VANET: METROPOLITAN SCENARIO TRAFFIC HANDLING AND CONGESTION AVOIDANCE

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ABSTRACT

VANET is an exclusive category of wireless ad-hoc networks, which emerged as an exciting research and application area. In the recent decades, VANET gained a tremendous response in the field of research for building communications consistently between vehicles for simple navigation and better control over traffic by equipping the vehicles with embedded sensors, with processing and wireless communication capabilities. An increasing number of vehicles on the roads increase the traffic in the city which leads to jams (congestion), pollution and various other problems making traffic management a Herculean task. In this paper, we present the theory called "Even-Odd" program in VANET for the control of traffic, better communication between vehicles and their smooth transportation. Introduction of the VANET is presented in Section1, related work in section2, and proposed a system in section 3, and finally results in Section 4

Index Terms— RSU, VANET, Even-odd Program

I. INTRODUCTION

Several unique and unconventional design goals must be devised for VANETs to establish their financial growth. When assembled with WAVE (Wireless Access in Vehicular Environment), different types of wireless connections given over to vehicle to vehicle (V2V) and vehicle to infrastructure communication (V2I), an ad-hoc network can be characterized as an assortment of nodes forms a hostile network lacking infrastructure or central administration that usually creates a mobile communication [1]. VANET is one of the categories of mobile ad-hoc networks where automobiles (nodes) design a sophisticated interconnection and ease of vehicle end user. Vehicular ad-hoc networks (VANETs) assimilate new generation of wireless network and improve capacity in vehicles for finer navigation. It builds a powerful ad-hoc network amidst dynamic vehicles and Roadside units (RSU). VANETs use unique wireless network devices such as Bluetooth, WIFI 802.11 b/g, WiMax [2] for communication between vehicles and roadside units (RSU).

Although the characteristics of VANETs share similarities with that of MANETs, there are certain features that are unique to VANETs and are listed below:

1. ***Vast dynamic topology*:** Maximum velocity of vehicles, including with the convenience of choice of numerous paths assigns dynamic topology of VANETs.
2. ***Frequently interrupted network*:** The immense speed of the vehicles on one hand determines the dynamic topology whereas on another hand necessitates various specifications of roadside units, lack of which produces frequent disconnections.
3. ***Prediction and Dynamic Modeling***: The prediction of the vehicle, location is tough. This feature of dynamic modeling and prediction in VANETs depends on the availability of pre-advanced roadmap models. The speed of the vehicles is again a necessary for productive network design.
4. ***Delivery circumstances*:** we shift from mobility model to communication environment. As the mobility model consists of different features relaying on the road architecture, highways, or city environments, we need to take care of communicating situations.
5. ***Compressed Detention Constraints*:** At the time of any danger, transmission of messages on time is a penetrating issue. While handling specific situations, discussing only about huge data rates is not sufficient.
6. ***Intercommunication with on board units:*** Sensors can read data relevant to the acceleration of the vehicle direction and can connect to the data center.
7. odes in VANETs do not endure authority and storage conditions as in sensor networks; therefore enhancing duty series is not as significant as in sensor networks.

VANETs primarily provide information similar to traffic management, protection of vehicles from accidents and other key data relevant to roadway locations. Therefore, this interconnection requires infrastructure, every vehicle is assembled with a VANET device,i.e. An On Board Unit (OBU) for gathering and broadcasting the communication in wireless networks. For establishing a robust, stable, safe and powerful system for stimulating the vehicle, we insinuate Intelligent Transportation Systems (ITS). ITS abides VANET as a pivotal part which consist of Vehicle to Vehicle Communication (V2V), Vehicle to infrastructure communication (V2I) and Inter Vehicle Communication (IVC) [3].

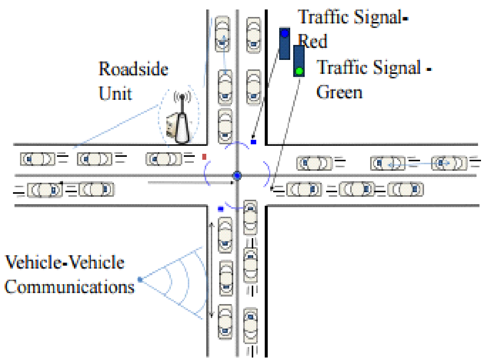

Figure 1: ***Block diagram of VANET***

VANET essentially comprises of 3 entities [5]:

- ***Road Side Unit* (RSU):** RSU is used for supervising and producing advantageous data for running vehicles. Mainly the correspondence among the vehicles and Roadside units (RSU) is a multi-hop or single hop transmission.
- ***Conveyance:*** In VANETs vehicles is treated as nodes. Vehicles communicate wirelessly with other transportation and the road side units for data transmission and collection.
- ***Communication Medium*:** In VANETs for communication among entities we use Radio Frequency (RF) waves.

Applications of VANETs:

- Traffic management.
- Convenient and Easy to travel on the road.
- Pollution ascendancy.

II. RELATED WORK

In Presented System, according to the real world synopsis there is no perception of VANETs. Entire vehicles on the road simply come from a firm path without communication between vehicles, i.e., V2V or with the RSU [4].

The proposed approach completely depends on driver efficiency to handle the situation and overcome any impediments for a smooth transition. In the existing system, the traffic in highly populated areas is managed through "Traffic Light Signal System". With the usage of Traffic Light Signal System, every vehicle follows a traffic signal color of light setup.

This Traffic Signal System is arranged at every junction. The Traffic signal System contains three colors of light those are red, green, yellow namely, to indicate different signal modes.

The red signal hints that the vehicles should wait for a moment. The green signal indicates that the vehicle can commence its action while the yellow signal indicates that the vehicle should slow down its acceleration and is pursued by a red signal.

The signal period is displayed in traffic light set up which is manually controlled by a supervisor. The signal system on roads with heavy traffic has limited display time.

In existing method, every vehicle without intercommunicating with each other follows the same route for navigation; due to inadequacy of communication between vehicles that route will contain more traffic. This method results more complications in traffic handling. The problem with current System is that on any road with huge traffic, if any hazard occurs, the medical facilities can't reach the site immediately as other vehicles would be unaware of it due to lack of communication between them.

In the Existing system, it is typical to restrict and monitor the vehicles with higher frequency. Due to rise in vehicle speed, there is an expeditious growth of noise pollution, air pollution, fuel utilization and time needed to communicate from one area other area [6]. To defeat all these problems, we introduce a system based on Even-odd Program in VANET.

In the proposed work, firstly, there is a computation at RSU on whether that particular day is an even day or odd day. Once the message obtained, it will be saved at RSU. Now, if the vehicle arrives within the range of a Road Side Unit (RSU) then the vehicles send a request message for finding out which category of vehicles moving in that particular route, i.e., vehicles with odd numbered license plate or even numbered license plate. RSU will respond by forwarding message to the vehicles with odd numbered license plate are permitted if it is odd day and vice- versa to the on-board unit which is facilitated in vehicles.

III. PROPOSED SYSTEM

In the Proposed System, our goal is to develop traffic handling by using "even-odd mechanism" [7]. The Even-Odd mechanism decreases the vehicle frequency on road corresponding to the appropriate date. If it is an odd date, at that time only the vehicles bearing odd numbers on their license plate will be granted to move into the city, when it is an even date, then only vehicles bearing even number on their license plate will be valid to travel in the city [8][9].

The vehicle which is traveling with an even numbered license plate on the odd date, the RSU sends a reroute message to the vehicle that it must use odd numbered license plate because it is odd day and vice-versa. Since every vehicle is equipped with an onboard unit (OBU) which is used to relay communication between OBU and RSU as well as with other vehicles. The on board unit is a combination of both transmitters and the receiver.

Figure 2: Even-Odd mechanism

Fig 3: Congested Existing System

Now RSU transmits message to all approaching vehicles. The vehicle which travels out of RSU range will convey message using vehicle to vehicle communication. RSU acts as an auditor to all the vehicles that are approaching it. If any even numbered vehicle approaches on an odd day, then the RSU will informs to that vehicle to route again itself back to where it comes from. In proposed work, we have considered only conventional vehicles, i.e., we do not include VIP vehicles, ambulances, and Police vehicles.

In our proposed method, we can monitor easily and reducing the traffic on a particular day. Due to decrease in vehicle density, there will be a reduction in air pollution, noise pollution, etc.

In metropolitan cities like Delhi, by using even-odd mechanism the levels of environmental pollution caused by vehicles decreased by 2%. In addition to, even-odd program helps in reducing the consumption of fuel in a specified area in a month. Moreover, the traveling time for reaching from one place to another place reduces by decreasing vehicle traffic as well as increasing the vehicle speed. The flow of the proposed system is shown in figure 5. The step by step process of the proposed system is as follows:

Step 1: In this step, finding present date from system Clock. And, we should find the vehicle number of each vehicle.

Step2: It checks whether the date is odd or even. It is estimated as an even day if it is divisible by 2. Otherwise, it is an odd day.

Step3: When the computed date is an odd day, then 2 possibilities will occur:

1. If a vehicle with odd numbered license plate tries to pass, the vehicle is allowed to reach its destination.

2. If the license plate is bearing even, then the vehicle is routed back to its original place.

Step 4: When the estimated date is an even day, then two conditions will arise:

1. If it is an even day, the vehicle that is having even numbered license plate tries to pass, and then only we can allow that vehicle to its destination.

2. If the vehicle has odd numbered license plate, it is rerouted to its earlier position.

Step 5: Recap Step 3 and Step 4 until there is no vehicle left to observe.

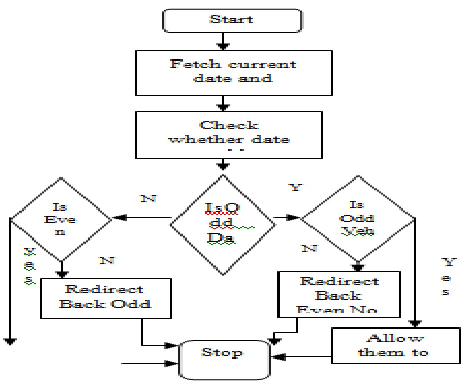

Figure 4: The following flow chart shows the Proposed System

IV. RESULTS AND ANALYSIS

We establish a network simulator by accommodating the positions of RSU, vehicle(s) and the position of all other vehicles used in proposed system. The information regarding to the vehicle and the present day is saved in RSU and every vehicle is assigned with a unique number for identification.

Parameter	Value
Routing Protocol	AODV, DSDV
Simulation time	T time(ms)
Number of Nodes	N nodes
Channel type	Wireless
Topography Dimension	N*M sq.m
Queue Length	50
Velocity	50 m/s
MAC protocol	IEEE 802.11

Before beginning the simulation, we consider the parameter for Simulation Configuration as shown in the previous table. After Simulation Configuring, we consider some parameters for performance analysis.

***Packet Delivery Ratio*:**

It can be defined as the proportion of the number of packets received and number of packets sent.

PDR=Number of packets received /Number of packets sent

***End to End Delay*:**

The time difference between the packets which arrived at the destination time and the time at which the packet was sent is termed as end to end delay.

Delay=£ (arrive time-sent time)/£ (number of Connection)

Lesser the amount of delay better is the simulation.

Throughput:

It is characterized as the amount of data is delivered from one node to another node in unit time. If the throughput is more than the proposed system then there will be less channel collision.

Here, we compare our Proposed System by using two different protocols.

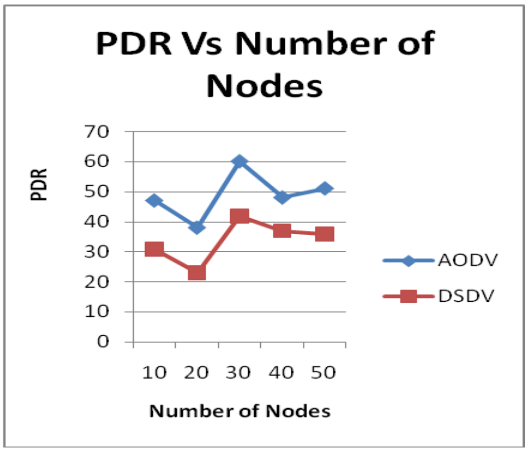

Figure 6: PDR analysis

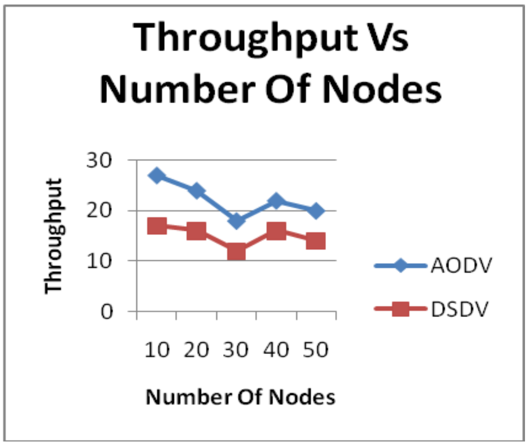

Figure 7: End to end delay analysis

Here are some other parameters, which got better after subsequent use of our proposed system [10] [11].

Parameter	Before Value	After Value
Air Pollution (PM 2.5)	**420**	**134**
Noise pollution	**51.8 db**	**36.4 db**
Vehicle Density	**68 %**	**46%**
Fuel Consumption Decrease %	**20-40 %**	**40-55%**

V. Conclusion and Future Work

In this paper, the main objective is to find shortest path to reach destination vehicle efficiently. In this paper we apply AODV protocol which is ascendant of DSDV, this AODV protocol is used for discovering shortest route and maintain active routing. So, in our proposed system we use both AODV and DSDV protocols and AODV is more suitable for sending message to destination vehicle with minimal delivery delay than DSDV. Finally, we conclude that Even-Odd mechanism is preferred for administrating and controlling congestion in metropolitan scenario. The main goal of our mechanism is that we allow only odd numbered licensed vehicles to travel on odd day in odd number bearing routes and even numbered licensed vehicles on even number bearing routes on even day.

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