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# Adaptive Traffic Management with VANET in V to I Communication Using Greedy Forwarding Algorithm

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**Abstract** : Vehicular ad hoc networks (VANETs) are used to collect and cumulative real-time speed and position information on individual vehicles to optimize signal control at traffic intersections. VANET can be used to group vehicles into almost equal-sized platoons, which can then be scheduled using OJF. Greedy forwarding algorithm is projected to use in the traffic management as it offer the better transfer. Vehicle to infrastructure method is used to handover the message from the platoon to the vehicle thus growths the safety. The road block data is transfer from platoon to V to I and from one V to I it is transfer to another.

Greedy Forwarding algorithm is used to forwarded message to the neighboring node which is "closest" to the destination. In this paper Greedy Forwarding is used to increase the delivery rate and throughput. This algorithm is also used to reduce the load traffic. Greedy algorithm has computationally efficient and can find the error in early stage. Under heavy vehicular traffic load, the greedy algorithm performs the same as the platooning algorithm but still produces low delays, and high throughput.

**Keywords:** VANET (Vehicular ad hoc networks), Greedy algorithm, V to I, I to V.

## I. Introduction

Adaptive Traffic Systems provide traffic signal timing that efficiently changes based on traffic conditions and maximize the traffic flow. Traffic Adaptive Systems are different from Traffic Responsive Systems because they do not rely on previously determined traffic timing thresholds. Traffic Adaptive Systems typically have detectors that gather traffic information and use of algorithms to logically adjust the signal timing based upon the current traffic demand. Adaptive traffic system is used to increase the traffic flow, Faster Responses to Traffic Conditions, Cutting Costs, and Customer Satisfaction. Adaptive traffic control system is implemented by using the roadside sensors, such as loop detector and traffic monitoring cameras. Loop detectors are used to detect can the presence or absence of vehicles. These loop detectors are physically connected to the traffic signal controller and this connection is used to communicate the information gathered from the loop detectors to the traffic signal controller. The traffic signal controller then uses the data to schedule traffic through this information assigning the appropriate amounts of GREEN time or skipping phases altogether.

In this paper I examine the possibility vehicle to infrastructure and vehicle to vehicle data transfer efficiency in real time. V2I communications apply to all vehicle types and all roads, and transform infrastructure equipment into

“smart infrastructure” through the incorporation of algorithms that use data exchanged between vehicles and infrastructure elements to perform calculations that recognize high-risk situations in advance, resulting in driver alerts and warnings through specific counter measures. In this V2I the information is transfer from the vehicle of car to the infrastructure of signal controller. Greedy algorithm is used in traffic controller this will transfer the information to the most nearest node in faster rate. Vehicle-to-Infrastructure (V2I) Communications for Safety is the wireless exchange of critical safety and operational data between vehicles and roadway infrastructure, intended primarily to avoid motor vehicle crashes.V2V is used to transfer the information from one vehicle to another vehicle through the sensor. This is used reduce the traffic accident by the information send from the vehicle.V2V communications enables a vehicle to sense threats and hazards with a 360 degree awareness of the position of other vehicles and the threat or hazard they present calculate risk issue driver advisories or warnings or take pre-emptive actions to avoid and mitigate crashes.

**A.VANET**

A VANET turns every participating car into a wireless router or node, allowing cars approximately 100 to 300 meters of each other to connect and this will create a network with a wide range. As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a mobile Internet is created. Vehicular ad hoc networks are used to implement t implement the dedicated short-range communications (DSRC) which is a type of Wi-Fi.

There are many challenges that need to be addressed when creating a vehicular ad hoc network. One of the challenges facing ad hoc networks is the topology of the network changes rapidly. Vehicles in a VANET have a high degree of mobility. The time needed to send the information between two vehicles in direct to each other is approximately one minute. Another obstacle restricting the wide spread adoption of ad hoc networks is many of the protocols used for 802.11 are centralized and new distributed algorithms must be developed. Many of the algorithms that were acceptable for 802.11 relied on the fact that there was a centralized controller, the AP. The 802.11 standard provides a limited ad hoc mode with the independent basic service set (IBSS) configuration, but it is not sufficient for vehicular ad hoc networks. Furthermore, wireless communication is unreliable. The error rate in wireless networks is much higher than on an Ethernet. All of these issues make implementing a VANET difficult. VANETs are one of the type of MANETs. In the VANET the communication nodes are always vehicles.

In VANETs, vehicles can communicate each other by V2V OR V2I. This V2I communication is done from vehicle to the roadside unit and to get some service. This communication is needed to attain the safety. In any causes If this information is corrupted, vehicles may lead to unnecessary or erroneous warnings to their drivers, and then finally results of control decisions depend on this information could be even more disastrous.

B. **VANET Application**

VANET application requires a certain degree of confiability and accuracy in the computed positions and/or in the distance estimation between vehicles. Applications in this group are usually Cooperative Driving applications, where vehicles in a VANET exchange messages between them to drive and share the available space on the road cooperatively. In these applications, the vehicles can assume partial control over driving. In most cases, localization errors from 1 to 5 meters are acceptable. speed and position information is transfer to the traffic signal controller using VANET.

Speed of the vehicle is determined by using the speed sensor in the vehicle. Such accurate per vehicle speed and location information can enable further capabilities such as being able to expect the time instance when vehicles will reach the stop line of the intersection. This is in comparison with roadside sensors such as loop detectors that can only detect the presence or absence of vehicles and, at best estimate, the size of vehicle queues. Furthermore, it is cheaper to equip vehicles with wireless devices than to install roadside equipment.

VANET applications can be divided into two major categories. Applications that increase vehicle safety on the roads are called safety applications. Applications that provide value added services, for example, entertainment, are called user applications. Safety applications can decrease significantly the number of road accidents. These accidents could be avoided if a driver were provided with a warning half a second before the moment of collision. There are three major scenarios in which safety applications could be very useful.

• Accidents: Vehicles travel at a high speed on major roads. This gives drivers very little time to react to the vehicle in front of them. If an accident occurs, the approaching vehicles often crash before they can come to a stop. Safety applications could be used to warn cars of an accident that occurred further along the road, thus preventing a pile-up from occurring. A safety application also could be used to provide drivers with early warnings and prevent an accident from happening in the first place.

• Intersections: Driving near and through intersections is one of the most complex challenges that drivers face because two or more traffic flows intersect, and the possibility of collision is high. The number of accidents would decrease if a safety application warned the driver of an impending collision.

• Road Congestion: Safety applications also could be used to provide drivers with the best routes to their destinations. This would decrease congestion on the road and maintain a smooth flow of traffic, thus increasing the capacity of the roads and preventing traffic jams. It also could have the indirect effect of reducing traffic accidents because drivers would be less frustrated and more inclined to follow traffic regulations.

## II. Network Simulator-2

NS-2 supports several algorithms in routing and queuing. Routing algorithm has two different parts such as LAN routing and broadcasts. Queuing algorithm includes queuing, round robin and FIFO. This queuing algorithm has many advantage like it uses useful tools, supports multiple protocols, detailing the network traffic. NS-2 uses the mobile nodes based on the X-coordinates. The information are send within this circles with particular threshold the data above this circle will not be considered. All THE NODES WITHIN this node are considered. Each node has particular gain and performance level by about 4 to 20 times, based on the size of the topology. For large topology and large nodes larger the performance will be get.

NS-2 is accessible on numerous platforms such as FreeBSD, Linux, SunOS and Solaris. NS-2 also builds and runs under Windows with Cygwin. Simple scenarios should run on any realistic machine; however, very large scenarios benefit from large amounts of memory and fast CPU's. NS-2, implementing languages NS-2 is basically printed in C++, with an OTcl (Object Tool Command Language) judge as a front-end. It supports a class chain of command in C++, called compiled hierarchy and a alike one within the OTcl interpreter, called judge hierarchy. Some objects are completely implemented in C++, some others in OTcl and some are implemented in both. For them, there is a one-to-one correspondence between classes of the two hierarchies. The simulator can be viewed as doing 2 different things. While on one hand detailed simulations of protocols are required and also need to be able to vary the parameters or configurations and quickly explore the changing scenarios.

For the first case need is a system programming language like C++ that effectively handles bytes, packet headers and implements algorithms efficiently. But for the second case iteration time is more important than the run-time of the part of task. A scripting language like Tcl accomplishes this

## III. Adaptive Traffic Control Scheduling Using Greedy Forwarding

Here, I propose a method to reduce traffic signal control problem to the problem of scheduling jobs on processors, and I propose an algorithm called the greedy forwarding algorithm to transfer the data faster. Fig. 1 shows a typical four-leg intersection with eight traffic movements numbered 1–8. Traffic movements 1 and 2 cannot simultaneously occur. The problem of traffic signal control is reduced by scheduling of jobs on a processor, where a job is a platoon of one or more vehicles.

In this paper single traffic intersection under considered. It is a typical four-leg intersection with eight traffic movement groups represented by the arrows. Each of the legs of the intersection is $L$ meters long, and each of the left turning bays is $B$ meters long. The numbered arrows show the directions of the various traffic movements. For this type of traffic intersection, describe the system architecture of the VANET-based traffic signal controller. In the single traffic intersection scenario, the traffic signal controller is connected to a wireless receiver that is placed at the intersection. The wireless receiver listens to information being broadcast from the vehicles.

The broadcast medium is the 5.9–5.95-GHz radio spectrum, and the communication standards are defined in the IEEE 802.11p standards. The information consists of speed and position data collected from vehicles. Speed data can be gathered from the vehicle speedometers, and position data can be gathered using GPS receivers fitted to the vehicles. In our implementation, the following data are gathered and encapsulated in data packets that are broadcast over the wireless medium. This is what call the data dissemination phase.

The jobs are subdivided into equal size. Within 100m all the node of the vehicle are called platoon. Nodes are subdivided into equal size platoon. Each jobs are scheduled under oldest job first algorithm basis. Vehicle to infrastructure is done by transferring the data from the car to the signal controller using the transmitter. Car is detected by using the sensor.

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During accident Vehicle to vehicle communication is done by transmitting the data from the car to the roadside sensor platoon and from the platoon the information is passed to another vehicle. This second vehicle will check the information with the platoon. By this checking the fault information is detected. For scheduling in the traffic signal Greedy forwarding is used. This Greedy forwarding algorithm is used to increase the data rate, throughput and decrease the load.

This simulation is done by using NS-2 simulator. NS-2 is an open-source simulation tool operation on Unix-like operating systems.

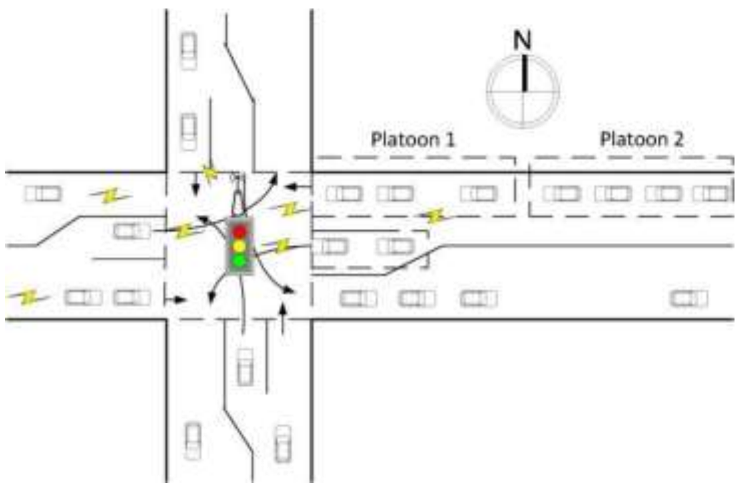


Fig. 1. VANET-based traffic signal control architecture.

It is a discreet event simulator targeted at networking research and provides important support for simulation of routing, multicast protocols and IP protocols, such as UDP, TCP, RTP and SRM over wired, wireless and satellite networks. It has many advantages that make it a useful tool, such as support for multiple protocols and the capability of graphically detailing network traffic.

• Vehicle ID: Every vehicle is uniquely identified by its Vehicle ID#. In our traffic simulator NS-2, every vehicle is identified by a unique unsigned integer. MAC also used for the same reason

• Location: In NS-2, the location of each vehicle is specified by the LINK NUMBER#, Lane#, and position from a point of reference. The position from a point of reference is a subfield containing (x, y), which are floating point quantities. We chose to use the stop line as a point of reference; therefore, the stop line has position (0, 0) for each Link Number# and Lane#. Thus, collectively, these three fields describe vehicle location.

•Speed: Speed of each vehicle is determined by using speedometer sensor. This sensor is already presented in each vehicle.

In practice, it is assumed that each vehicle is equipped with a GPS receiver; therefore, vehicles always know their locations. By this the information is transmitted easily.

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IV SIMULATED RESULTS AND DISCUSSION

The performance of Greedy algorithm is compared with the OAF algorithm and optimizing the time, data rate, throughput, load. Based on the information the GREEN signal is automatically adjusted. When there will be a heavy traffic load then the green light is adjusted to increase the timing. When there is no traffic then the green light timing is adjusted to minimize.

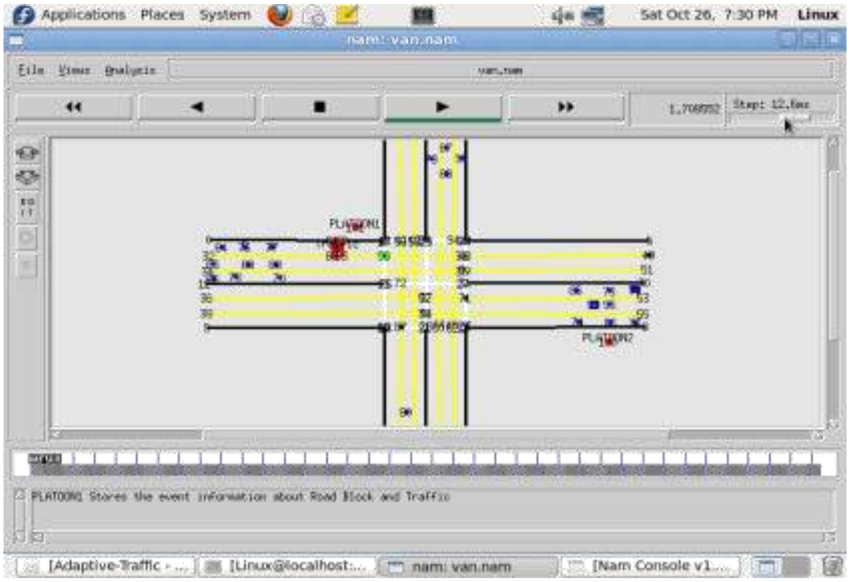


Fig. 2.Simulation result for V to I when signal is in GREEN

The green signal is ON so the vehicle starts to move. The RED color near the platoon 1 indicates that some accident is held in that particular place. The platoon 1 stores the road blocks and traffic information which is shown in this simulation

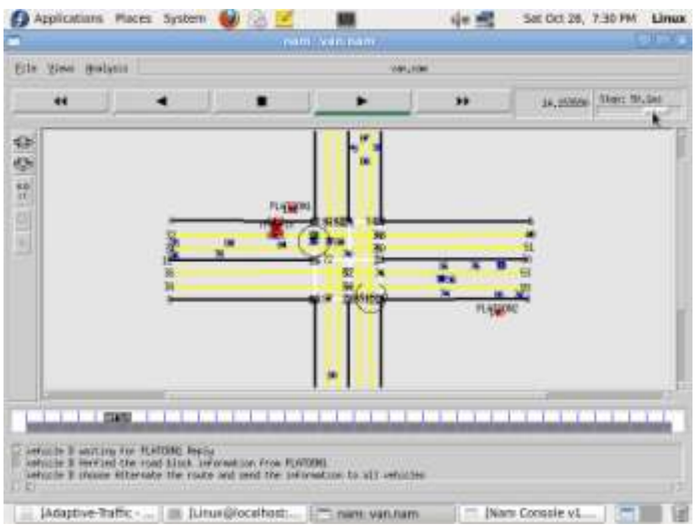


Fig. 3.Simulation result for V to V

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The information of accident is send from platoon 1 to A vehicle. From vehicle A the information is send to B. B verify the road block information from platoon 1 and Waiting for platoon 1 reply. B verified the road block information from platoon 1. B choose alternative route and send the information to all vehicle.

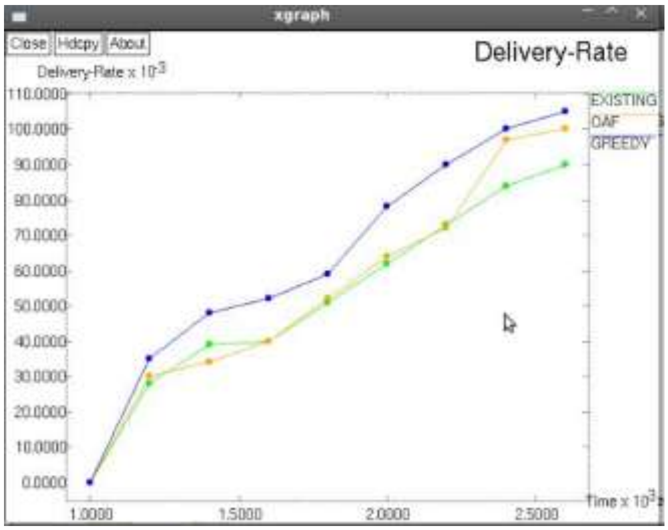


Fig. 4. Comparison of delivery rate output

In this simulation graph greedy algorithm has high Delivery rate when compared to the existing and OAF algorithm. The load which indicates here is the traffic density. Existing method used is platooning algorithm

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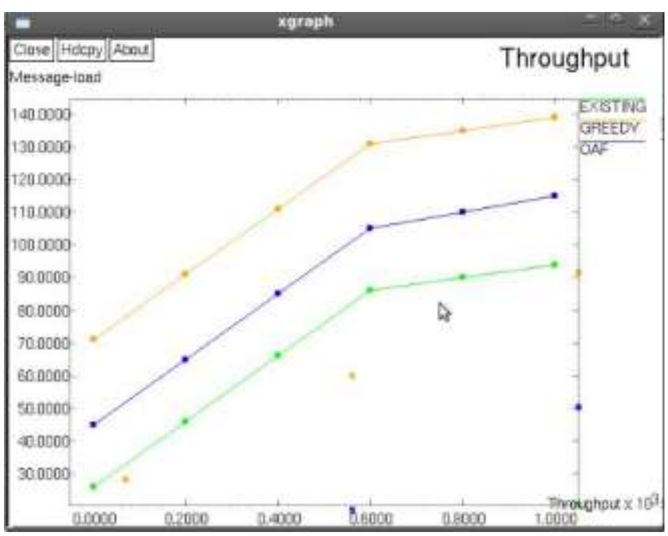


Fig. 5. Comparison of Throughput output

In this simulation graph greedy algorithm has high throughput when compared to the existing and OAF algorithm. The load which indicates here is the traffic density. Existing method used is platooning algorithm.

This simulation is done in NS-2 simulator using C++ coding and OTCL (object tool control language).

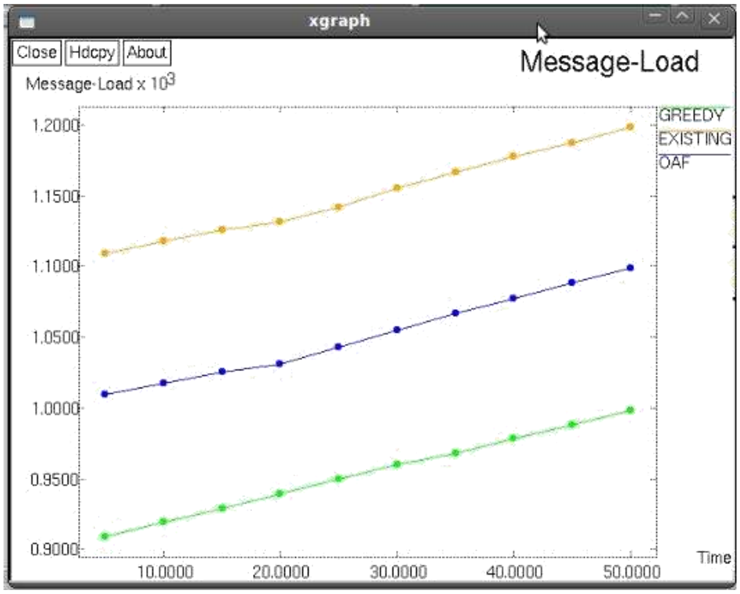


Figure 6: Comparison of Load graph output

In this simulation graph greedy algorithm has low load when compared to the existing and OAF algorithm. The load which indicates here is the traffic density. Existing method used is platooning algorithm.

## V. **Conclusion**

Adaptive traffic management with VANET using Greedy algorithm in V to I is used to increase the throughput, data rate and reduce the load when compared to the platooning algorithm. This greedy forwarding is used to increase the routine in end to end communication. In this OJF algorithm is used to schedule the vehicle. This OJF algorithm is also used to reduce the delay. Experimental results show that the Greedy forwarding algorithm reduces the delays experienced by the vehicles as they pass through the intersection, as compared with the Platooning algorithm methods under light and medium vehicular traffic loads. Damages on the road can also be send from the platoon to vehicle this increase the safety.

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