International Journal of Innovative Research in Engineering
Volume 3, Issue 2 (March-April 2022), PP: 78-82
www.theijire.com
ISSN No: 2582-8746

E-Toll Management System

Kirankumar Vasala[1], Mayuresh Jadhav[2], Anuja Nilak[3]
[1,2,3]A C Patil College of Engineering/ Mumbai University, India.

How to cite this paper: Kirankumar Vasala1, Mayuresh Jadhav2, Anuja Nilak3, "E-Toll Management System", IJIRE-V3I02-78-82.

Abstract: *This paper entitled Electronic toll collection system based on Radio Frequency Identification System explained in detail based on current issues at toll collection system. There are some obstacles faced every day where the users spend their valuable time in queues at toll gates due to traffic congestion as well as using traditional manual methods in most existing toll ETC systems to collect toll from road users. Besides that, the barrier design where each vehicle stops waiting until barrier lift which considers the source of time delay. To tackle stated problems, an electronic toll collection system is proposed which is based on RFID technology. The integrated system which consists of basically two main sections, electronic sides where all the input data is received from while the database management office is where all necessary information is stored. To compare the current ETC system, this research elaborated on the internet of things where all data is transmitted through the cloud and then to the main office in real-time. Not only that, there is some enhancement based on barrier design where the gate remains open for all vehicles with sufficient tags without requiring to stop to eliminate time delay. By checking system throughput compared to existing toll systems, various tests have been carried out in different methods of the current system.*

I. INTRODUCTION

Automatic toll collection using Optical Character Recognition (OCR) aims at successfully removing unnecessary traffic delays, faster and reliable processing, and transaction of toll tax aiming to go cashless. In this, OCR is a widely used technology that converts scanned images of printed text, handwritten text characters into machine-encoded text information such as ASCII. It has three major parts: vehicle number plate extraction, character segmentation, and OCR. Number plate extraction is that stage where a vehicle number plate is detected. The detected number plate is pre-processed and then the result is passed to the segmentation part to segment the individual characters from the extracted number plate. The segmented characters are normalized and passed through an OCR algorithm. At last, the optical character information will be converted into encoded text. The characters are recognized using Template matching. The final output must be in the form of a string of characters along with the comparison of the characters (number plate) with the database for a successful transaction of toll tax.

II. EXISTING SYSTEM

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 an 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 attached on the windshield, just like in the existing road tax system. Each time the vehicle passes the toll booth, the tag will be read and information will be transmitted to the main computer. The tax amount will be either deducted by prepaid or credited by postpaid. Using RFID in this identification is done with the help of radiofrequency. A vehicle will hold an RFID Tag. The reader will be strategically placed at the toll plaza. When the vehicle passes the toll Naka, the tax amount will be deducted from his prepaid balance.

III. APPLICATIONS

- Applicable at toll roads or highways- The proposed proposal is for the toll booths to make them automotive and advanced for the time saving and it is applicable really for the toll roads.
- Applicable at parking areas – The parking areas at companies having regular employees for that the amount of parking is will get possible to deduct by the e-wallet system.
- Applicable in stolen vehicle identification- The stolen vehicles are getting caught up with the help of the image processing domain, by matching the passing vehicle number plate with the police admin database.
- E-Wallet system applicable at the parking areas- The amount deduction is getting applicable at parking areas for overcoming the problem of vehicle congestion.

IV. OBJECTIVE

- Automation of toll collection.
- Design an efficient Optical Character Recognition technology for image processing.
- To minimize traffic congestion near toll booths across roads and highways.
- To increase the digital payments across the country, supporting the cashless economy.
- The Automatic Toll Collection using Optical Character Recognition (OCR) aims at successfully removing unnecessary traffic delays, faster and reliable processing, and transaction of toll tax aiming to go cashless.

V. LITERATURE SURVEY

A] Automatic Number Plate Recognition (ANPR) System: Proposed by Shriram Kishanrao Waghmare, A. K. Gulve, Vikas N. Nirgude that automatically recognizes the number plate of the vehicle. In this paper a proposed approach is present. It is considered the Indian number plate, where the rear follows the number plate standards. This system consists of a few algorithms like "Feature-based number plate Localization" for locating the number plate, "Image Scissoring" algorithm for character segmentation, and proposed algorithm for character recognition using Support Vector Machine (SVM). The system can recognize single or double line number plates. An algorithm for license plate recognition (LPR) applied to the intelligent transportation system is proposed based on a novel shadow removal technique and character recognition algorithms. This paper has two major contributions. One contribution is a new binary method, i.e., the shadow removal method, which is based on the improved Bernsen algorithm combined with the Gaussian filter. This paper also presents improved techniques for image tilt correction and image gray enhancement which helps to detect the number plate correctly.

B] Automated Toll Collection System Using RFID: Proposed by Satyasrikanth P, Mahaveer Penna, and Dileep Reddy Bolla Automatic. It will be one of the easiest methods used to organize and maintain the heavy flow of traffic in the growing population. When the car moves through the toll gate on any road, the system captures the RFID tag and the amount is deducted through the system. The actual need for manual toll-based systems has been completely reduced through this method and the tolling system works through RFID tag. The system thus installed is quite amazing which reduces the time and cost of travelers since the RFID tag can be deciphered from a distance.

C] Number Plate Detection with Application to Electronic Toll Collection System: Proposed by Akanksha Waghmare. The detection of the number plate is the part of the image processing domain, the detection of the number plate is done with the help of the camera and then process by using the OCR image processing algorithm and the collection of the toll is with the help of RFID system is done here.

D] Automated Toll System for Number Plate Detection and Collection: Proposed by Ankita Bhore, Bhawana Nimbhorkar, Punam Pure, Priya Thombre, the report is to overcome the drawback of vehicle congestion, money corruption, time consumption, and stolen vehicle. It uses the technique called image processing to detect the number plate and input the video and have the collection of number plates in the video.

VI. SCOPE

- The concept of automatic toll collection has been studied since 1992 and is based on the RFID Tags.
- The concept is based on existing toll booths; however human intervention is no longer required.
- The vehicles will be given a RFID tag in the form of a sticker which could be affixed on the windshield, just like in the existing road tax system.
- Every time the vehicle passes through the toll booth, the tag will be read and information will be transmitted to the main computer through the management system.
- The tax amount will be either deducted by prepaid or credited by postpaid. Using RFID in this identification is done with the help of radiofrequency.
- A vehicle will hold an RFID Tag. The reader will be strategically placed at the toll plaza. When the vehicle passes the toll Naka, the tax amount will be deducted from his prepaid balance
- Our System will capture the car number plate image and deduct the amount.

VII. PROPOSED SYSTEM

- The overall system is based on scanning the number plate very precisely and then capturing the image of the number plate. For efficient capturing of the 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 numbers to machine-encoded language. The OCR technique used for image processing has several steps:

A) Acquisition of image
B) Conversation of an image into gray image
C) Dilation of the captured image
D) Horizontal edge and vertical edge processing
E) Segmentation of image for the region of interest

F) Extraction of the required image from a region of interest
G) Conversation of an image into a binary image
H) Segmentation of image in alphanumeric characters
I) Recognition of individual character in the extracted image Due to which, only the character and number are recognized and other parts of the plate are eliminated. Once we get the extracted data, it is compared with the database. As the vehicle number is linked with the user's bank account, the toll amount is automatically deducted from his account.

HARDWARE & SOFTWARE REQUIREMENTS

Hardware:

- Minimum hard disk space required 500GB
- Minimum RAM required 2GB Processor Intel Core i3
- Operating system Windows 7,8,10

Software:

- Python 2.7
- XAMPP
- OpenCV

VIII. DESIGN DETAILS

➢ Modules under Proposed System

1. Number Plate Capturing
2. Number Plate Processing
3. Amount Deduction
4. Acknowledgement

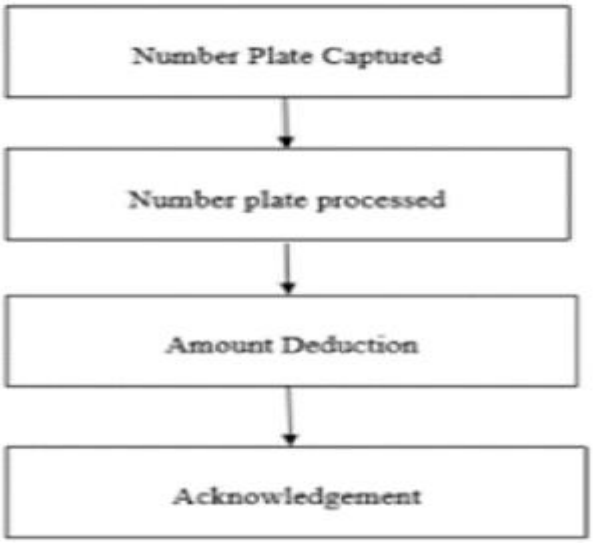

Figure 1.1

➢ DFD [Data Flow Diagram]

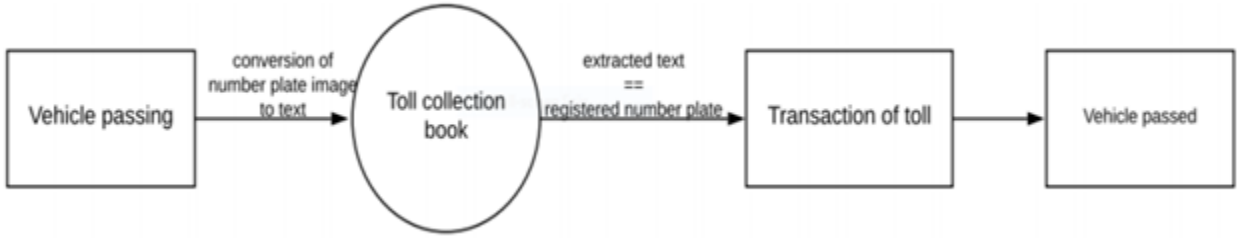

Figure 1.2

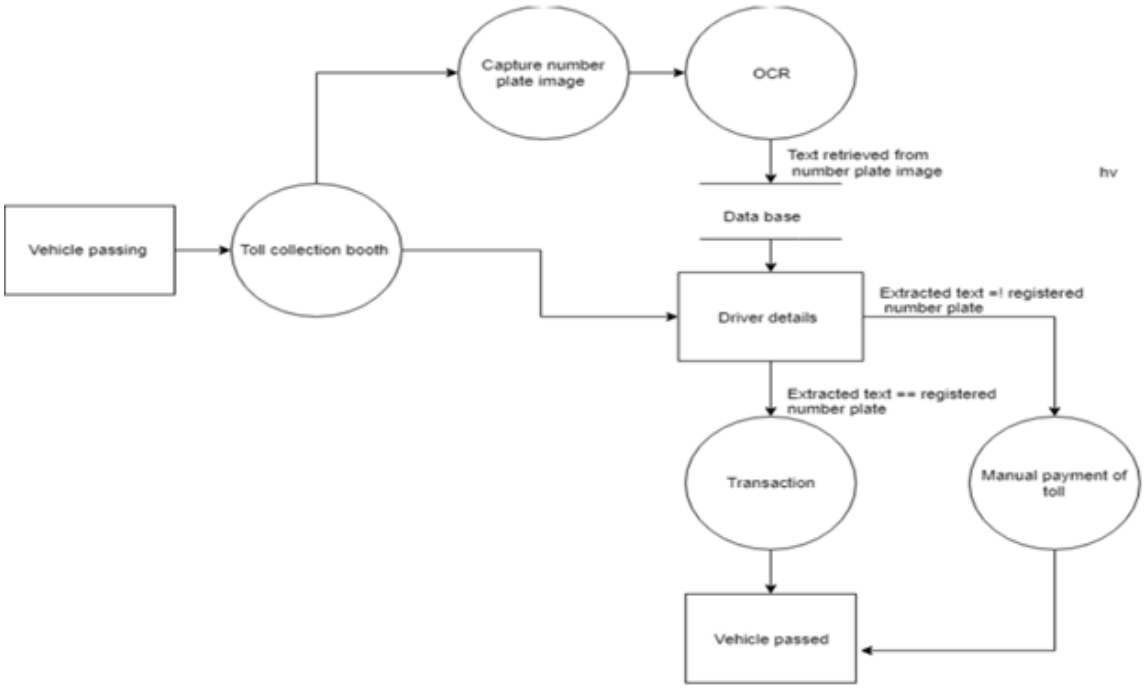

Figure 1.3

- **Block Diagram**

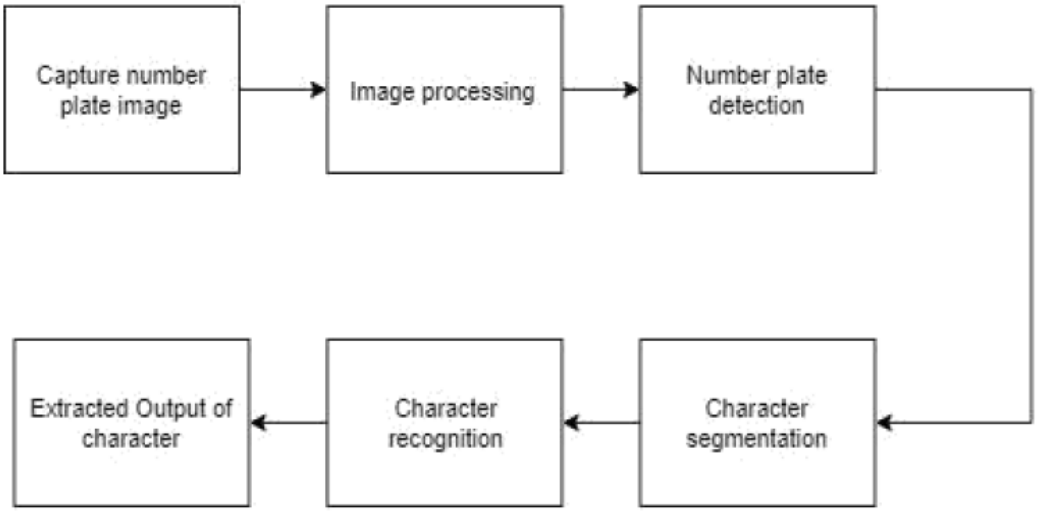

Figure 1.4 Block diagram for the number plate detection

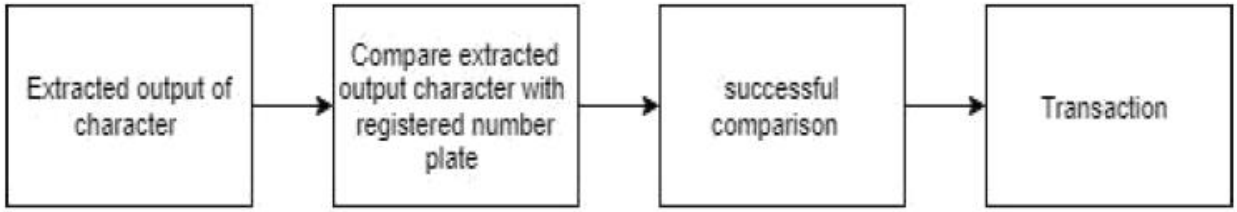

Figure 1.5 Block diagram for the transaction process

IX. CONCLUSION

- The simulation results showed that the proposed algorithm of Number Plate Recognition 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 the best quality camera and 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 has an efficient toll collection system.

X. FUTURE SCOPE

The automatic toll collections systems eliminate manual operations by toll receivers and payers, the demand for automatic toll collection is likely to witness an upsurge. Cashless transactions offered by automatic toll collection systems do not only save travel time but also minimize traffic congestion near toll collection booths across highways. The need for multiple toll plazas is ruled out owing to the installation of an automatic toll collection system, saving additional costs. As we are using automatic toll collection using the OCR technique, we are eliminating the high installation costs. Many emerging economies are increasingly addressing the need to adopt time and cost-efficient automatic toll collection systems throughout the major cities. In India, the National Payments Corporation of India has been encouraging several highways to install automatic toll collection systems to increase digital payments across the country, supporting the cashless economy initiative of the government.

XI. MERITS

- It is reliable and an efficient toll collection system.
- No Traffic congestion as the process is fast.
- Reducing the number of personnel required for toll collection.
- It does not require any special tag such as RFID tags.
- It is cheaper as compared to RFID technology.

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