



# Automated Toll Collection System Using Optical Character Recognition

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**ABSTRACT:** Now a days there is a huge rush at the toll plazas in order to pay the toll tax. On any toll plaza the vehicle has to stop for paying the toll amount. Hence we are trying to develop a system that would pay the toll amount automatically and reduce the rush at the toll plaza. In our system user registration is done with information like name, address, mobile number, vehicle plate number, vehicle type, etc. Camera is used to capture number plate of vehicle. System will check the database, if match is found then toll amount will be deducted from the user's account and then gate will be open. Notification will be sent to the user via message. Our system is able to count the total number of vehicles that are passing through the toll plazas. By doing automation of toll plaza we can have the solution over money loss at toll plaza by reducing the man power required for collection of money and also can reduce the traffic at toll plazas which indirectly resulting in the reduction of time at toll plaza.

**KEYWORDS:** Toll, Camera, Image, Number Plate, Vehicle

## I. INTRODUCTION

We are proposing a new approach for toll payment at the toll plazas. As we all know that development of any country depends upon its infrastructure like an express highway, for physical movement. But we experience a long queue or large rush at each toll plazas on expressway which wastes a lot of journey time, fuel. Initial toll collection system being manual in nature and time consuming, it leads to traffic congestion, pollution. Quite obviously, this process makes it necessary for the manual services to be worked continuously through the day and night. Ever increasing need for efficient, reliable and safe toll tax payment along with image processing resulted in the development of different kinds of solutions. In our project "Vehicle counting and automated toll collection system using image processing" as the name describe infrastructure. "Automated Toll Collection" the main aim of our project is the automation. So here we will just take over look of what is mean by automation. The word Automation indicate that replace the human being from the process with the machine. It means what presently the human is doing on the process now onwards the same work machines are going to do. Automatic Toll Collection System using image processing aims at successfully removing unnecessary traffic delays, faster and reliable processing etc.

## II. RELATED WORK

A. "Receiver Autonomous Integrity Monitoring of GNSS Signals for Electronic Toll Collection", Daniel Salós, Anaïs Martineau, Christophe Macabiau, Bernard Bonhoure, and Damien Kubrak with, *iecc transactions on intelligent transportation systems*, vol. 15, no. 1, february 2014.

In this paper they developed the electronic toll collection system which is based on user position estimated with GNSS that is Global Navigation Satellite System. This system uses receiver autonomous integrity monitoring (RAIM) which are algorithm run within the GNSS receiver and hence are easier to tune to ETC need than other system based on external information. They mainly focuses on ETC systems in urban and rural environments based on GNSS positioning. GNSS-based ETC schemes are particularly interesting because they are free-flow highly flexible systems with a reduced quantity of roadside



**B. “Automated Toll Collection System Using RFID”, Pranoti Salunke, Poonam Malle, Kirti Datir, Jayshree Dukale with IOSR Journal of Computer Engineering**

In this paper, they developed the system using RFID technique in which vehicle is identified with the help of radio frequency. Each vehicle has the RFID tag. And this RFID tag has a unique identification number which is assigned by the RTO or traffic governing authority. System will store all the basic information of the owner, and the amount that has to be paid for the toll tax along with this number. The RFID reader will be placed strategically at the toll plaza. When the vehicle crosses the toll plaza, the toll amount based on vehicle type will be deducted from user's account balance and new account balance will be updated. If the user has insufficient balance, they uses the alarm which will alert the authority that the vehicle have insufficient balance and that particular vehicle can be trapped. The advantage of this system is RFID tag can not be cloned so can not be cheated and it is less costly. The disadvantage of this system is RFID tag are vulnerable to electro static discharge damage.

**C. “Electronic toll collection system using barcode laser technology”, Sanchit Agarwal, Shachi Gupta, Nidheesh Sharma with International Journal of Emerging Trends & Technology in Computer Science (IJETTCS) Volume 3, Issue 2, March – April 2014**

They developed the electronic toll collection system using barcode laser technology. This system uses barcode. Initially user information embedded on barcodes which are mounted on the number plate of vehicle. When the vehicle passed through the toll booth, information is read by barcode reader and toll is deducted from the user's account. This system make the payment without using the cash manually and save time. The disadvantage of this system is that it takes more time for sending the signal to barcode and retrieving the information from Barcode. pollution and wasting fuel and money. Another method is automated coin machine which is also time consuming process. One more existing method is prepared card toll collection which avoids wastage of time and little bit good in management but it does not provide security as anyone can utilize the card. Hence, to overcome the drawbacks of existing systems, thus we need to create more advanced automated toll collection system as a solution. The concept of automatic toll collection has been studied since 1992 and is based on the RFID Tags. The research paper titled “Electronic Toll Collection System Using Passive RFID Technology” gives the overview of the toll collection system using RFID. The concept is based on existing toll booths; however human intervention is no longer required. The vehicles will be given a passive tag in the form of a sticker which could be affixed on the windshield, just like in the existing road tax system.

### III. PROPOSED METHODOLOGY

The proposed system provides a base for implementing automatic number plate detection using image processing for toll collection at toll checkpoints. This system will help in saving time as well as help in reducing congestion at toll checkpoints. This system will also help in monitoring any fraudulent behaviour that takes place at the toll checkpoints. The proposed system will capture an image placed at the toll checkpoint and will perform certain processes to detect the number plate of a vehicle.

Following are the steps that needs to followed to detect a number plate.

A. Image Acquisition

B. Image Pre-processing

C. License Plate

D. Character Segmentation

E. Character Recognition

Step 1 : With the help of a camera, the number plate of the vehicle will be captured.

Step 2 : The number plate of the vehicle will be processed using an image processing technique.

Step 3 : Once the license number is extracted from the overall image, it will be compared and searched in the centralize database and the respective vehicle owner's details will be fetched.

Step 4 : Along with the details, it will also check whether the owner of the vehicle obtains a smart card.



Step 5 : If the possession of the smart card does not exists, then go to step 7. Else check for the validity of the card.

Step 6 : If the card is not valid, then go to step 7. Else the toll amount will not be deducted from the vehicle owner's bank account.

Step 7 : Toll amount will be deducted from the vehicle owner's bank account.Using the proposed system mentioned above, the overheads of toll collection at the toll checkpoints will be minimised. This system helps in keeping a tab on the total toll amount collected.

#### IV. DESIGN

The overall system is based on scanning the number plate very precisely and then capture the image of the number plate. For efficient capturing of image the camera should be placed perpendicular to the vehicle. Then after capturing, the image is processed using OCR (Optical Character Recognition) technique which will convert the image containing text and number to machine-encoded language. The OCR technique used for image processing has several steps:

- A) Acquisition of image
- B) Conversation of image into grey image
- C) Dilation the captured image
- D) Horizontal edge and vertical edge processing
- E) Segmentation of image for region of interest
- F) Extraction of the required image from region of interest
- G) Conversation of image into binary image
- H) Segmentation of image in alphanumeric characters
- I) Recognition of individual character in the extracted image

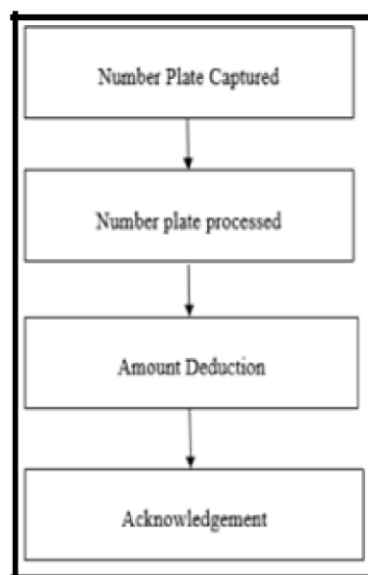


Fig1.Flow Of The System



**Algorithm:**

- Step 1: Start.
- Step 2: Capture image of the number plate of the vehicle passing the toll booth.
- Step 3: Detect the number plate from image.
- Step 4: Convert the number plate image to text.
- Step 5: Extract the number plate text.
- Step 6: Compare the extracted text with the register number plate in database.
- Step 7: Check extracted text == register number plate.
- Step 8: If match found then check balance, if no match found go to step 12.
- Step 9: If sufficient balance available go to step 10, if not go to step 12.
- Step 10: Deduct toll amount
- Step 11: Transaction of toll.
- Step 12: Manual payment of toll.
- Step 13: End.

**V. RESULTS**

Test case	Test Case Name	Output	Result
TC1	Image Of Number Plate Obtained	Clearly Obtained	pass
TC2	Number Plate Should be Readable	Readable	pass
TC3	Convert Image In Grey Scale	Image Converted	pass
TC4	Extract Text From Gray Scale Image	Text Extracted	pass
TC5	Extracted Text Should be Valid	Text is registered in database	pass

**Test Case Table**



➤ **Number plate detection phase:**

The following stage/phase is the number plate recognition phase that does several functions such as resizing of the image to a feasible aspect ratio. As well as converting the colored image into a grey scale, image. Number plate detection searches an input image in order to identify specific features that contain the number plate. The number plate can be found anywhere within an image, it is impractical to check all the pixels of the image in order to locate the number plate. Therefore, we only focus on those Pixels that have the number plate.



Fig 2.Number Plate Detection

➤ **Gray scale conversion:**

It involves conversion of color image into a gray image as shown in the fig 5.2. The method is based on different color transform. According to the R, G, B value in the image, it calculates the value of gray value, and obtains the gray image at the same time.



Fig 3.Gray Scale Conversion

➤ **Extracted Number plate:**

In this phase the number plate is recognized as shown



Fig 4.Extracted Number Plate



## VI.CONCLUSION AND FUTURE WORK

The simulation results showed that the proposed algorithm of Number Plate Recognitions using OCR is executed well. Thus a system for Image Processing Based Automatic Toll Collection is very secure and highly reliable and can be obtained easily. It can be used to remove all drawbacks in the current system such as time and human effort. It also doesn't require any tag, it only requires a best quality camera and a fixed font number plate. Automatic Toll Collection System using Optical Code Recognition technique is cheap as compared to RFID Tags and avoids the chances of forgery. In addition, it provides faster processing, avoids traffic congestion, pollution and an efficient toll collection system.

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