Intelligent Traffic Signal Controller Using RFID

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ABSTRACT

Today one of the most critical issues of the road is Traffic management. Traffic Signals play an important role in the traffic management. The existing traffic signals follow the predetermined sequence. So these signal lights are called static traffic lights. These Traffic lights are not capable to count the number of vehicles and the priority of the vehicles on intersection point. As a result some vehicles have to wait even there is no traffic on the other side. The proposed RFID traffic control avoids problems that usually arise with standard traffic control systems, especially those related to image processing and beam interruption techniques. This RFID technique deals with a multi-vehicle, multilane, multiroad junction area. It provides an efficient time management system in which a dynamic time schedule is worked out in real time for the passage of each traffic column. The vehicles like Ambulance and Fire Brigade are also stuck in traffic and waste their valuable time. The proposed system provides quality of service to emergency vehicles and improves the accuracy of Automatic Traffic Light Violation Detection system as well as helps to trace out the stolen vehicle's using RFID.

Keyword: - *RFID, Traffic Light, Dynamic, Time Scheduling, Priority based Algorithm.*

1. INTRODUCTION

With the growth of the urbanization, industrialization and population, there has been a tremendous growth in the traffic. With growth in traffic, there is occurrence of bundle of problems too; these problems include traffic jams, accidents and traffic rule violation at the heavy traffic signals. This in turn has an adverse effect on the economy of the country as well as the loss of lives. The expected increase of cars and SUVs from 2005 to 2035 is 13 times (35.8 million to 236.4 million vehicles), while two wheelers are expected to increase about 6.6 times (35.8 million to 236.4 million vehicles) [1]. So problem given above will become worst in the future.

Traffic lights are the signaling devices that are placed on the intersection points and used to control the flow of traffic on the road. In 1868, the traffic lights only installed in London and today these have installed in most cities around the world [2]. Most of the traffic lights around the world follow a predetermined timing circuit. Sometime the vehicles on the red light side have to wait for green signal even though there is little or no traffic. It results in the loss of valuable time. Traffic control at intersections is a matter of concern in large cities. Several attempts have been made to make traffic lights sequence dynamic so that these traffic lights operate according to the current volume of the traffic. Most of them use the sensor to calculate current volume of traffic but this approach has the limitation that these techniques based on counting of the vehicles and treats an emergency vehicles as the ordinary vehicles means no priority to ambulance, fire brigade or V.I.P vehicles. As a result, emergency vehicles stuck in traffic signal and waste their valuable time. Another limitation of this approach is that sensor based system needs the line of sight path between the sensor vehicles which results in low performance.

2. LITERATURE SURVEY

In Adaptive Traffic Control System which receive information from vehicle such as position and speed and then it utilize to optimize the traffic signal. The system specifies the use of onboard sensors in vehicle and standard wireless communication protocol Specified for vehicular applications. They implement various traffic signal control algorithms [13]. Intelligent traffic systems for VANET suggest that creation for smart city framework for VANET consisting of Intelligent Traffic Lights which transmit warning messages and traffic statistic. In That System Various Routing Protocol Has Been Discus And Compare. They suggest that AODB is best suited for Intelligent Traffic Light [14]. Authors suggest in reference [15] the data forecasting model for transmitting data from

one to other. This article studied about the dynamic traffic control system and based on radio propagation model for predicting path loss & link.

Under the proposed work, each intersection contains 8 RFID readers. The road is divided into two lanes. Each lane has its RFID reader to track the vehicles passing through it. Each intersection point has its own database to store the information regarding the vehicles that passed from it with time stamp and traffic light. Every vehicle has a RFID enabled device that stores a vehicle identification number (VIN). Every vehicle has its unique VIN number that provides the information regarding the priority of the vehicle and type of the vehicle. With the help of VIN we can uniquely identify the vehicle its owner.

The roads intersection is a bottleneck point in the urban traffic network and it is very critical node. Traffic may accumulate quickly and traffic jam can occur quickly in case the traffic control system is not efficient to properly manage the vehicles queues in fast and smart manner. The work proposed a smart traffic control system based on the wireless sensor network and an alerting system for red light crossing scenario to alert the drivers on other sides to save their lives. This technique is based on the queue length of the vehicles on the traffic lights. They also represent the simulation of 4 models which are used in the different parts of the world and shows competing results in the terms of waiting time and number of vehicles not served first time. The work proposed an approach to integrate Wireless Sensor Network (WSN) in the RFID Reader to implement bus management system where motion sensors are used to send command to the RFID reader to enter in the read when it detects the RFID tag movement around it and then RFID Reader reads the contents of RFID tag and pass this information to host application via IEEE 802.15.4/Zigbee standard, that reduces the cost and time by eliminating the wired installation of cable. Here they also compare Bluetooth and Zigbee technique for wireless communication.

3. SYSTEM DESIGN

Each intersection on the road has 3 traffic lights as shown in the fig. 1. Each lane has its own RFID reader that stores the vehicles passing through it with time stamp. On the basis of the time stamp, we find the violators. For this purpose we store the duration of the green light. So the vehicles coming on the corresponding light are allowed to move in any direction. During this time reader corresponding to red light stores the vehicles passing through the lane.

Intelligent Traffic Light Controller: Each city has multiple intersections. Two lights are called linked Lights that are placed on opposite sides of the road that join two intersections. The RFID reader stores the records of all the vehicles that passed through the road. The Traffic light controller follows the same round robin sequence of the lights. But if an Emergency vehicle is detected at any traffic light then controller leave the round robin schedule and generate the green signal for the ambulance. The other task of the controller is to calculate the time of green signal that is based on the number of vehicle. To solve the problem of Starvation a time limit is defined. If this limit exceeds then that light gets its turn.

**Fig -1**: Architecture of the system.

Vehicle Identification Number: In the proposed work RFID, tag will store a Vehicle Identification Number. This number is divided into 3 parts: First part represent the priority of the vehicles. Next part represents the type of vehicle and next digits represent the vehicle number. Priority: In the proposed work, different types of vehicles have the different priorities. The total vehicles are divided into 4 categories: First system category includes Ambulance, Fire Brigade vehicles and V.I.P vehicles. These vehicles have the highest priority. The second category includes the buses and school college buses. These buses need to reach their destination on time so these vehicles also need a fast service. Third category includes the car, motor cycles and scooters and fourth category include the Heavy vehicles.

Day time priority of 3rd category is high as compare to 4th category but during night hours the priority of the heavy vehicles high.

The components that we require to implement the system is as follows:

- RFID Reader.
- RFID Tags.
- Serial Interface Port.
- DC Power Supply.
- Traffic Light.

4. FLOW CHART
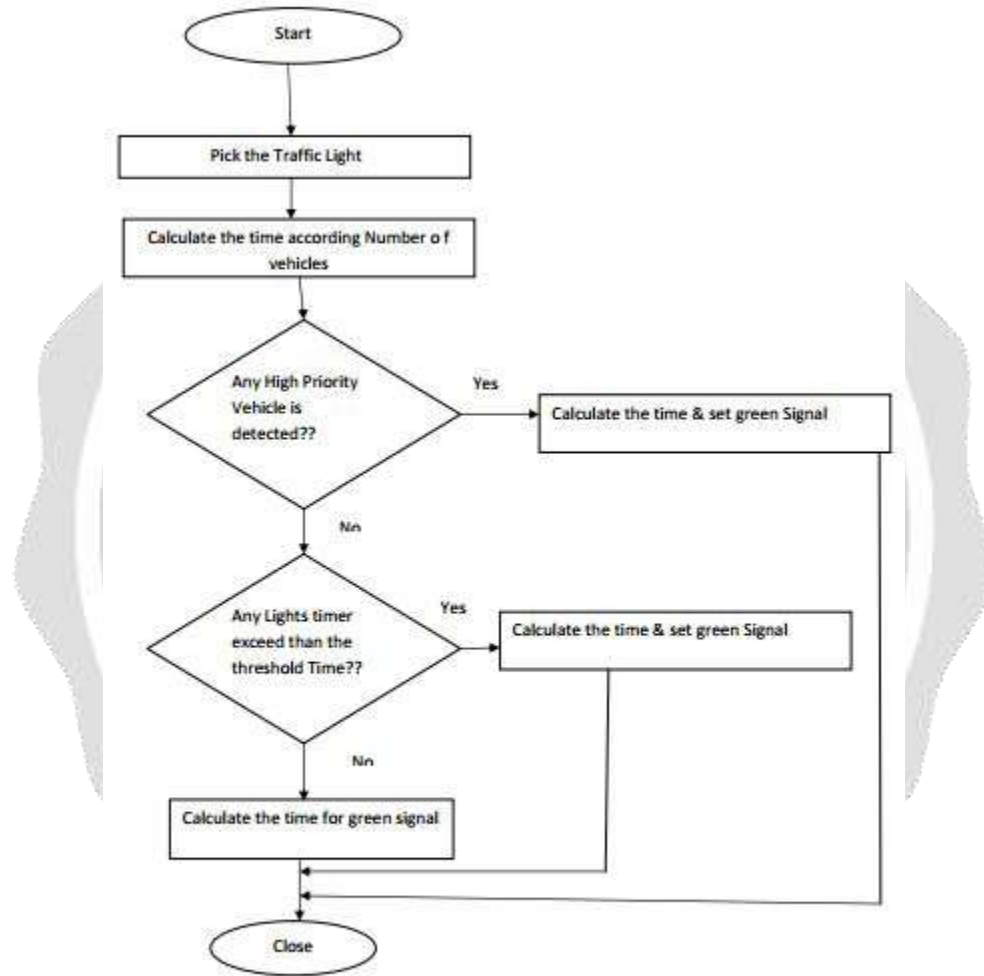
Fig-2: Flow Chart

The flow chart represents the flow of the algorithm. In which after receiving the message from linked lights controller consider the factors like traffic density of the road, priority of the vehicles and queue length and starvation factor to decide the term of the light to display green signal. The flow chart given below not only works according to the number of vehicles near the traffic light but also solve the problem of starvation that can be arisen. Here the basic purpose of the algorithm is to calculate the green time duration and also provide the quality of the service to the Emergency vehicles like ambulance, Fire brigade and VIP vehicles so that they can reach at their destination as early as possible and reduce the time wasted at the Red Light.

5. ADVANTAGES

- All the methods that are reviewed in this paper use different techniques to determine the traffic density and change the traffic light based on different criteria.
- In use of System provide easy mobility of vehicles on the road by providing easy communication between vehicles and road side units but use of specific hardware on the vehicles proves to be a drawback of this system.
- Similarly RFID based system is cost-effective and cheaper but the system is not flexible as receiver and transmitter have to be in direct line of sight of each other. Also large areas require multiple emitter panels to be installed which can add up to the overall cost of the system.
- In the proposed system reduces air pollution by reducing air pollution by reducing traffic, proves to be more flexible and provides highly accurate results.
- In the system makes the traffic information available to the administration department as well which can make use of this information for making other decisions as well.
- In the algorithms used are easy and simple but the system does not handle the problems of occlusion (i.e. hiding of object under bridge or tree) and shadow overlapping.

6. CONCLUSIONS

Although previous approach represents efficient techniques to control the traffic light sequence but these are not to provide the QoS to Special Vehicle. The proposed work considers not only the priority of the vehicles but also the density of the vehicles on the road and controls the traffic light sequence efficiently and more accurately and the accuracy of the RFID is more than Cameras so it also improves the performance of traffic light Violation Detection System. This paper presents architecture for automatic adaptation of the longitudinal speed control of a vehicle to the circumstances of the road which can help to decrease one of the major causes of fatalities: the excessive or inadequate vehicle speed. Our approach is based on a combination of three different sensor technologies: RFID tagging of traffic signals to convey their information to the car, Hall Effect sensors located in the vehicles wheels for high accuracy measurement of the speed of the car, and DGPS for precise positioning of the vehicle and control loop time. Sensor fusion is applied to the information received by these subsystems, and used to adjust the longitudinal speed of the vehicle with a fuzzy controller. The proposed on-board architecture is portable and easily adaptable to any commercial car with minimal modifications.

7. ACKNOWLEDGEMENT

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