International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE)
ISSN: 0976-1353 Volume 19 Issue 2 – JANUARY 2016.

A SURVEY ON VARIOUS TRAFFIC MANAGEMENT SCHEMES FOR TRAFFIC CLEARANCE, STOLEN VEHICLE AND EMERGENCY VEHICLE

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***Abstract*- Due to growing in number of vehicles on roadways causes heavy traffic congestion on the road. Traffic congestion on roads may cause delay for emergency services (i.e. Ambulance, Fire fighter, Police, etc.).A traffic light plays an essential role in traffic management. Under the normal state traffic light duration for path is almost fixed and same for the entire path and emergency vehicle are not considered. A various survey paper present different schemes that determine traffic volume and set the green light duration for the path. This paper presents a survey on various traffic management schemes for traffic clearance, detection of stolen vehicle and clearance of emergency vehicle.**

***Index Terms*: Intelligent Traffic Management, Traffic Congestion, Emergency Vehicle.**

I. INTRODUCTION

The Internet of Things (IoT) is a network of objects that can communicate with each other. The IoT in traffic management plays an important role here by collecting data from various sources such as traffic cameras, vehicles' GPS, commuters' mobile phones, sensors on the roads, passing vehicles and so on. Traffic IoT provides traffic information collection and incorporation, supportive processing and analysis in all categories of traffic information on roads in a large area automatically and intelligently [1]. Modern traffic management is evolving into an intelligent transport system based on IoT. IoT functions in traffic management such as Consolidate traffic data coming from different sources , Analyse traffic information to provide near –real-time-insights, Monitor traffic operations and incidents , Support the storage and presentation of geographic information system (GIS).Essential characteristics of IoT such as Dynamic & Self- Adapting, Self-Configuring, Interoperable Communication Protocols, Unique Identity, Integrated into Information Network. Traffic congestion is a severe problem in many modern cities around the world. Traffic congestion has been causing various critical problems and Encounters in the major and most populated cities. To travel to different places within the city is becoming more difficult for the travellers in traffic. Owing to these congestion problems, people lose time, miss Opportunities, and get frustrated IoT application in traffic management provides dynamic interaction between the components of a transport system, allows inter and intra vehicular communication, smart traffic control, smart parking, electronic toll collection system, logistics and fleet management, vehicle control and safety , road assistance[1].

Fig. 1 Traffic Congestion in Roadways

II. VAROIUS TRAFFIC MANAGEMENT SYSTEMS

In existent world there are various traffic management schemes described below.

A. Simple Traffic Management System

The normal form of traffic management, system requires human intervention in the road. In this method, a traffic officer is positioned on each and every cross section of roads; the traffic police controls flow of traffic. A traffic police officer is outlooks in middle of road and monitors flow of traffic. In instance of any traffic congestion the police officer gives signals whether to drive or stop to the vehicle driver. Hence the driver is capable to recognize emergency case, so the police officer can prefer which lane desires more priority than other. This scheme is most

proficient than any other system. But the system requires human as a part of system this scheme is inadequate. Efficiency of system depends on experience and capability of the person.

B. Intelligent Traffic Management System

In order to evade the human intervention in the normal traffic management system, an automatic traffic management scheme is recommended. This system comprises of simple three colour traffic signal. Generally for each lane 120 seconds of green light is set on. Before green light, yellow light flashes for 20 second, signifying to start your vehicle and be ready to go. For all the time red light is on, requesting each vehicle to stop. This system cannot recognize and prioritize the emergency vehicle, normal car and ambulance same way. So there are probabilities of delay in emergency services. E.g. Delay in reaching hospital by the ambulance in case of traffic congestion. Drivers disobeying signal rules are also headache, sometimes they causes serious accidents.

Fig. 2 Traffic Light Signal

C. Intelligent Traffic Management Scheme using Wireless Sensor Technologies

An improved traffic control system using Wireless Sensor Network (WSN) and using new techniques for controlling the traffic flow sequences based on a new traffic infrastructure have been proposed [2]. These methods are dynamically adaptive to traffic conditions for both single and multiple intersections. A WSN is used as a tool to controlling traffic signals roadways, while an intelligent traffic controller is established to control the operation of the traffic infrastructure maintained by the WSN. The controller represents traffic system communication algorithm (TSCA) and the traffic signals time manipulation algorithm (TSTMA). The proposed system consists of two parts: WSN and a control box (*e.g.* base-station) running control algorithms. The WSN, which comprises of a group of traffic sensor nodes (TSNs). Every TSN will mostly collect and produce the traffic data (represented by the number of vehicles during arrival and departure processes), vehicle speed, and length of the vehicles, based on processing of the sensor data. The above system with the embedded algorithms plays a vital role in relieving the congestion problem, when compared to incompetent traditional traffic control systems. The system is self-configuring and operates in real-time to identify traffic states and interchange information with other nodes via a wireless communication with self-recovery function. The system can be improved, when traffic signal receive signal from emergency vehicle it sets green light to that particular lane, in which emergency vehicle is coming.

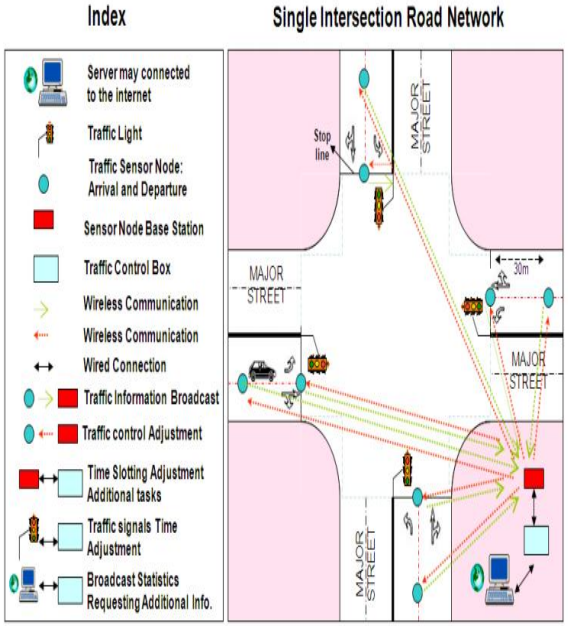

Fig. 3 Architecture for Traffic WSN

III. LITERATURE REVIEW

In this section various solutions for traffic management have been reviewed.

In paper [3], A RFID deploying at the traffic junction has been proposed. The paper presents a method of monitoring traffic in a junction by radio frequency identification. The RFID system can be found a wide range of logistics applications; the current paper describes how the system is able to provide location data. The system has the advantage of fast data collection and reporting, which obviously works only with vehicles equipped by RFID tags.

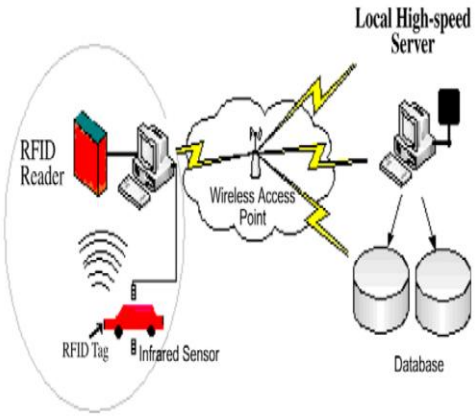

Fig. 4 Framework of RFID technology

Deploying multiple readers in a carefully planned constellation in a traffic junction, the radio frequency identification is suitable for special tasks, e.g. detecting vehicles travelling against traffic direction.

In paper [4], green wave system for the vehicles has been proposed, which was used to allow clearance to the ambulance vehicle by turning all the red lights to green on the path of emergency vehicle by providing whole green wave system. A 'green wave' is the synchronization of the green phase of traffic signals. With a 'green wave' setup, a vehicle passing through a green signal will continue receive green signals as it travels down. The green wave system will also track a stolen vehicle when it passes through a traffic light. The advantage with this system is that GPS inside the vehicle does not require additional power. The drawback of this system is that, when the green wave is disturbed, it causes traffic problem that can be exacerbated by the synchronization.

In paper [5], a dynamic and automatic traffic light control expert system has been proposed for solving the road congestion problem. The active and automatic traffic light control system is done using a six simulation models. The typical model adopts inter arrival time and inter departure time to simulate the arrival and clearing number of cars on roads. In the experiment, each sub model represents a road that has three intersections. The simulation results physically prove the efficiency of the traffic system in an urban area, because the average waiting time of cars at every intersection is sharply dropped when the red light duration is 65 s and the green light time duration is 125 s.

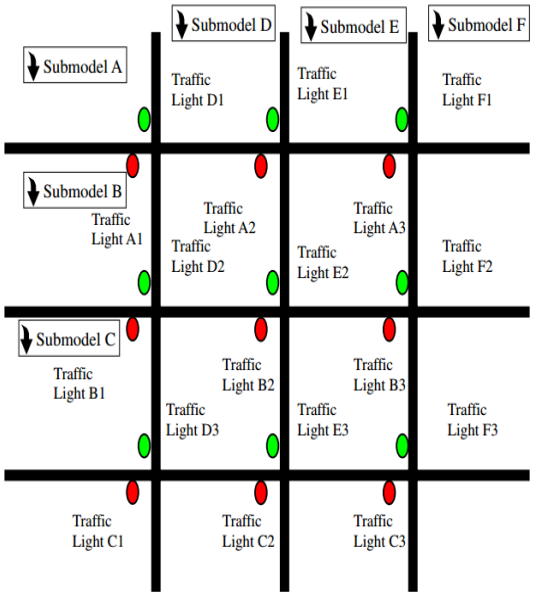

Fig. 5 A Traffic Control Simulation

Meanwhile, further analysis also shows if we keep the inter arrival time of roads A, B, and C, and change that of roads D, E, and F from 1.7 to 3.4 s and the inter departure times at the three intersections on roads A, B, and C are equal to 0.6 s, the total performance of the simulation model is the best .Finally the data collected from RFID readers are the best and the traffic congestion is controlled.

In paper [6], Design of Intelligent Ambulance and Traffic Control have been proposed. Ambulance system comprises of Heart Beat sensor and Temperature sensor. When key is forced, heart beats and temperature values will be directed to default mobile phone number (Hospital Number) using GSM module. In signal there will be two RFID readers which will identify traffic density on two roads. When ambulance is detected on any of the road signal for that lane the traffic light will be set to green. Drawbacks: All ambulances must equip with special instruments other than medical. Some other integration also needs.

In paper [7],A real time intelligent decision making system that computes decisions for a dynamically changing application environment has been proposed . This paper address the Major Problems encountered in Conventional Automatic road traffic congestion control system. If the position of vehicle does not come in position of infrared rays then IR sensor would not give response. If the vehicle is under faulty condition in the sort of IR rays then the response given by IR sensor would be inaccurate. If a single camera is used as a vision sensor for obtaining the image of traffic then it is hard to detect the space between two vehicles means projection of camera would be vital feature for measuring the traffic density.

In paper [8], Intelligent Traffic Signal Control System Using Embedded System has been proposed. Various typical problem in traffic light controller such as heavy traffic jams, No traffic but still people need to wait, emergency car stuck in traffic jam.

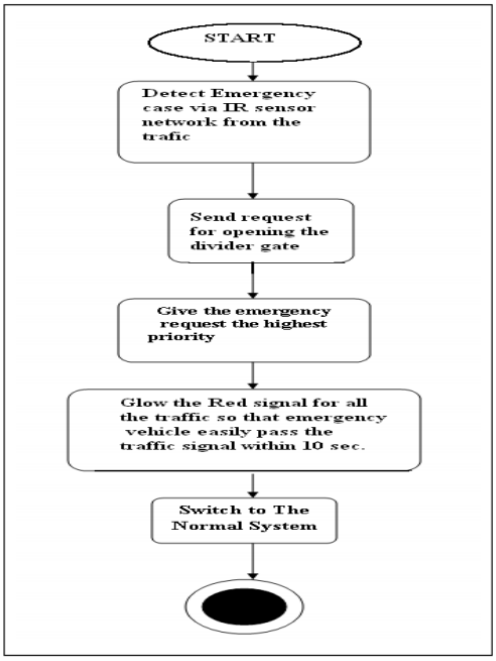

Fig. 6. Flow chart of Emergency vehicle

An evolutionary method to evaluate the traffic volumes of road networks have been proposed, in which real time traffic information is not delivered. Genetic algorithm existed to estimate the unknown traffic volumes for such road section whose traffic information not available. Drawback: No detection of stolen vehicle.

In paper [9], the traffic light priority control for emergency vehicle has been proposed. The use of RFID traffic control to avoid problems that usually arise with standard traffic control systems, especially those related to image processing and beam interruption techniques are discussed. RFID technique deals with multivehicle, multilane, multi road junction areas. It provides an effective time management scheme, in which, a active time schedule is worked out in real time for the track of every traffic column. Real-time operation of the system rivals the judgment of a traffic policeman on duty. The quantity of vehicles in each column and the routing are proprieties, upon which the controls and the decisions are done. The shortcoming of this work is that it does not discuss the communication method used among the emergency vehicle and the traffic signal controller.

In paper [10], a RFID and GPS based automatic lane clearance system for ambulance has been proposed. The focus of this work is to reduce the interruption in entrance of the ambulance to the hospital by automatically clearing the lane, in which, ambulance is travelling, before it influences traffic signal, in the path of the ambulance, to green when the ambulance is at a firm space from the traffic junction. The use of RFID distinguishes between the emergency and non-emergency suitcases, thus avoiding redundant traffic congestion. The communication between the ambulance and traffic signal post is done through the transceivers and GPS. The system is fully automated and hence not requires human intervention at the traffic junctions. The shortcoming of this system is that it needs all the information about the opening point, close point of the travel. The system may not work, if the ambulance needs to take another route for some reasons or if the starting point is not known in advance.

In paper[11], an intelligent traffic light management system for Ambulance rescue and Automatic detection of accident has been proposed. The loss of human life due to accident is to be avoided. Traffic congestion and tidal flow are major facts that cause delay to ambulance. The main theme behind this scheme is to provide a smooth flow for the emergency vehicles like ambulance to reach the hospitals in time and thus minimizing the delay caused by traffic congestion. The idea behind this scheme is to implement ITLS which would control mechanically the traffic lights in the path of the ambulance. The ambulance is controlled by the control unit which furnishes adequate route to the ambulance and also controls the traffic light according to the ambulance location and thus reaching the hospital safely. The controller identifies the location of the accident spot through the sensor systems in the vehicle which determined the accident and thus the controller walks through the ambulance to the spot. The vehicle unit installed in the vehicle senses the accident and sends the location of the accident to the controller. The GPS SYSTEM finds out the current position of the vehicle (latitude and the longitude) which is the location of the accident spot and gives that data to the GSM MODULE. The GSM MODULE sends this data to the control unit whose GSM number is already there in the module as an emergency number. In the ambulance unit the controller finds the nearest ambulance to the accident spot and also the shortest path between the ambulance, accident spot and the nearest hospital. The controller then sends this path to the ambulance.

IV. CONCLUSION

From the present difficult segment, it can be seen that, existing technologies are inadequate to handle the difficulties such as congestion control, emergency vehicle clearance, controlling the congestion volume, detection of stolen vehicles etc. To solve these problems, a smart traffic light control system must be implemented in highways. In future the system can be enhanced by automation traffic control system and thereby reduce human intervention at the roadways.

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