Red Light Violation Detection Using RFID

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Abstract

Traffic lights play an imperative role in traffic management. Traffic lights play an important role in the traffic management. Existing Automatic Traffic Light Violation Detection System is based on the camera's to detect the violator. This system has a number of limitations like blurry image due to motion , poor image resolution because the number plate is far away, poor lightening, different fonts . The proposed system improves the accuracy of Automatic Traffic Light Violation Detection system as well as helps to trace out the stolen vehicles using RFID.

Index Terms- Intelligent Traffic light controller, round robin, RFID

I. 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.

In 1868, the traffic lights only installed in London and today these have installed in most cities around the world [2]

Today red light violation is one of the most common and serious problem which results in the collision of millions of vehicles at the traffic light signals every year. A red light violation occurs when a vehicle try to cross the intersection at the red traffic light. So to give the punishment to the drivers of these vehicles, we must identify the vehicle that violates the traffic light signals.

Automatic Number Plate Recognition is a technique use image or video picture of license plate and then applies optical character recognition techniques to extract the number from the image and then use

this information to identify the vehicle identity. Under this system the cameras use the infrared signal to allow the camera to take picture at any time of the day. This system has a number of limitations like blurry image due to motion due to motion blur, poor image resolution because the plate is too far away, poor lightening, different fonts or an object obscuring the plate, quite often a tow bar or dirt on the plate [4].

The problem of traffic light violation detection can be solved by RFID based system. With this system, we can consider the priority of different type of vehicles and also consider the density of traffic on the roads by installing RF reader on the road intersections. Radio frequency identification is a technique that uses the radio waves to identify the object uniquely. RFID (Radio Frequency Identification) is one of the new upcoming technologies in the market, which has made its place in many more applications. RFID is basically an identification technique which uses the Radio waves for the identification of objects having RFID tag equipped with them [3].

There are three main components of RFID: RFID tag, RF Reader and Database. Various types of tags are available but we can mainly divide them into two categories: passive tags and active tags. The passive tags don't contain any internal power source. There are three parts of the tag: antenna, semiconductor chip and some form of encapsulation. The RFID tags are used to read the information from the tag and acquire and maintain this information for the application. The reader has an antenna that emits the radio waves. These waves are captured by the antennas of the tags in the range of the reader which amplify this signal and pass it to the microchip to activate the internal circuitry. As a result the tag respond by sending back the data stored in the tag to reader. There are two types of the readers:

- Stationary Reader
- Mobile Reader

The stationary readers are the fixed at a specific location and it is able to read the tags within its range. On the other hand, Mobile readers are moveable devices [5]

The Low frequency tags works on frequency lies between 30 ~ 300 KHZ and High Frequency and Ultra High Frequency Tag works on the frequency range lie 3 ~ 30 MHZ and 300 ~ 3 GHZ respectively [6].

The paper is organized as follows: Related Work, Proposed Work and Conclusion.

II. RELATED WORK

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 in [9] explained the idea of implementing Electronic Toll Collection system using the Automatic Vehicle Identification (AVI) technique and also discussed the various AVI technologies Image processing AVI system, RF and Microwave AVI system etc [20]. They also compared the microwave and Infrared communication and represents the components like onboard Unit (OBU) and Road Side Unit (RSU) with two way communication using Infrared. Under this system a data base stores the required information regarding the vehicle and when the vehicle enters in the toll collection booth the RSU transmits the ask signal to OBU using downlink and OBU response through the uplink and provides its identity to RSU, which further send this information to Computer system where the tax is calculated and bank transaction is performed. The work in [11] discussed an approach based on the GPRS to implement the Red light violation system and hardware and software for its configuration. The whole system is divided into two portions:

- Monitoring Stations
- Control Center

The monitoring centers are distributed near the red lights of the city and the control station is placed at the central location. During the red light period, two cameras and magnetic loop sensor are activated to capture three pictures of the vehicle. Then image compression and number plate recognition is performed. Then the data of the violation time, compressed imaged and monitoring station serial number are written to wireless modem that further this is sent to monitoring center using the GPRS network and GGSN network. The following diagram defined overall working of this system.

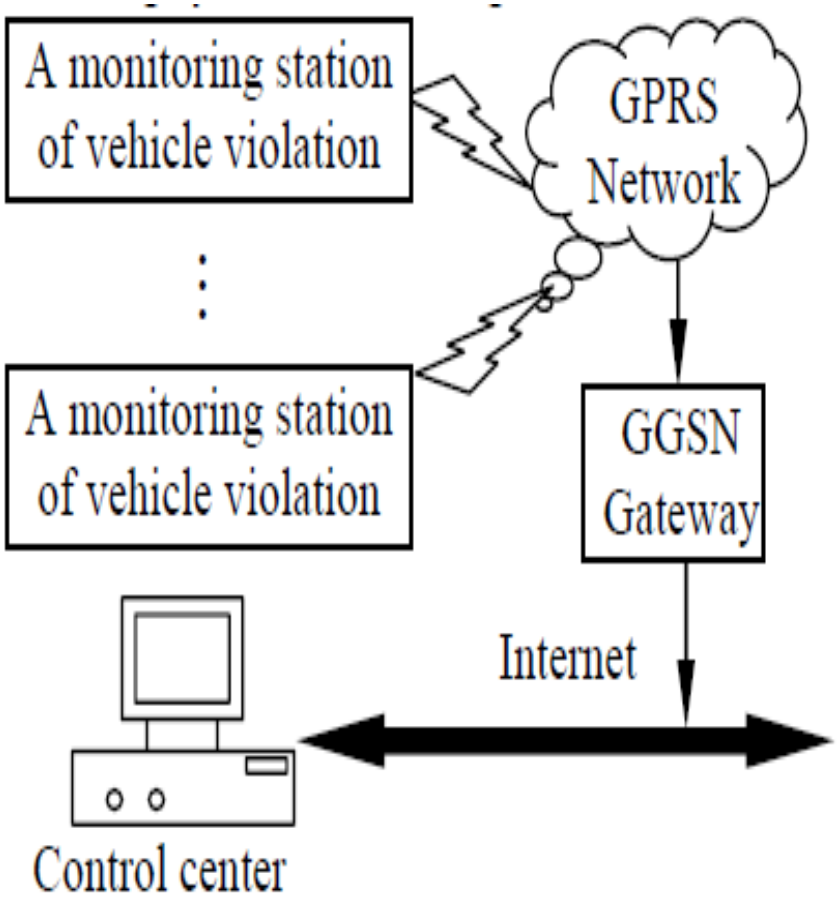

Figure 1 : Structural chart of Video Based Detection System

III. PURPOSED WORK

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 timestamp 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.

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.

Automatic Traffic Violation light Detection: Each intersection on the road has 4 traffic lights as shown in the figure 2. 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. To detect the violator, we compare the reading of reader corresponding to the Red light lane with the records of the reader corresponding to green light. If any there is any vehicle that is not presented in the record of reader corresponding to green light and this vehicle is presented in the record of the reader corresponding to Red light then this vehicle is violator.

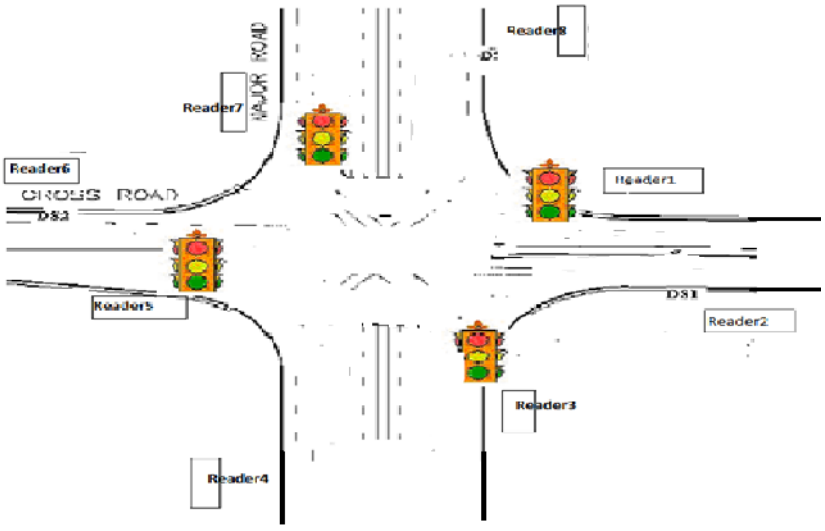

Figure 2: Structure of the Intersection & placement of the reader

The database stores permanently these records. So at any time, the records related the vehicles can be extracted and violators are easily found. This is the effective way to find the violators and punish them. The Figure given above shows the placement of the readers and traffic light and structure of the intersection point.

Pseudo code for Red light Violator Detection:

Here Tst represent the start time and Tend represent the End time of the green light.

1. At time interval tg when one light becomes Green.

2. Set TLG := light that signal green

3. Store its Tst: = tg and Tend:= tg + stable

4. Pick the traffic lights that has Red signal at time interval tg and store it into Queue.

5. Repeat the following steps for For i:=1 to 3

    a. Pick the traffic light i from the Queue.

    b. Pick the Records from database of traffic light i with time stamp between Tst and Tend.

    c. Compare it with the records of the reader corresponding to TLG (Green light).

    d. If any unmatched record found

        i. Store these records in Violation list.

    e. End if

6. End loop

7. End

The following flow chart represents the basic idea. Here TLGR means the reader corresponding to the Green light. In other words reader in the lane whose light is Green

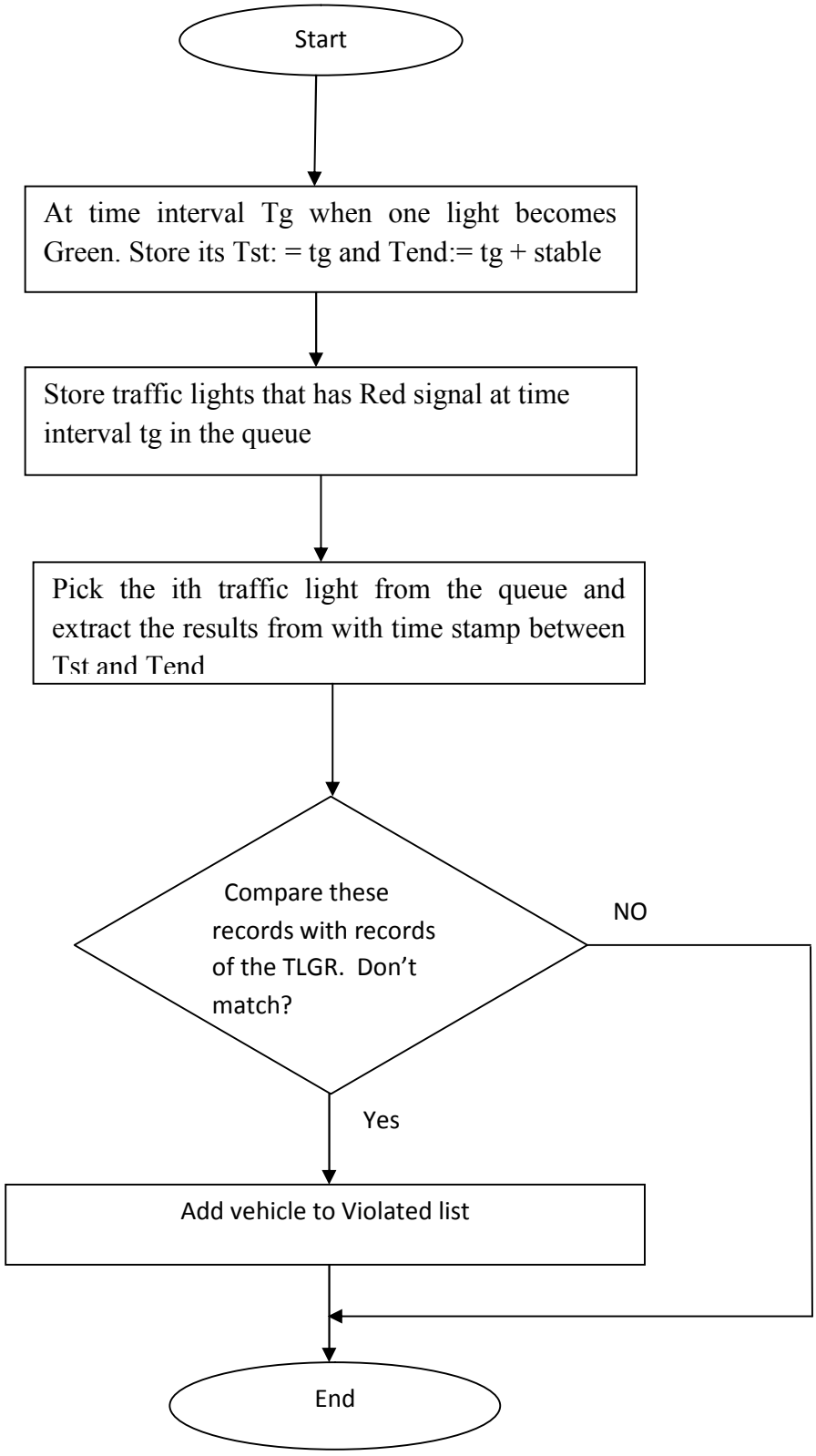

Figure 3: Flow chart for Red Light violation detection

IV CONCLUSION

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 Camera's so it also improves the performance of traffic light Violation Detection System.

V. REFERENCE

[1] Rajat & Nirbhay Kumar (2007) "RFID Resolution: Your cars will be tagged", The Economics Times, 25 September.

[2]http://www.kbrhorse.net/signals/history01.html

[3] www.talgov.com

[4]http://www.mouchel.com/services_atoz/automatic_number_plate_recognition.aspx

[5] Elisabeth ILIE-ZUDOR "The RFID Technology and Its Current Applications", MITIP 2006, ISBN 963 86586 5 7, pp.29-36

[6] Chong hua Li "Automatic Vehicle Identification System based on RFID", Anti Counterfeiting Security and Identification in Communication (ASID), 2010, pp 281-284.

[7] A. Chattaraj, S. Chakrabarti, S. Bansal, S. Halder and A. Chandra "An Intelligent Traffic Control System using RFID", IEEE Potentials, vol. 28, no. 3, May-Jun. 2009, pp. 40-43.

[8] Roy Want "An Introduction to RFID technology", Journal IEEE Pervasive Computing Volume 5 Issue 1, January 2006, pp-105-113

[9] Guang-xian Xu, Jian-hui Liu, Zhi-yong Tao, and Xin-chun Li "The Research and Development of the Highway's Electronic Toll Collection System", World Academy of Science, Engineering and Technology 31 2007, pp 383-385.

[10] Ben Ammar Hatem, Hamam Habib " Bus Management System Using RFID in WSN", EMCIS 2010, pp 45-50

[11] Faisal A. Al- Nasser,Hosam Rowaihy "Simulation of Dynamic Traffic control system based on Wireless sensor network", IEEE Symposium on Computers & Informatics 2011, pp 40-45.

[12] Lejiang Guo,Wei Fang, Guoshi Wang "Intelligent traffic management system based on WSN and RFID" International Conference on Computer and Communication Technologies in Agriculture Engineering 2010, pp 111-114.

[13] Valery Naumov, Thomas Gross "Simulation of Large Ad Hoc Networks", ETH Zurich, pp 88-93.

[14] Prof A. A. Pandit, Jayoti Talreja, Ankit Kumar Mundra, " RFID tracking System for vehicles" International Conference on Computational Intelligence, Communication Systems and Networks 2009, pp 302-308.

[15] Sheng, Q.Z., Li, X. and Zeadally, "Enabling Next-Generation RFID Applications: Solutions and Challenges", IEEE Computer 2005 , Vol 41 No 9, pp 21-28.

[16] http://RFID.nordic.se

[17] Yang tao "The Application of RFID Technology in the Field of ITS," Logistics technology 2005, Vo1.27, pp. 24-26.

[18] LI Xiangmin,FENG Xu,_" Intelligent Toll Collection System Based on RFID Technology," Industry automation 2007, Vo126 ., No9, pp. 81-82