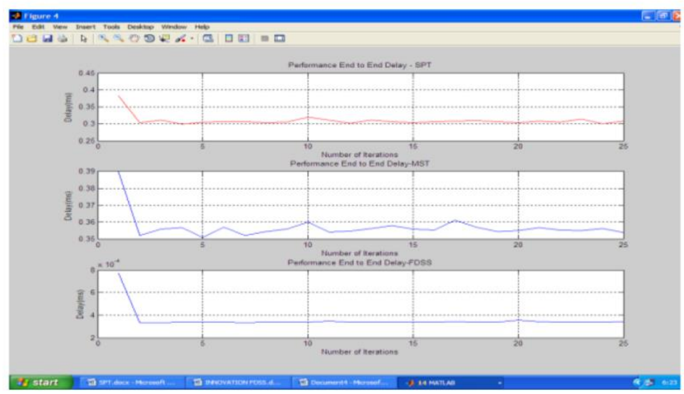

Figure 9: Comparison of Delay (ms).

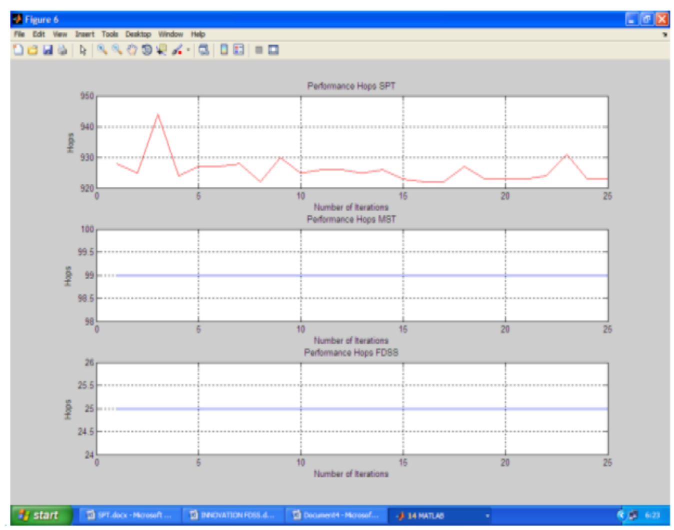

Figure 11: Comparison of Hops.

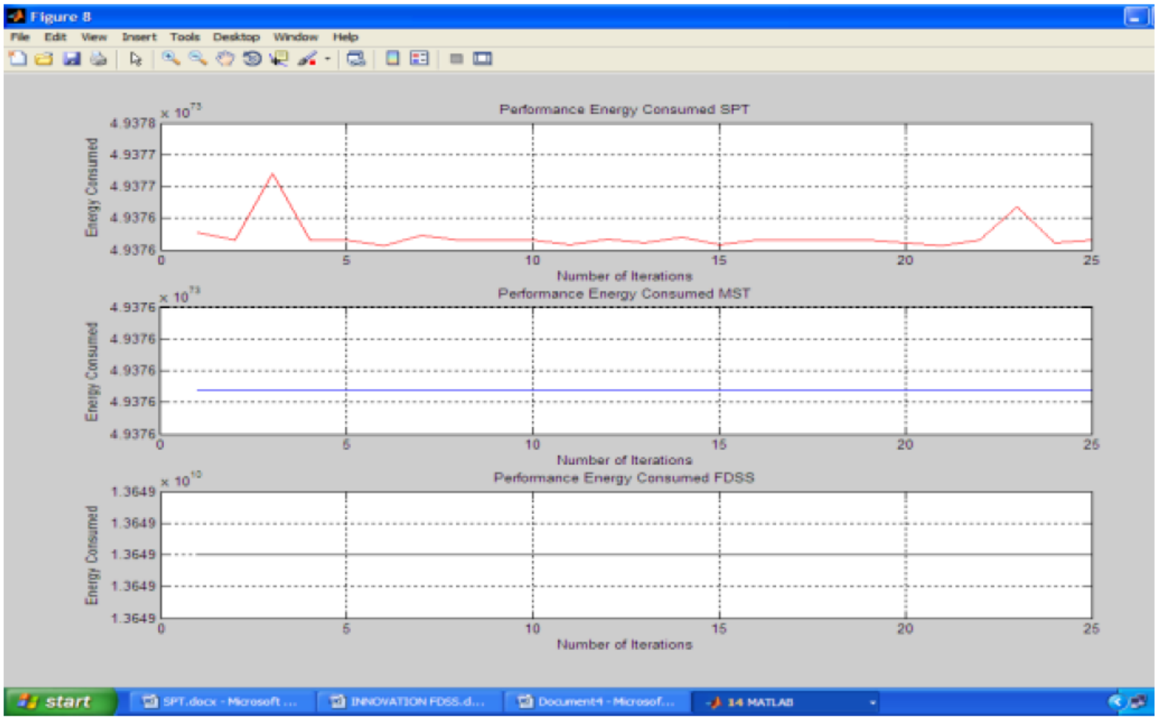

Figure 12: Comparison of Energy consumed.

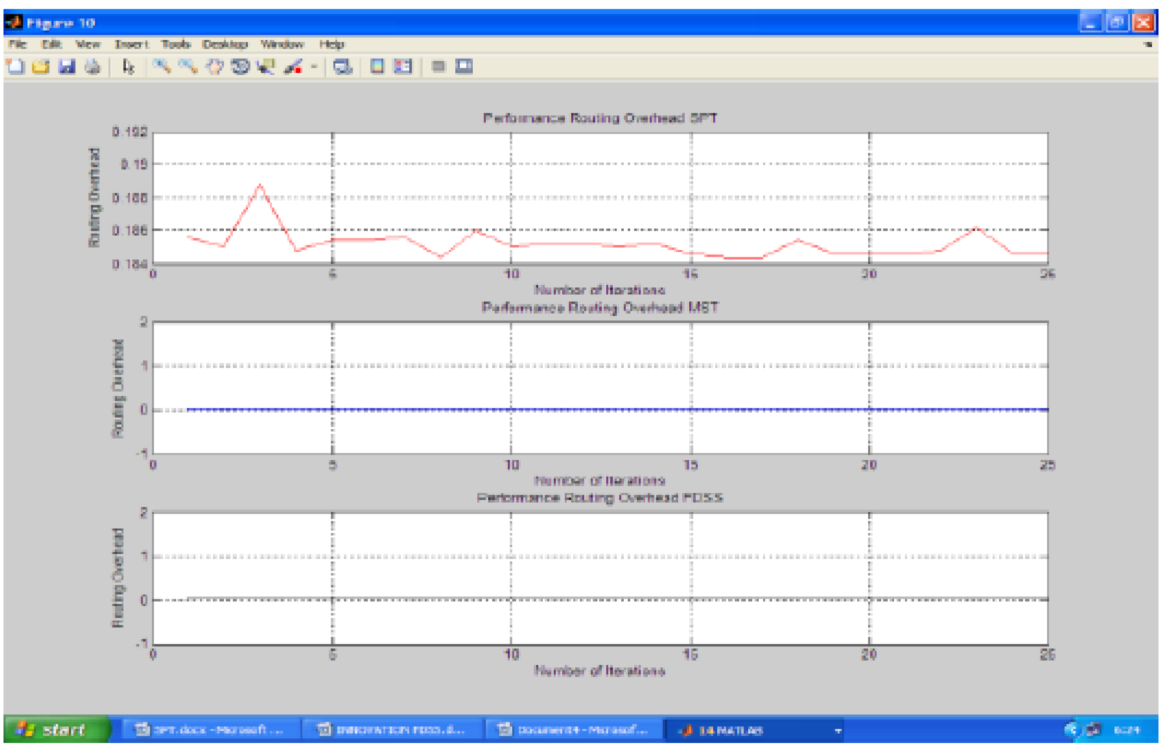

Figure 13: Comparison of Routing overhead.

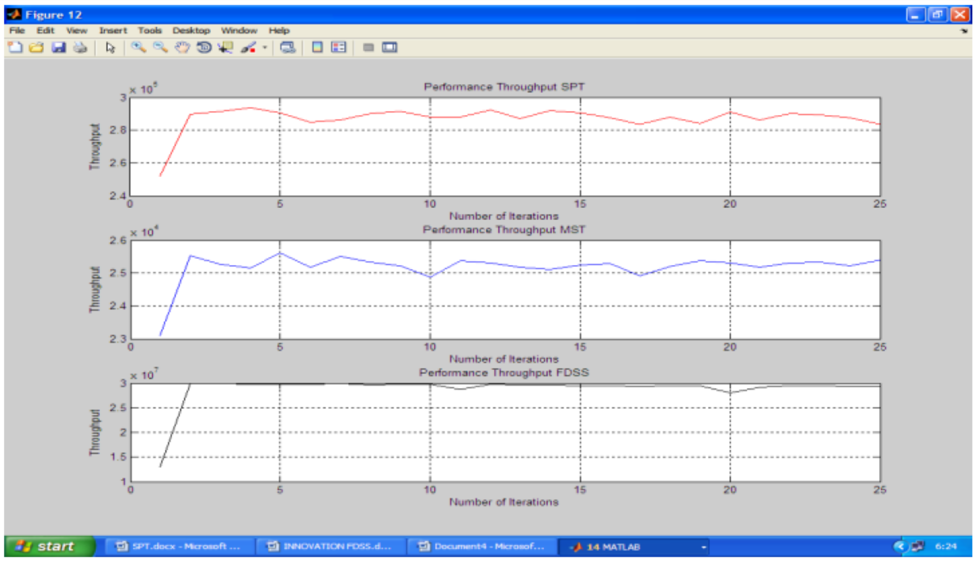

Figure 14: Comparison of Throughput

VIII. CONCLUSION

There are three mechanisms or algorithms have been simulated for VANET's network for various densities of vehicles and each algorithm has its own way of establishing the path and sending the packets. SPT finds the GPS vehicles pick the vehicle which's sends reply first and has the lowest channel noise like this it repeats until destination is reached. Finally the route which has the lowest distance is chosen as the best route. In Proposed algorithm the forward node is chosen based on the farthest destination and shortest path is used. This is an on demand algorithm and chooses the route based on the approach of routing.

IX. FUTURE SCOPE

More accuracy can be obtained while sending packets to those nodes /vehicles which has more memory rather than sending to only nodes which are closer to destination. More routing protocols required for shortest path connection and for the quality of service analysis.

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