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A Survey on Traffic Management Systems in VANET

[1]Er.Jagjodh Singh Bajwa, [2]Er.Lipsa Walia
[1]M.tech Scholar, Electronics and Communication Department, RBIEBT, Mohali
jagjodhsinghbajwa@gmail.com
[2]Assistant Professor, Electronics and Communication Department, RBIEBT, Mohali
Walia_lipsa@yahoo.co.in

Abstract: *The reason behind to choose this topic is to make awareness in everyone and also fruitful for future point of scope. As we know that the vehicle populace increases daily this leads towards the accidents. So to overcome this issue VANET has come with lot of ideas such as vehicular communication, traffic controlling, Navigation and other application in VANET. In this paper we are focusing on traffic signal control for ambulance, police force vehicle, and normal vehicles too. To overcome this we presented previous techniques like GA, PSO and ACO that manages vehicle mobility and shows the actual communication between vehicle to vehicle (V2V) and vehicle to infrastructure (V2I).*

Keywords: *Traffic Management system, ACO, GA, PSO, Prevention*.

I. Introduction

Vehicular Ad-Hoc Network (VANET) is a form of Mobile ad-hoc network, at primary was used to provide security and comfort for passengers, and at present being used to create committed little range roads among close by Vehicles (V2V Communications) and among vehicles and close to fixed transportation equipment's; Roadside equipment's (V2I Communications). VANET is also used to warn drivers for accidental possibilities, road sign alarms, automatic payment at road tolls and parks. Most of ITS (intelligent transportation Systems) applications use VANET [1]. The main objective of the VANET system is to communicate with the vehicles in the ad-hoc network but we have to look after its security so that no one can interfere to manipulate or do any kind of naughtiness with the data graceful in the system. The VANET ideally works in an integrated environment as exposed in Fig 1. [2].

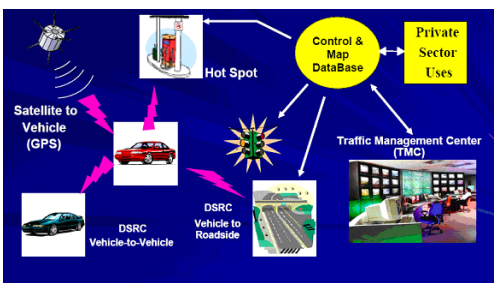

Fig.1. VANET Infrastructure

Fig 1. Illustrate the major VANET system. Naughtiness income from time to time as a effect of either planned spiteful behaviors or hardware failure. Base stations can be used to give authentication so that it can reject access and service requests from outsider [3]. In difference, naughtiness of suitable users of VANETs is more complicated and tricky to prevent, the cause being that insiders obtain the identifications issued by the authority to achieve authentication with peer vehicles or base stations that can be with no trouble tricked into trusting the insiders. Fortunately, certain techniques can be employed to detect such misbehavior and misbehaving users will be punished accordingly. For instance, misbehavior can be the spreading of false messages, anticipation of broadcast messages from reaching other vehicles, addition of extraneous messages, escaping from an accident, dreadful use of network resource exceeding the allowed bandwidth etc.

II. NECESSITY OF TRAFFIC MANAGEMENT SYSTEM

A vehicular ad hoc network (VANET) is a advance technology in which vehicle to vehicle and vehicle to roadside infrastructure wireless communication can be achieved [4]. In recent years, this is important to obtain road safety for vehicles and drivers and collision avoidance. That's why in this paper we propose a basic

warning advertisement system based on the use of 802.11p standard. The aim is to send vehicle safety message with high reliability and low delay.

III. PROBLEM OF TRAFFIC MANAGEMENT

India's vehicle population underwent the second-largest growth rate, up by 8.9% to 20.8 million components, compare with 19.1 million in 2009. The motor vehicle population in China has been increasing at more than 30% and at around 10% in India. However, this has recently dropped to negative growth in the first section of [5]. The normal journey velocity in Indian cities is low, particularly in cities which have high car volumes. In 2007, a learned commissioned for the Ministry of metropolitan Development, Government of India, found that the normal trip speed in Delhi was around 16 km/h and only slightly higher in Mumbai. The study found the average journey speed to be below 20 km/h in Hyderabad, Chennai and Bangalore, as well as low in cities with slow moving vehicles such as Varanasi and Bhubaneswar. Similarly, a survey conducted by CSIR-CRRI to see the commuting problems near mainstream school premises has found that the adjacent walls of these school premises are blocked with parked cars hence the train kids, teacher; other pedestrians using the pathways are compelled to come on the road to face heavy traffic, which in turn forces the bus commuters to wait on the road instead of waiting on the bus stop due to inconveniences and traffic chaos.

IV. LITERATURE REVIEW

In 2007, **Fussler, H**., discussed the history of vehicular ad-hoc networks and shows the early vision of creating a huge MANET that would facilitate cheap and ubiquitous communication on the ISM band, and how this vision was reduced to cross sending emergency information in a geographically limited area [6].

Leung, K. K., proposed the concept of node connectivity in vehicular ad-hoc networks. He pays attention on studying transport system with planned mobility. He provides a logical framework including the design requirements of the mobility model for realistic vehicular networks [7].

In 2013, **Pundit, K. and Ghosal, D**., planned to use vehicular ad hoc networks (VANET) to collect and aggregate real time speed and position information on individual vehicles to optimize signal control at traffic intersections. They give an online algorithm, referred to as the oldest job first algorithm, to reduce the delay across the intersection [8].

Sok-Ian sou gives brilliant idea about modelling Emergency messaging for car accident over Dichotomized headway model. This paper proposes an analytical model for evaluating the performance of emergency messaging via wireless CA systems. He utilizes the dichotomized advance model, the braking model, and Greenberg's logarithmic model to generate vehicular mobility traces for analysis [9].

In 2014, **Penna, K**., proposed evaluation of active position detection in vehicular Ad-hoc networks. The main involvement of their move toward by running an ns-2 simulation with dynamic number of nodes in various mobility scenarios. Their primary proposed algorithm replies on signal propagation time for verifying the location. And their next algorithm verifies the position information with the help of base station located in the coverage area of the vehicular networks [10].

Sivakumar, T. proposed a concept of stable routing protocol for vehicular ad-hoc network. In this document he mostly focuses on finding a reliable route between source and destination automobile in VANETs. A new uncast routing protocol is proposed to route the packets from source to destination vehicles in a reliable and stable path by introducing Reliability Index (RI) metric [11].

Tyagi, P. and Dembla, D. works on investigation the security threats in vehicular ad hoc networks (VANETs). This paper investigates the security aspects of VANET and the attacks. The study of security features and flaw is expected to lead to lead to developed broadcasting and direction-finding armed forces, adding collectively to the worth of examine. This manuscript examines a variety of security threats in VANET's, analyze how they are implemented and their impact on the VANET security design. A few gaps in the VANET security frame works have also been highlighted which can be worked upon in the future [12].

V. VANET APPLICATION IN TRAFFIC MANAGEMENT

VANET application requires a certain degree of confusability and accuracy in the computed positions and/or in the distance estimation in the middle of vehicle. Application in this group are typically Cooperative Driving application, where vehicle in a VANET replace messages between them to drive and share the available space on the road considerately. In these applications, the vehicles can assume partial control over driving. In most cases, local 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. Moreover, it is cheaper to equip vehicles with wireless devices than to install roadside equipment.

VANET applications can be divided into two major categories. Request that add to vehicle safety on the roads are called safety applications. Applications that offer value added services, for example, activity, are called user application. Security application can decrease considerably the number of road accidents. These accidents should 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 tiny time to react to the vehicle in front of them. If an accident occurs, the forthcoming vehicles often crash before they can come to an end. Safety applications should 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 risk of crash is high. The number of accidents would decrease if a safety application warned the driver of an imp ending 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 facility of the roads and preventing transfer jam. It also might have the meandering effect of reducing traffic accidents because drivers would be less frustrated and more inclined to follow traffic regulations.

VI. VANET AS A SOLUTION FOR INDIAN NON-LANE BASED ROADS A CASE STUDY OF DELHI TRAFFIC VOLUME

- India has non lane based roads. With low breadth of roads and high volume of traffic, traffic congestion becomes inevitable.
- Intelligent Transportation system will be implemented till 2020 in four metro city of India i.e. Delhi, Mumbai, Kolkata and Chennai.
- Wireless communication between two vehicles will lead one of them to find out if there's some stuff or not. It would also diminish the number of accidents on road as India has a notorious figure in road accidents.
- The road culture of Delhi is characterized by complexity and a high degree of heterogeneity.
- High numbers of motorized forms of transport include auto rickshaws, two-wheel vehicles and buses, and non-motorized forms including pedestrians, cyclists and cycle rickshaws.

VII. TRAFFIC CONTROL MANAGEMENT USING GA/PSO/ACO

A. Genetic Algorithm (GA)

A Genetic algorithm (or GA) is a search technique used in computing to find true or approximate solutions to optimization and search harms [13]. MATLAB inherited algorithm application interfaces are used to implement the algorithm. The Genetic algorithm is constrained with a fixed cycle length and green extension times (g) with the bounds.

g1 + g2 + g3 + g4 – 10; where (gi represents green additional time, i=1, 2, 3, 4)

G.T. = G_{min} + x (Green time allotted to the road).

The observation data from the emulator is sent to GA. They create a set of green time extensions, which will minimize the fitness function, at the same time satisfying the constraints. The Figure 2 illustrates the process schematically as follows:

(1) An emulator is developed which shows dynamic conditions of traffic on an isolated four-way intersection. Code for surveillance is written which gives the total number of cars on each road in the intersection.

(2) After each predefined surveillance interval, genetic algorithm is executed with the input as total number of cars on each road as determined by S.

(3) The Genetic algorithm (GA) executed as to obtain the best possible result. The steps of algorithm are as follows:

(i) Generate the random population (i.e. green time extension) which is selected by a random function within the specified range (0-5).

(ii) Evaluate used strength function. The strength purpose (ff) is to be minimize (i.e. it gives small values for improved generation).

(iii) Check, if termination criteria is fulfilled (i.e. either the predefined maximum number of generation have reached or fitness function is not satisfied, the performance is tested with both 100 and 6 generation. A small improvement in case of 100 generation is observed but to increase the speed of algorithm, minimum of 6 generations have used).

(iv) If the termination criteria are not satisfied; selection is performed from the given population to obtain fitter parents, which can lead to fitter sons.

(v) These parents, thus selected are mated to produce fitter children and this phenomenon is called crossover or recombination.

(vi) Some mutation is perform (i.e. a little bits of brood are changed from the above result). This emulates the genuine life as children may have some traits different but the chances are generally kept very low.

(vii) After mutation we have a new set of generation, now go to step (ii).

(viii) If the termination criteria in step (iii) are satisfied, get the solution (i.e. the current generation).

(4) The result is received from GA is the green extension times for all the four roads. These extension times are added with predefined fixed green times and applied to the emulator.

B. Ant Colony Optimization (ACO)

Swarm intelligence is a branch of intelligent system, deals with the artificial and natural environment in which group of living being interact locally with each other to perform any task without the control of central agent. The goal of task depends on the performance of individual agent but if any agent fails to give its maximum contribution, other agents compensate it. The agents like bees interact with other agents by producing pheromones chemical or sound, by dancing, by changing the setting and so on. The announcement between the agent is supportive to control robot and traffic light system. For this, Ant Colony Optimization and practical swarm optimization technique are used. Here Ant Colony Optimization technique is used for solving traffic light problem.

This is the technique used for finding the shortest path for food source by the agents.

1) In step1, every bee come out from the nest and start searching for food source in their surroundings.
2) After some time, about 75% of bees start moving toward a same food source but from different routes.
3) In final step, almost maximum bees move in a particular direction [14]. There are two optimization methods, heuristic and meta-heuristic used for solving a traffic related problems. But preference is given to the meta-heuristic method because it solve optimization problem faster in comparison of a heuristic technique. Mostly this algorithm is connected with the searching behavior of ants for food sources. In initial state every ant come out from the nest and start searching for the foodstuff basis, and in the go back journey a chemical name pheromone is shaped on the trail. Diverse ant produce dissimilar attentiveness of chemical, it depends on the path length or in additional words, more care of pheromone shows the smallest path. Then every ant starts selecting this path for the food source. Same behavior is used for solving traffic light trouble [15]. In transfer light system, each traffic light is treated as an agent and by generating good communication between them; traffic light problem can be solved. An agent performance depends on its behavior. It is compulsory for an agent to do work in a group of agents but within predefined boundaries or with a certain set of rules. A manager is supposed to have powerful memory so that it can store information up to maximum value just like a bee store its previous path direction in a brain Sensors are used for calculating the numeral of vehicles. The planned output of sensor and pre estimated data of traffic flow is sent to the traffic data updater or mainframe. Then computer personalized the data according to the global result obtained beginning the relatives. After that process data is forwarded to the path programmer or planner and applies ACO (ant colony optimization) algorithm with the use of traffic and drawing folder. Final output is then transferred to the user by using text or internet.

C. Particle Swarm Optimization (PSO)

Particle Swarm Optimization [16], [17] is a population based met heuristic inspired by the social behavior of birds inside a group, and was initially intended for continuous optimization evils. In PSO, every possible

solution to the problem is called a particle position and the population of particles is called the swarm. In this algorithm, each particle position x i is updated each iteration g by means of Equation.

$$X\ i\ g+1 = x\ i\ g + v\ i\ g+1. \qquad \text{Eq (1)}$$

PSO algorithm has been used to generate four numbers representing the starting time of the green lights in the four junctions.

VIII. CONCLUSION

In this paper we discussed various methods like ACO, PSO and GA second-hand by researchers on VANET. With the wireless technology become omnipresent and cheap, VANET is available to turn out to be the networking platform that would like to propose a scenario that would overcome all types of accidents and much more useful for ambulance as well as for police vans.

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