# TRAFFIC LIGHT VIOLATION DETECTOR AND TICKET GENERATOR

Shubham Jain, Yuvraj Sharma, Varnika Sharma, Aayush Jain, Vanshita Manral

Chandigarh University AIT

# Abstract

Forestalling general petty criminal offenses isn't simple in streets these modern times because of the drivers who are indifferent to the consequences of not following simple traffic rules. This little infringement is one of the main sources for mishaps on our roads. We present a paradigm in this paper by weighing the existing system with our RFID traffic control system, that identifies and generates a e-ticket for the liable vehicle owner.

This framework depends on Radio Frequency Identification (RFID) innovation for recognizable proof of vehicles that are guilty of this transgression. The RFID reader that is attached to the traffic light poles will detect these vehicles and send an alert to a server present at the nearest RTO control room. This server will raise a fitting ticket for the infringement. Traffic stream is investigated by gathering continuous vehicle information and utilizing this information to keep the callous drivers.

# Introduction

Travel is a significant piece of the present quick paced life as everybody needs to move around for their day-to-day work. Travelling by road is most orthodox method exploited by the mortals these days, because of its straightforwardness, minimal effort and accessibility to common man. The simplicity of movement is influenced

by such factors as the nature of street, time taken, mishaps, speed, and so forth. The significant risk is the expanding number of mishaps every day. A mishap overview assessed that the number of annual road traffic deaths has reached 1.35 million according to WHO (World Health Organization) in December 2018. These misfortunes eat lives of many individuals as well as lead to financial loss of the nations. It accounts for more than 1.5 lakh individuals who were executed on Indian streets while the absolute financial misfortune inferable was incredibly high.

Absence of order and feelings of drivers cause traffic clogs which may encourage traffic infringement. Having a protected and free progression of traffic is urgent for monetary advancement of the nation as a guarantee of investing less of our time on the road by getting stuck in the traffic for a major part of the day, travelling from one place to another, is required.

For accomplishing this notion of upholding the traffic rules can be adhered by the assistance of this modern technology which may help us to put down these dissenters for good. This ideology represents a system to ensure that the drivers heartily follow the traffic rules. Manual following of each vehicle that abuses signals is the main issue of concern. This issue can be managed if the following can be automated alongside generating and communicating online tickets. This mechanism is more effective than the existing systems as these penalties can be paid online.

**Existing system**

Traffic control systems that are built on RFIDs, a framework named RFID tracking system for vehicles (RTSV) [2], wherein traffic blockage is diminished, and the log of vehicles is recorded.

Every vehicle is enlisted with a novel RFID tag and each sign related with a RFID reader. The areas of different RFID readers are put away in the database. Traffic at a sign is processed dependent on the length, width of the street, speed limit, number of vehicles and normal zone per vehicle. Utilizing this, the briefest course starting with that spot to the next is resolved. The framework condenses the clog and recognizes courses to help during emergencies, for example ambulances and fire brigades face difficulties to reach to their destinations due to heavy traffic hence, this subsequently disseminates the traffic over the city instead of some specific regions. A tag can be read by different readers to coordinate the recurrence of that tag. But the number on the RFID tags could be cracked by which the tags can be fabricated.

In the current frameworks, the following of sign infringement is actualized utilizing picture preparing procedures. The cameras utilize infrared signs to catch the number plates of the vehicles nonstop. The vehicle number is separated from the picture of the vehicle's number plate utilizing optical acknowledgment procedures.

These RFID based frameworks comprise of 3 principle segments, to be specific RFID Reader, RFID Tags and RFID Database [1]. The reader has a receiving wire that produces the radio waves. At the point when the label receiving wire comes quite close to the reader's range, it reacts to the reader with the special distinguishing proof number of that tag. Tags can be characterized into 2 sorts: active tags and passive tags.

In [4], RFID tags are applied in rapid railroads frameworks. Every vehicle is distinguished by utilizing unique RFID tag mounted underneath the railway car and acknowledged by the RFID readers mounted along the rail route tracks. The reader is associated with the railroad framework through a wired system. The readings about the tags are received by the readers and are further sent to the CPS unit to screen fast and rapid trains in their classes. Through this, arrival and departure of trains are accounted for. The full round- about time for the correspondence between the quick moving tags and the reader is reduced. RFID endures misfortune in getting readings through metals and fluids as they experience collisions and result in wrecking of tags.

In [3], RFID based traffic violation detection and traffic flow analysis system; passive tags are used to retrieve information from vehicle and type of signal from traffic light. And an algorithm calculates and updates the penalties for vehicles jumping red light. The penalty cab be fetched from the information publicly available on the traffic police forum. This information is collected by surveying the ongoing traffic via collection of real time vehicle count data and using data analysis techniques.

* 1. **Literature Review**

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| --- | --- | --- | --- | --- | --- |
| S No. | AUTHOR’S NAME | YEAR OF PUBLICATION | ATTRIBUTES | TECHNOLOGY IMPLEMENTED | SUMMARY |
| 1. | Raymond B. Morin | 2013 | RFID sensor, motion sensor | A system having a first motion sensor configured to sense movement of an object on a first side of a portal, the object including an RFID tag. | Method and system for controlling the traffic flow through an RFID directional portal |
| 2. | Ganquan | 2012 | RFID, Electronic tag | The invention provides a RFID based traffic violation lane-changing detection system, which comprises at least one electronic tag for storing vehicle identification information, a violation information acquisition terminal and a data centre. | RFID-based traffic violation lane-changing detection system |
| 3. | Sridhara Subbiah Ramasubbu | 2009 | RFID tags and reader | An RFID reader in the vicinity of each traffic signal in communication with the processor, a plurality of RFID tags in the vicinity of a license plate so as to be within communication range of an RFID reader at the intersection. | RFID reader enabled intelligent traffic signalling and RFID enabled vehicle tags (number plates) |
| 4. | Wan Jinlin | 2016 | RFID electronic tag, a traffic light collector, a mobile phone app, a handset and a server. | the vehicle-mounted module compares the RFID road tag information with a pre-stored traffic violation decision rule, judges whether the motor vehicle violates laws or not in real time according to the comparison result, and conducts real-time processing and broadcasting | Intelligent detection processing system and method for motor vehicle traffic violation |
| 5. | Liu Yingzhang | 2013 | RFID readers, Server, real-time clock | Dividing the RFID readers into a drive-in node group and a drive-out node group; reading the vehicle ID; judging the running direction of the vehicle by the monitoring server; judging whether the vehicle breaks rules and regulations by the monitoring server; and transmitting the received information and the judged result to the traffic management information network by the monitoring server. | Traffic violation detection system and traffic violation detection method for crossroads. |
| 6. | Yang Ming | 2013 | RFID, wireless module, auxiliary early-warning module | The invention provides an intelligent traffic light auxiliary system based on a vehicle road coordination technology and belongs to the technical field of intelligent traffic control. | Intelligent traffic light auxiliary system based on vehicle road coordination technology |
| 7. | Bruce B. Roesner | 2012 | RFID tags and reader, parking array | A location of the vehicle can be determined based on an association of the interrogation by the RFID reader with an identifier detected by the vehicle identification system. | Vehicle Detection System with RFID-Based Location Determination |
| 8. | W.Wen | 2008 | RFID reader and tags | According to the data collected from RFID readers and the best, second and third best traffic light durations generated from the simulation model, the automatic and dynamic traffic light control expert system can control how long traffic signals should be for traffic improvement. | A dynamic and automatic traffic light control expert system for solving the road congestion problem |
| 9. | W.Wen | 2010 | RFID reader, a passive tag, infrared sensors, server with a database system. | The system provides both practically important traffic data collection and control information and can trace criminal or illegal vehicles such as stolen cars or vehicles that evade tickets, tolls or vehicle taxes. | An intelligent traffic management expert system with RFID technology. |
| 10. | Harpal Singh | 2012 | RFID tags and reader. | 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. | Intelligent Traffic Lights Based on RFID and f Automatic Traffic Light Violation Detection system |
| 11. | Joshué Pérez | 2010 | RFID Technology, Hall-Effect based sensor | A new Infrastructure to Vehicles (I2V) communication and control system for intelligent speed control, which is based upon Radio Frequency Identification (RFID) technology for identification of traffic signals on the road, and high accuracy vehicle speed measurement with a Hall effect-based sensor. | An RFID-Based Intelligent Vehicle Speed Controller Using Active Traffic Signals |
| 12. | Amnesh Goel | 2012 | Wireless Sensor Network | An adaptive traffic intersection system based on Wireless Sensor Network where the traffic light of one intersection can communicate with the traffic light of the next neighbouring intersections and traffic clearance will be prioritized for special vehicles with the help of sensors. | Intelligent Traffic Light System to Prioritized Emergency Purpose Vehicles based on Wireless Sensor Network |
| 13. | A. Guerrero-Ibáñez | 2010 | RFID technology, auxiliary element. | .An intelligent algorithm based on the policy management model is defined and used as an auxiliary element for the coordination mechanism in order to form an adaptive control system with learning capabilities that allows a more fluid traffic and reduce some of the problems that the society face such as the average wait time and trip travel time and the average size queue per intersection. | A policy-based multi-agent management approach for intelligent traffic-light control |
| 14. | Songkran Kantawong | 2010 | RFID Technology, Image compression analysis | The time operation of the system emulates the judgment of a traffic policeman on duty or user that may have PDA nearby RFID traffic cone. The image compression present here is used along with RFID information to get a precise event data that composed of image encoding and decoding algorithms called wavelet transform with principle component analysis (PCA) via vector quantization tech. | Intelligent traffic cone based on vehicle accident detection and identification using image compression analysis and RFID system |

# Methodology

* 1. **Description of System:**

The proposed framework as shown in the figures for petty criminal offense detection involves three modules: reading data, that is stored in the RFID tag by RFID reader that is placed on the street's traffic signals, extracting data from RFID reader and traffic sign, and information evaluation in a server.

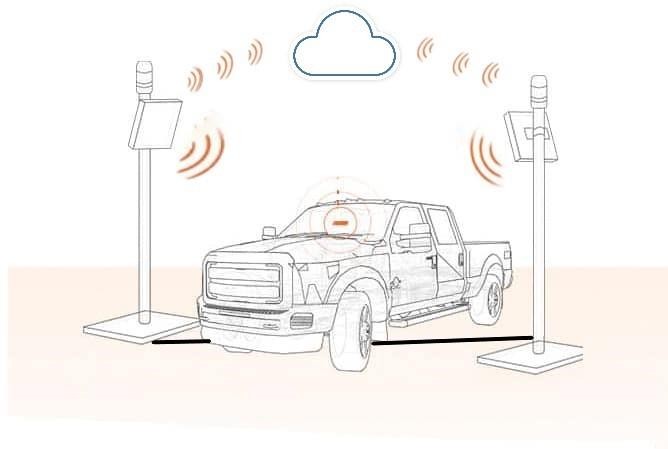


Figure 3.1.1

A drawing of a face

Description automatically generated

Figure 3.1.2

There are two sensorial sources of information: RFID identifications from passive RFID tags set in vehicles and sign from active traffic signals. The data about the vehicle is read using RFID tag readers. The RFID tag appended to the vehicle contains a microchip which has a unique tag number and vehicle number and proprietor's name, address, telephone number and email is attached to that tag number in the server at the RTO office.

The RFID reader which is a two-way radio transmitter-receiver conveys electromagnetic sign to these tags. The tag receiving antenna, which is tuned to get these waves, reacts by balancing the waves and sending it back to the reader which changes over the reaction waves into computerized information. An inactive RFID tag is utilized as it draws power from field made by the reader and utilizations it to control the microchip's circuits. Additionally, RFID reader has capacity to understand more than one tag reaction simultaneously, in this manner improving the general execution of the procedure. The status of the traffic signal is gained from the traffic light controller.In the choice stage, the information acquired in discernment stage is broke down. The information procured from traffic signal what's more, RFID reader are transmitted to the principle computer by means of remote correspondence. The Arduino Uno with worked in Wi-Fi module is associated with RFID reader and utilized for information correspondence.

The extricated information is pre-prepared, separated and examined. The sign transmitted to the server is changed over to twofold arrangement, 1 for red sign and 0 for green or yellow. The date and time of a vehicle crossing are recorded. The tag id, vehicle number, proprietor's name, telephone number, address and email id are likewise put away in the server. The server checks for the infringement of traffic signals. The RFID reader doesn't hail all vehicles crossing the sign.

For example, in an intersection, vehicles can turn left openly however not continue forward. Thusly, if a similar vehicle is experienced the second time by a neighbor RFID reader as appeared in above figure inside 10 seconds of time, it can't an infringement. The accompanying calculation is utilized to distinguish the petty criminal offense.

In the control activity stage, punishment is determined by the estimating for signal bouncing which is refreshed from the open gathering distributed by government. The determined punishment is refreshed alongside proprietor subtleties in a database. From the proprietor table, email id is separated, and a warning email is sent to the client with respect to their traffic rule infringement. Occasional warning will be sent on any fine update. The choice stage and control activity stage are executed as third module of the framework.

**Flow chart: Traffic Light violation detection**

**A close up of a piece of paper

Description automatically generated**

Figure 3.1.3

**Algorithm: Traffic Light Violation**

TS=TRAFFIC SIGNAL

VCT=VEHICLE COVERING TIME

IF TS1==1 then update the value of VCT3 and VCT4 with 10secs

ELSE IF any of the VCT except VCT3 AND VCT4 IS 1

THEN “FINE”

IF TS2==1 then update the value of VCT5 and VCT6 with 10secs

ELSE IF any of the VCT except VCT5 AND VCT6 IS 1

THEN “FINE”

IF TS3==1 then update the value of VCT7 and VCT8 with 10secs

ELSE IF any of the VCT except VCT7 AND VCT8 IS 1

THEN “FINE”

IF TS4==1 then update the value of VCT1 and VCT2 with 10secs

ELSE IF any of the VCT except VCT2 AND VCT1 IS 1

THEN “FINE”

A screenshot of a cell phone

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Figure 3.1.4

In the control action stage, penalty is calculated according to the pricing for signal jumping which is updated from the public forum published by government. The calculated penalty is updated along with owner details in a database. From the owner table, email id is extracted, and a

notification email is sent to the user regarding their traffic rule violation. Periodic notification will be sent on any fine update. The decision stage and control action stage are implemented as third module of the system.

# System Requirements

The accompanying equipment and programming segments were utilized to do the test:

* *ESP32:* It is capable of functioning reliably in industrial environments, with an operating temperature ranging from –40°C to +125°C. Powered by advanced calibration circuitries, ESP32 can dynamically remove external circuit imperfections and adapt to changes in external conditions.
  + - * *Jumper Wires:* are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with [breadboards](https://blog.sparkfuneducation.com/what-is-a-breadboard) and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn’t get much more basic than jumper wires.
      * *Breadboard:* Dimension: 6.5\*4.4\*0.3 inch. 2 Distribution Strips, 200 tie-points. Insertion Wire Size: 21 to 26 AWG wire.
* *RFID tags and reader:* Segolike 13.56 MHz RC-522 RFID Card Reader Writer Module Mifare RC522 for Arduino.
  + - * *LEDs:* LEDs are extremely durable and built with sturdy components that are highly rugged and can withstand even the roughest conditions.
* *Battery:* 9 volts.
* *Proteus:* The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation.
* *PHP by admin:* By default, the memory is limited to 128MB per request.

# Database

000webhost is an online server or a real time database, used to store information of the owners owning a vehicle. This server behaves like a virtual RTO which have information like owner’s name, mobile no., House address, RFID number, Email address. In this server we have two table maintained, one for the required information and other for fetching the data from the first table maintained.

It is necessary for all the owners to fill a mandatory form shown in Figure 1, in order to register to the virtual RTO.

A screenshot of a cell phone

Description automatically generated

Figure 3.2.1.1

Registration page of the data base.

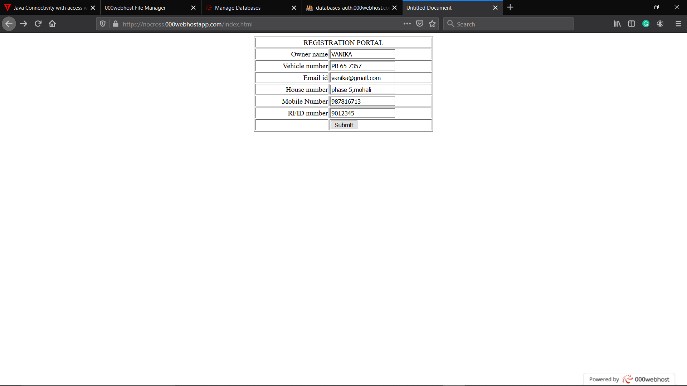


Figure 3.2.1.2: The information being filled by the user.

If anybody violates the traffic light the RFID reader scans the tag and captures the info the information is then matched with the table containing information of the owners and then fetches the data shown in the Figure 3.2.1.3.

A screenshot of a cell phone

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Figure 3.2.1.3: Data is being stored in database.

# Conclusion

We have proposed a framework system for programmed identification of vehicles and punish the executives of sign infringement which will thus assist with diminishing the quantity of mishaps. The proposed engineering is convenient, precise and can be introduced at a sensible expense. The framework lightens the requirement for traffic police at each traffic sign to physically distinguish the infringement. The system shows promising outcomes on programmed recognition, since the location of the tag ID is increasingly exact, dependable and productive in dynamic RFID, prompting execute restorative activities.

The recurrence of RFID reader is 125 Hz and the scope of the RFID reader is 1 meter. Progressively condition, on the off chance that the normal street path is 3.5m, at that point around two 125 Hz readers are required for one street path.

Numerous vehicles might be moving close by and conceivably blocking or constricting a portion of the RFID signals, particularly with huge vehicles like trucks. A potential arrangement is the utilization of RFID readers of higher recurrence go since their perusing range is high.

Therefore, the system framework is quite capable and efficient enough to distinguish the odd one and work as per the programmed path with no partiality and with least latency.

# References

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