Cloud Based Traffic Management System For Emergency Scenarios

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Abstract:

Preventing general traffic violation is not easy in roads or urban streets due to the inattentive drivers. This small violation is one of the leading causes for accidents. In this paper, we present an intelligent traffic violation detection to monitor and measure red light jumping. This system is based upon Radio Frequency Identification (RFID) technology for identification of vehicles on the road. Traffic violation detection system is based upon the information retrieved from vehicle and type of signal from traffic light. The system also extends to calculating and updating the penalty for vehicles jumping red light. The penalty is retrieved from the information publicly available in the traffic police forum. The existing methods of time-based traffic management system is the one which is not adequate for the present-day traffic. Owing to this reason many emergency service vehicles like ambulance, fire service was prevented from doing their duty at the right time. Increasing of vehicle population demands a major change in the conventional Traffic management systems. To get the best remedy to solve this by fitting the special RFID tag in the ambulance, When the tag matched with its receiver the traffic signal automatically switches to green thus makes the ambulance to cross the road intersections. The system also extends to measure the pollution emission from the vehicle.

Keywords: *RFID, Traffic control, Traffic Management*

I INTRODUCTION

Travel is an important part of today's fast paced life as everyone has to move around for their day -to-day work. Road transport is the most commonly used
mode of travel due to its ease, low cost and availability to common man. The ease of travel is affected by such factors as the quality of road, congestion, time taken, accidents, speed, etc. The major threat is the increasing number of accidents on a daily basis. An accident survey estimated that around 3,00,000 accidents occur on Indian roads

every year. These accidents not only eat lives of people but also adds on to the economic loss of the country. It is reported that over 80,000 people are killed on the Indian roads while the total economic loss owing to road accidents is estimated to be over Rs. 3,600 crores. Lack of discipline and emotions of road users cause traffic congestions which might lead to traffic violations. Having a safe and free flow of traffic is crucial for economic development of the country as we must ensure spending less on fuels and less time on the road. Traffic enforcement authorities can deal with the challenge of regulating the traffic and enforcing rules caused by the huge number of vehicles on the road and the indiscipline of the motorists by applying

modern technology. Flouting lane discipline is the single major factor in India that inhibits safe and free flow of traffic. It is also a common sight in India to see one slow moving vehicle blocking the way of hundreds of vehicles coming behind it. If keeping slow moving vehicles to the left is enforced, one important cause of traffic jams is removed. The authorities are responsible for controlling the traffic violation and pollution and imposing fine on the violators.

The single most important rule is to follow the traffic signals in junctions. Violation of signals results in several accidents. The major problem is the manual tracking of every single vehicle that violates signals. This problem can be brought under control if the tracking can be automated along with calculating and updating the fines. In the existing systems, the tracking of signal violation is implemented using image processing techniques. The cameras use infrared signals to capture the number plates of the vehicles round the clock. The vehicle number is extracted from the image of the vehicle's number plate using optical recognition techniques. If a vehicle has violated the signal, the identified owner is imposed suitable fine. On the other hand, RFID based traffic violation detection systems use radio frequency waves to identify vehicles which are endowed with unique identification numbers in the form of RFID tags. RFID (Radio Frequency Identification) is one of the upcoming technologies in the field of engineering and innovation. It has several applications in the market starting from vehicle identification at tolls to security systems at malls. These RFID based systems consist of 3 main components, namely RFID Reader, RFID Tags and RFID Database. The reader has an antenna that emits the radio waves. When the tag antenna comes within the range of the reader's range, it responds to the reader with the unique identification number of that tag. Tags can be classified into 2 types: passive tags and active tags. A passive tag contains no internal power source whereas an active tag contains its own power source which runs the microchip circuitry and helps in broadcasting the signal to the readers.

Similarly, there are two types of readers: Stationary Readers which are fixed at a specific location and able to read the tags within their range. The ambulance needs to wait for longer duration to reach the hospital when the vehicle population is peak at particular place for longer duration. The existing traffic management method based on Timer difficult to detect the ambulance in a particular traffic lane. In this scenario, traffic authorities in that particular area will identify the presence of ambulance and then make changes in the traffic signal for permitting the ambulance to cross the road intersections. Mobile Reader which are movable devices. The frequency of low frequency tags varies between 30 ~ 300 kHz that of high frequency tags varies from 3 to 30MHz and that of ultra-high frequency varies between 300 to 3000MHz. In this work, an RFID reader uses radio waves to read tags and hence does not require to be in line of sight. Every vehicle is endowed with an RFID tag, while RFID readers on the sides of the road. Road markings are done according to the required range. Any vehicle crossing the road marking when the signal is red will be detected from RFID tag of that vehicle. The air pollution caused by automotive exhaust gases has become a critical issue. The fossil fuel combustion is also a issue in some areas. Nitrogen oxides, NOx (NO and NO2), and carbon monoxide (CO) are the main gases which cause air pollution from automobiles. Since NOx gasses with sulfur oxides (SOx) emitted from coal-fired plants cause acid rain and global warming and create ozone (O3) that results from a photochemical reaction to severe metropolitan smog, they need to be identified.

II LITERATURE SURVEY

The method in [1] explains about the detection of vehicle count. In this, Inductive loop detection can be placed in a roadbed to detect vehicles by measuring the vehicle's magnetic field. The simplest detectors is used to count the number of vehicles during a specified time. Loops can be placed to measure the vehicle count in a single lane or across multiple lanes. The author explained a method for video analysis in [2]. In this, video feeds from the cameras. The built-in software harvests information from that video. Information

such as Vehicle volume, Vehicle count, average velocity etc. are fed into the fuzzy algorithm to reduce the level of traffic congestion.

Magnetic sensors are deployed by the road intersection to detect vehicles. The sensors send the collected data to the Intersection Control Agent (ICA) and it is described in [3]. ICA method process the input data and controlled the traffic light dynamically to pass the ambulance in an emergency scenario. A high vehicle density in a lane allows a traffic signal to remain open in that particular direction for a longer duration and thus to control the signal adaptively.

Radio-frequency identification (RFID) is a technology that use for the purpose of identification and tracking using radio waves in [4]. In this method, most RFID tags contain at least two parts. One part is an integrated circuit is used for storing and processing the information, modulating and demodulating a radio frequency (RF) signal and also used to specialized the particular functions. The second part is an antenna used for receiving and transmitting the signal. There are two types of RFID devices: Active RFID device contain a battery and can transmit signals autonomously and Passive RFID devices have no battery and require an external source to provoke signal transmission

The paper elucidated a method in [5-6] for traffic controlling. The urban traffic is more day by day because of increasing the usage of private cars. As result of this, traffic is becoming one of the most important problems in cities in all over the world. Traffic congestion and accidents are caused because of large number of vehicles running in any area. This creates problem for people they get stuck in traffic this causes a huge waste of time, property damage and environmental pollution. This paper proposes a smart traffic management system, based on the Internet of Things, featuring low cost, high scalability, high reliability, simple to update, to replace conventional traffic management system and the proposed system will significantly improve road traffic. The internet of factors is primarily based at the internet, WiFi sensor network and detection technology to comprehend the wise popularity on the tagged site visitors 'automobiles, monitoring, monitoring, dealing with and processed mechanically. The paper presents an architecture that integrates net of factors with agent technology into a single platform in which the agent generation handles powerful communique inside the IoT. The architecture introduces the use of a lively radio-frequency identity (RFID), wireless sensor technology [8], item ad-hoc networking, and net-based totally records systems wherein tagged traffic gadgets can be routinely represented, tracked in the network.

III PROPOSED SYSTEM

The proposed system for traffic violation detection and traffic flow analysis comprises three modules: reading information stored in RFID tag by RFID reader placed near road's traffic signals, extracting of information from RFID reader and traffic signal. The overall control flow of system takes place in three stages: environment perception, pollution control and control action. In the perception stage, the data from the traffic environment and the vehicles are acquired. This stage includes the first two modules of the proposed system. There are two sensorial inputs: RFID detections from passive RFID tags placed in vehicle and signal from active traffic signals. The information about the vehicle is read using RFID tag reader. The RFID tag attached to a vehicle contains a microchip which has unique tag number, vehicle number and owner's name, address, phone number and email. The RFID reader which is a two-way radio transmitter-receiver sends out electromagnetic signal to these tags. The tag antenna, which is tuned to receive these waves, responds by modulating the waves and sending it back to the reader which converts the response waves into digital data.

A passive RFID tag is used as it draws power from field created by the reader and uses it to power the microchip's circuits. Moreover, RFID reader has ability to read more than one tag response at the same time, thereby improving the overall performance of the process. The status of the traffic signal is acquired from the traffic light controller. In the decision stage, the data obtained in perception stage is analysed. The data acquired from traffic signal and RFID reader are transmitted to the main computer via wireless communication. NodeMCU [7] with built –in Wi-Fi module is connected to RFID reader and used for data communication. The signal transmitted to the server is converted to binary format, 1 for red signal and 0 for green or amber. The tag id, vehicle number, owner's name, phone number, address and email id are also

stored in the server. The server checks for the violation of traffic signals. The RFID reader does not flag all vehicles crossing the signal. The special type RFID had fitted in the ambulance when the tag reads the ID, it can switch all the signals to clear the traffic and to move quickly form there to take the necessary actions. If the polluting gases are high, then this sensor will detect those gases also.
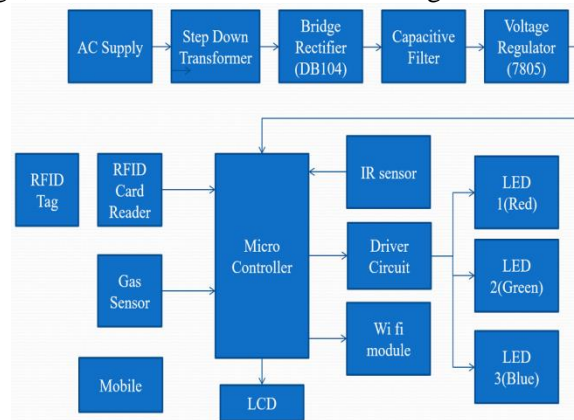

Figure 1. Block diagram of the RF-ID based traffic monitoring system

IV IMPLEMENTATION

All the hardware components are assembled on a PCB board and the power supply is given.

1. System Setup

Whenever a vehicle crosses during RED signal, an RFID tag is attached in the signal, the relevant information like, Owner's name, vehicle number, etc. The detailed information regarding the vehicle is captured in the computer database. The computer database is used to stores all information for individual users. Each vehicle owner is supplied with registered RFID cards. These cards carry identification data and other associated details like name, address, vehicle no., and mobile no. etc. for each user.

2. Vehicle Interface

This is the part of software that has all the operations like issue, reissue, and add data about new vehicle user. Most importantly the database control is given to the vehicle authority so that they can access it. Even then, we have created an option of viewing the transactions that have taken place. The search is made easy by giving him/her to search history according to the signal violation. Hence manual errors are removed, and transactions have been more automated than before.

3. Module 1:

SBR abbreviated as Seat Belt Reminder and is a system to confirm the availability of seat belt by occupants in vehicles. SBR abbreviated as Seat Belt Reminder and this is used to whether system is to confirm seat belt availability for occupants in vehicles.

The first module idea is Seat belt identification. On a survey that has been done recently overall, of 56 accidents, 14 to 15 deaths occur on our roads per day due to not wearing the seat belts. The road safety is indeed important in this aspect that is the reason we are controlling the system based on the seat belt wearing. The seat belt wearing is confirmed with the use of IR sensor. When the IR sensor is not detected, the led indication is given as the sign to wear the seat belt.

4. Module 2:

The second module idea is pollution control of the vehicle. Here the gas sensor is used to monitor the pollution level of the vehicle.

5. Module 3:

The third and final idea proposed here is identification of traffic signal violation. Here, the three-colour signal generation is carried on in the traffic signals. As the signal crossing is considered as traffic rule

violation, the development idea is extended to the automatic fine generation for the vehicles crossing the red signal. The fine amount for the red signal crossing is predefined in the code. If the vehicle with the RFID card was scanned during the Red Signal, the predefined fine amount will be automatically deducted from the owner s account and the intimation will be given to the owner through SMS (Short Message Service). And also, these data are transferred to the cloud. The entire system will be disabled when the signal is green. This system also proposes the idea of blue colour signal for the detection of ambulance. As the ambulance is an lifesaving emergency vehicle, the fine generation process is not allowed for that. So, the idea of blue signal is proposed where the signal automatically changes to the blue colour during the arrival of ambulance. The ambulance is detected by allocating unique tag id for the ambulance.

V CONCLUSION

The proposed system for automatic detection and penalty management of signal violation which will in turn help to decrease the number of accidents. The system also analyses the traffic flow on a given road at a given time according to the circumstances of the road. The proposed architecture is portable, accurate and can be installed at a reasonable cost. The system alleviates the need for traffic police at every signal to manually identify the violations. The system shows promising results on automatic detection, since the detection of the tag identification is more precise, reliable and efficient in active RFID, leading to implement corrective actions. The experiments are done using four test vehicles. The frequency of RFID reader is 125 Hz and the range of the RFID reader is 1 meter. In real time environment, if the average road lane is 3.5m, then approximately two 125 Hz readers are required for one road lane. Many vehicles may be moving nearby and possibly blocking or attenuating some of the RFID signals, especially with large vehicles like trucks. A possible solution is the use of RFID readers of higher frequency range since their reading range is high. This tool displays the details of polluted air in the developed mobile app and the same information is updated to the cloud. The data stored in the cloud can be further analysed to know the air quality according to the recorded region. This helps in knowing the major cause and pollutants contributing to the polluted air and suitable precautionary measures can be taken to overcome and minimize the air pollution. The major role of this project is to control the traffic lights from the ambulance and make clearance for its way of path automatically without any disturbance of public. The project is use to save the time of delay in most efficient to save the life.

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