

Automatic Toll Management and Penalty System Using number Plate Recognition

Prof. P.R. Shahane¹, Harsh Nimbijiya², Shubham Rathi³, Zaki Shaikh⁴, Tunisha Ujawane⁵

¹Professor, Dept.of Electronics and Telecommunication Engineering, Sinhgad Academy of Engineering, Pune, Maharashtra, India

^{2,3,4,5}Students,Dept.of Electronics and Telecommunication Engineering, Sinhgad Academy of Engineering, Pune, Maharashtra, India

Abstract – Automatic Toll Tax systems have really helped a lot in reducing the heavy congestion caused in the metropolitan cities of today. It is one of the easiest methods used to organize the heavy flow of traffic. When the car moves through the toll gate on any road, it is indicated on the RFID reader that it has crossed the clearing. The need for manual toll based systems is completely reduced in this methods and the tolling system works through RFID. The system thus installed is quite expedient reducing the time and cost of travelers since the tag can be deciphered from a distance.

Key Words: Image processing,, RFID card, Automatic Number Plate Recognition(ANPR), LCD.

1. INTRODUCTION

Automatic Number Plate recognition (ANPR) is a form of automatic vehicle identification. It is an image processing technology used to identify vehicles by only their number plates on Top. In this study, the proposed algorithm is based on extraction of top Bus number plate region, segmentation of plate characters and recognition of characters. ANPR can be used to store the images captured by the cameras as well as the text from the number plate. Systems commonly use infrared lighting to allow the camera to take the picture at any time of the day. ANPR technology tends to be region-specific, owing to plate variation from place to place. The most excellent advantage of this ATP system is that it is capable of eliminating congestion in toll plaza, especially during those seasons when traffic seems to be higher than normal.

1.1 Existing Scenario

A. Existing System

There are two methods of collecting tax presently used they are First is the traditional manual method where one person collects money and issues a receipt. The other one is the Smart Card method where the person needs to show the smart card to the system installed at the toll tax department to open the Gate.

B. Drawbacks of Existing System

Both the above mentioned method for collecting tax is time consuming method. Chances of escaping the payment of tax are there. It leads to queuing up of following vehicles.

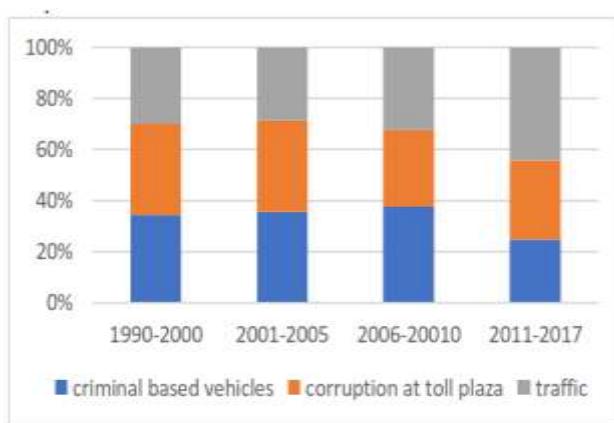


Figure: statistics of various activities taking place at toll plaza.

1.2 Objectives

- To study the various key components used like RFID, IR sensor, Microcontroller,etc
- To develop a Graphical user interface (GUI) in MATLAB.
- To study Image processing techniques and apply an algorithm for Number Plate Recognition.

2. Literature Survey

RFID has the potential to change an organization's ability to get real time information on the location of assets and even personnel. The use of RFID technology reduces operational costs by reducing the need for human operators in systems that collect information and in revenue collection.

The product presented in this paper is an investment in logistics. As goods are transported, the senders and the receivers are interested in knowing the location of the transporter in order to plan accordingly. This information can be accessible to the stakeholders in real time if a network of RFID enabled tollgates is put in place. This is achieved by building a network of RFID systems referred to as an EPC network. A complete EPC network consists of the RFID hardware connected to a backbone network of application servers and web servers. A computer hosting a specific RFID application pilots the reader and processes the data it send.

The information acquired from RFID hardware can be transferred to the interested parties without delay through the EPC network. The product discussed in this paper reduces delays that may happen if hard cash is used at tollgates. A prepaid system ensures that a paid up vehicle does not have to stop at a tollgate. The sensor is positioned at a position where it can read the information about a vehicle before it reaches the physical barrier and if it is paid up, the barrier opens and the vehicle will pass. Such a product eliminates the need to pay cash at the tollgate and this is very safe and convenient. The product described in the paper uses a mechanical boom gate which receives instructions from a microcontroller. The instruction from the microcontroller is dependent on the status of the vehicle's account as reported from the RFID system.

3. Proposed System

This project gives the simplified procedure to passengers to pay toll at toll booths by making them automated and tracking over the crime based vehicle. All these activities are carried using single RFID tag thus saving the efforts of carrying money and records manually [5].

A. Automatic Toll Collection: The RFID Readers mounted at toll booth will read the prepaid RFID tags [4] fixed on vehicles' windshield and automatically respective amount will be deducted. If the tag is removed from the windshield then cameras fixed at two sites at toll plaza take snaps of the front and back number plate. Since every vehicle registration ID is linked to users account, toll can be deducted from the account bank directly.

B. Tracking Over the crime based Vehicle: Vehicle travelling are tracked with 100 % accuracy.

4. Algorithm

Number plate recognition Algorithm-

The number plate is normalized for brightness and contrast, and then the characters are segmented to be ready for OCR. There are six primaries algorithms that the software requires for identifying a license plate:

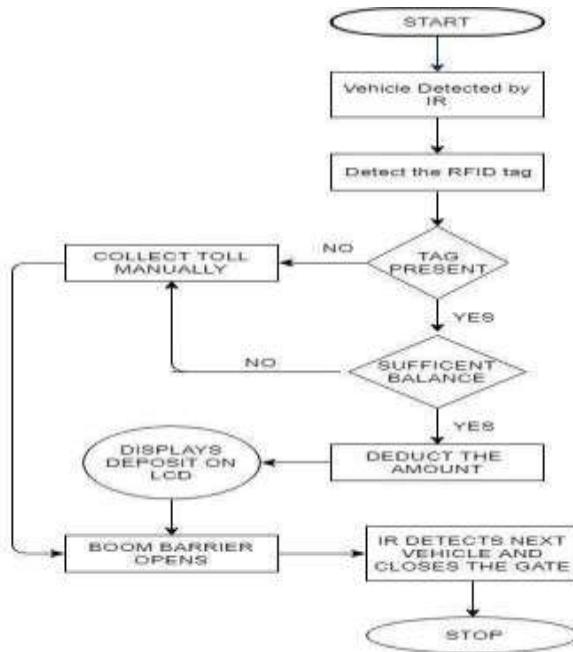
Plate localization and preprocessing – responsible for finding and isolating the plate on the picture. In this process the captured RGB image is converted to binary format, then filtering is carried out to eliminate the unwanted noise.

Plate orientation and sizing – compensates for the skew of the plate and adjusts the dimensions to the required size. In this process the plate is isolated from the image and the image of the plate is resized. The centroid of the first number is located and the plate is cropped accordingly.

Normalization – adjusts the brightness and contrast of the image. This process is carried out to make the numbers more prominent than the background. **Character segmentation** – finds the individual characters on the plates. In this process the individual numbers are cropped using region properties (area, centroid) and bounding box.

Character recognition using neural networks -

In this process the neural network is pre-trained with several fonts to identify the actual cropped number images.



5. Methodology:

Here whenever the IR (infra-red) sensor is detected the µC will wait for some time to read the RFID card. If the RFID card is not detected, then it is assumed that the user is going to manually (Post-paid toll). If a RFID card is detected, then the user is using a prepaid toll system.

Post-paid Toll system:

For post-paid toll system the attendant will manually press the button for recognizing the vehicle Number plate. The MATLAB will take the number plate photo. Then using neural network algorithm, we will identify every number and alphabet one by one. Once the full number is recognized then the MATLAB will compare the vehicle number with the database already stored in MATLAB. If match is found, then an SMS is to the owner's Mobile with an E-ticket of toll. If the number matches in the black listed database, then an automated SMS will be sent to the base station.

Pre-paid Toll system:

A passive RFID tag is installed on each vehicle who have deposited a prepaid amount. The reader is installed near the toll booth. The reader device reads this data when near to toll system from the vehicle and sends the RFID data to PC via RS232. On PC we have the MATLAB s/w. The MATLAB s/w compares the RFID with the data in the computer database, if Id matches then the toll is cut from the balance of the user. The system is connected to a PC using the RS232C interface in the embedded system. This allows the system to read and write data from/to a database that is from the account.

When any vehicle pays toll then the MATLAB will automatically take a picture of the Number plate. Using the Neural network algorithm, the number plate is recognized. Then the number is compared to the data base in MATLAB. If match is found, then an SMS is to the owner's Mobile with an E-ticket of toll.

The PC will send an SMS to the user using the "AT" commands through USB cable. The "AT" commands are used to initialize the mobile and send an SMS.

Here we are designing Traffic Crime Control Using ANPR, Vehicle has webcam so capture the number of the plate and matched that number with the RTO server and automatically send vehicle owner a message to pay charges.

6. System Testing



Figure : The Proposed System of RFID toll tax

6.1 Actual Work

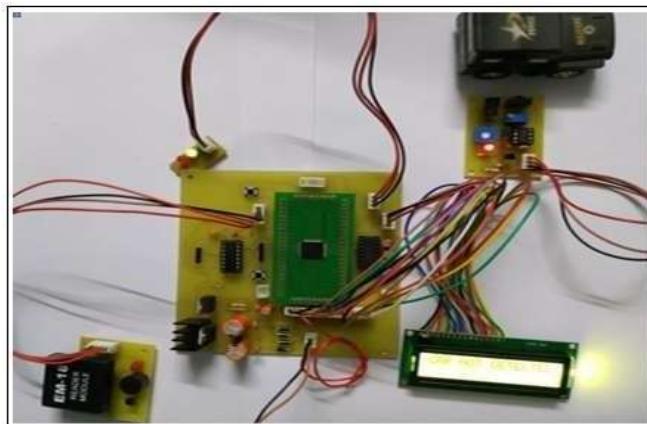


Figure 6.1.1: When vehicle is not Present at the Toll Station

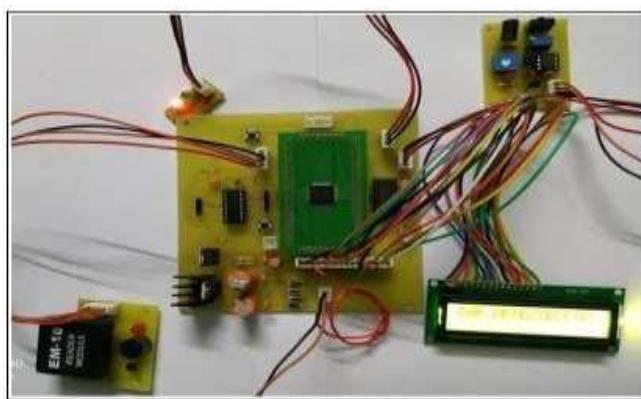


Figure 6.1.2: When the vehicle approaches at the Toll Station.

7. CONCLUSIONS

- By doing automation of toll plaza we can have the best solution over money loss at toll plaza by reducing the man power required for collection of money and can reduce the traffic indirectly resulting in reduction of time at toll plaza.
- Our system is a user-friendly toll free method which can save time and reduce traffic congestion at toll gates and provide solution for users to reach their destination without wastage of time. It can be used to remove all

drawbacks with the current system such as time and human effort and it also doesn't require any tag only requires best quality camera and fixed font number plate. The main drawback of our paper is oriented number plates and false detection of objects in segmentation step. The future research of ANPR should concentrate on multi style plate recognition, oriented plates, high definition plate image processing, ambiguous character recognition.

- In our project, we have introduced the Automatic Number Plate Recognition (ANPR). This technique will include the image processing technology used to identify vehicles by their number plates.

REFERENCES

1. A study on Electronic Toll Collection Systems in Expressway in Sri lanka Conference Paper · August 2015 Lalith Edirisinghe CINEC Maritime Campus, Dilrukshi Hewage University of Colombo.
2. IMAGE PROCESSING BASED TOLL AUTOMATION USING ANPR 1Kavya.S, 2Mutturaj Hubballi, 3Priyanka.B.N 1,2,3Department of Electronics & Communication Engineering, BMS Institute of Technology and Management, 6446 Doddaballapur Main Road, Avalahalli, Yelahanka, Bangalore, Karnataka 560064, INDIA 2015
3. RFID based toll collection system, 2011 IEEE third international Conference. Atif Ali Khan ; Adnan I. Elberjaoui Yakzan ; Maaruf Ali