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Adaptive Traffic Signal Control with VANET

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Abstract: ***A Vehicular Ad-Hoc Network or VANET is a technology used to collect and aggregate real-time speed and position information on individual vehicles to optimize signal control at traffic intersections. Today VANET used mainly for the purpose for the public safety , the comfort , Travelers Information ,Traffic Management, Traffic coordination and Assistance etc. Today's many of the things get controlled automatically. Everything is getting controlled using the mechanical or the automated systems. In every field machines are doing the human works. But still some area is controlled manually. For example traffic controls, road control, parking controlling. Keeping these things in mind we are trying to develop the project to automate the traffic tracking for the square. To make any project more useful and acceptable by any organization we need to provide multiple features in a single project. Keeping these things in consideration proposed system is less with multiple methodologies which can be used in traffic control system.***

Keywords: Conflict Graph, Global Positioning System (GPS),Traffic Control signal, Vehicular Ad hoc Network (VANET)

1. Introduction

In this project, an intelligent and real-time adaptive traffic signal controller, this receives information from vehicles, such as the vehicle's position and speed, and then utilizes this information to optimize the traffic signal scheduling at the intersection for reducing the delay [1].

Traffic jamming is the big problem in metro cities, traffic jamming issue may be because of increase in number of vehicle drastically in last few year and most of the time traffic jammed occur at the traffic signal because of huge lane of vehicle on the road or we can say traffic is not properly flow at right time so number of vehicle will be waited for long time in lane, for overcome this problem. we can used the approach of Adaptive traffic control with VANET. Density, speed, and flow are the three critical parameters for traffic analysis.

In practice, point sensors such as inductive loop detectors are popularly used for traffic detection; they can continuously count the number of vehicles in the traffic stream in real time at fixed sensor locations; that is, they provide practical information continuous in time but discontinuous in space [6].

The proposed method derives from the definition of density, and counting vehicle numbers within specific segments correctly is the key for this method. With the development of vehicle telemetric and other intelligent transportation system (ITS) technologies, such as the Global Positioning System (GPS) and IntelliDrive, information from a vehicle itself could be a potentially valuable source to compensate for the deficiencies of point sensors[3][7].

The possibility of deploying an intelligent and real-time adaptive traffic signal controller, which receives information from vehicles, such as the vehicle's position and speed, and then utilizes this information to optimize the traffic signal scheduling at the intersection [1]. This approach is enabled by onboard sensors in vehicles and standard wireless communication protocols specifically for vehicular applications. For example, all vehicles are already equipped with a speed sensor. In addition, new vehicles are increasingly being equipped with Global Positioning System (GPS) units that can provide location information with accuracy of a few meters [3]. Furthermore, vehicles can use wireless communications for vehicle-to vehicle (V2V) or vehicle-to infrastructure (V2I) communications, as described in the dedicated short-range communications/wireless access in vehicular environments standards operating in the spectral range of 5.85– 5.95 GHz [4].

2. Literature Review

An intelligent and real-time adaptive traffic signal controller, which receives information from vehicles, such as the vehicle's position and speed, and then utilizes this information to optimize the traffic signal scheduling at the intersection. is enabled by onboard sensors in vehicles and standard wireless communication protocols specifically for vehicular applications. For example, all vehicles are already equipped with a speed sensor. In addition, new vehicles are increasingly being equipped with Global Positioning System (GPS) units that can provide location information with accuracy of a few meters [1].

The density of vehicles within the cluster is computed using a clustering algorithm and sent to the traffic signal controls to set the timing cycle. an adaptive traffic signal control system based on car-to-car communication This system reduces the waiting time of the vehicles at the intersection along with the reduction in queue length. To realize this system, the concept of clustering is used for the vehicles approaching the intersection [2].

New vehicles are increasingly being equipped with Global Positioning System (GPS) units that can provide location information with accuracy of a few meters. Furthermore, vehicles can use wireless communications for vehicle-to-vehicle (V2V) or vehicle-to infrastructure (V2I) communications, There uses the Webster method for

calculate the density of vehicles [3]. The dedicated short-range communications/wireless access in vehicular environments standards operating in the spectral range of 5.85–5.95 GHz the transient mesh networks formed via V2V or V2I communication links as vehicular ad hoc networks [4].

The conflict graph for the four-leg intersection used for control the traffic signal. Conflict graphs have been studied by traffic engineers to build safe traffic signal control plans [5]. Current methods of implementing intelligent traffic signal control include roadside sensors, such as loop detectors and traffic monitoring cameras. Loop detectors can only detect the presence or absence of vehicles [6]. The adaptive urban traffic signal control (TSC) system became a development trend of intelligent transportation system (ITS). The investigated of the vision based surveillance and to keep sight of the unpredictable and hardly measurable disturbances may perturb the traffic flow, confirm the efficiency of our vision based adaptive TSC approach [7].

This paper presents an adaptive traffic signal control system using camera as an input sensor that providing real-time traffic data. Principal Component Analysis (PCA) is used to analyze and to classify object on video frame for detecting vehicles. Distributed Constraint Satisfaction Problem (DCSP) method determine the duration of each traffic signal, based on counted number of vehicles at each lane [8].

Optimization of adaptive traffic signal timing is one of the most complex problems in traffic control systems. This paper presents an adaptive transit signal priority (TSP) strategy that applies the parallel genetic algorithm (PGA) to optimize adaptive traffic signal control in the presence of TSP [9]. An image processing system to measure vehicular queues in approach lanes of an intersection. TV cameras of this system are installed at a height of 10 m or so at an intersection to take images of traffic inflows at a bird's-eye view. This system using a macroscopic detection method allows measurement of queue lengths up to 300 m long if the visibility is good the proposed method follows the optimal split even if the traffic inflow patterns change, and prevents increasing the delay [10].

The present paper introduces an adaptive method for responsive control that adjusts the stage durations according to traffic flows. The methodology used for this is approximate dynamic programming, which uses a state-dependent estimate of future optimized costs to assess decisions. Results are presented for example applications, showing favorable performance by comparison with other approaches [11].

SCOOT is the most widely implemented system. It comes from the UK with over 200 installations worldwide including the US. Average delay reductions of 20 percent have been shown in urban networks that employ adaptive signal control systems. SCOOT runs on the VMS operating system, CORSIM on Windows NT. In a completed loop, the optimized signal timing is then communicated from SCOOT to CORSIM, which implements the timing and updates the traffic simulation [12].

This paper presents a framework for real-time bus priority control system. This derived framework composes one control center and two modules, detection-communication module (DCM) and signal priority control module (PCM)[13]. The emergence of new technology called as intelligent traffic light controller, this makes the use of sensor n/w along with embedded technology. Where traffic light will be intelligently decided based on the total traffic on all adjacent roads. Thus optimization of traffic light switching increases road. Capacity, traffic flow and can prevent traffic congestions [14]. The adaptive sectorized systems have been adopted to increase the system capacity by balancing traffic in a cell. It is necessary to know exactly the traffic of each narrow beam for operating the adaptive sectorized system effectively. Interference, noise and so on. In this paper, we have proposed a simple and practical method to optimize the sector configurations using only 3-sector traffic data which are collected easily from the BSM (base station manager) [15].

3. Research methodology to be employed

3.1 Proposed Research

We propose Adaptive Traffic Control Signal with VANET for reducing the delay at the time of intersection on Traffic signal and traffic flow smoothly without congestion. the problem of traffic jam will be overcome. We also propose Priority Based Signaling. Priority gives to emergency vehicles like Brigade Vehicle, Ambulance or Police on pursuit.

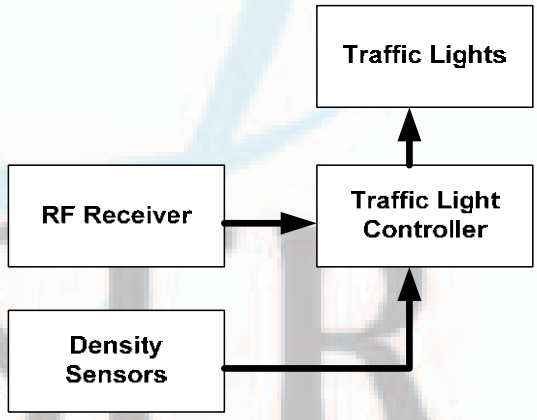

Figure 1: Block Diagram of Adaptive Traffic Signal with VANET

3. 2 Proposed Methodology

The proposed methodology runs into two modules:

3.2.1 Traffic Volume based signal timing

Here, we are developing a traffic signaling system which will decide the time interval by its own as per the traffic volume at road. The traffic volume will decide the exact time interval for every signal present at traffic signal. At peak time it will be greater and at less volume the time

interval may be little. This will lead to time saving approach and will control the habit to jump the traffic signal due to low traffic signal interval at low traffic volume [1].

3.2.2 Priority Based Signaling

Whenever an emergency vehicle like Fire Brigade Vehicle, Ambulance or Police on pursuit, the transmitter will transmit the RF signals to RF receiver fitted with the traffic poles, they will automatically turn green and rest of the signal stay RED. After passing of that vehicle, all the functionality of the traffic signal will be normal as per specified [9] [14].

Figure 2: Priority Based signaling

4. Proposed Plan of Work

Following two Algorithms are used in this approach.

4.1 Density Algorithm

This algorithm used to calculate the density of vehicle on the road and selection of appropriate time slots on the basis of density distribution on the mainline density is already high.

4.2 Scheduling Algorithm

The method is based on an adversary technique in which the adversary creates a sequence of job arrivals based on the behavior of Density. At the beginning of each time unit, the adversary can determine how many jobs arrive and on which vertices of the conflict graph.

5. Expected Outcome

We have developed a simulator that integrates a vehicular traffic simulator, in our simulation; the data aggregation module encapsulates the adaptive traffic signal control algorithms for the traffic lights. Simulation result has shown that the Traffic management is well smooth by using the VANET.

6. Conclusion

In this approach, show how a VANET can be used to aid in traffic signal control. We implemented adaptive traffic signal control algorithm that reduces the delays experienced by the vehicles as they pass through the intersection. This algorithm produces lower delays, compared with other method and the pre timed signal control method. This Approach used to reduces the Problem of traffic jams at the traffic signal. This is used to flow traffic smoothly without congestion. This is help to provided Emergency services at the critical condition like Fire Brigade Vehicle, Ambulance or Police on pursuit by using Priority Based Signaling.

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