

**License Plate Recognition**Sukanya Rane¹, Leelawati Gaddam², Jayashri Baspure³, Priyanka Gagare⁴, Amol Baviskar⁵^{1,2,3,4,5}Computer, BSIOTR

Abstract —License plate detection is important and fastest growing technology in Intelligent Transportation System (ITS).The license number can be detected by various techniques like by using Artificial neural networks, plate localization and feature extraction and other basic image processing techniques. In this paper we perform Optical Character Segmentation (OCR) on the captured image. Different steps of OCR viz. gray scaling, blurring, thresholding, segmentation are applied on the image. Through template matching, the characters on the number plate are matched with the template characters stored on the local database. Finally the character numbers are recognized. The detected number is used for checking the billing account of user vehicle at toll plazas. Thus the application of license plate recognition is applied for maintaining the records and billing at tolls.

Keywords- ITS, feature extraction, OCR, template matching, database, toll plazas

I. INTRODUCTION

License number plate recognition system is advanced in surveillance of vehicles at toll plazas and car parking. The system is used to detect the vehicle number that will help for gathering statistics on road or at a check point for custom checking. The system takes the images of the different vehicles of any size. The image is broken into smaller pieces of image. Thus the exact location of license number can be located by analyzing the image pieces. Once the area of the character numbers is determined, the plate is then further processed.

The characters are extracted from the plate by parsing it. These characters are given to OCR (Optimal character Recognition) module for detecting characters. OCR program recognizes the characters where they are converted in the form of text. The important application of number plate recognition system is managing the toll collection, billing and maintaining individual vehicle's database record. A centralized server is prepared for storing and checking the user vehicle records. A new vehicle is register in that centralized server. When any vehicle passes by a specific toll, the license number will be recognized, which will help to search the record of the vehicle in the server. And thus the individual billing account can be handled.

II.LITERATURE REVIEW

HaoWooi Lim and Young HaurTay worked for license plate character detection technique in nature scene by using the technique of MSER and SIFT [1]. Since in past decades to implement ANPR system many researchers have used high end desktop PC and high resolution camera for recognizing number plates. For ANPR, template matching optimization is implemented on the phone based on Android, this phone is used in Malaysia for detecting number plates, whose accuracy is 97.46% [2]. Guanghan Ning et.al tested the licensed plate on 200 image plates in China under different weathered and lightning conditions, with a rate of detection=100% [5]. With MSER, it is effective to identify the license plates of different size, angles and viewpoints. On this basis, Wei Wang, QiaoJing Jiang, Xi Zhou et.al tested about 450 images of size 720*450 in complex background and the rate of detection is 83.3% and the detecting time per vehicle image. They also worked on vehicle face library extracted from one video sequence, where 159 vehicle face images of size 322*131 were tested, with the rate of 95.6% and 40ms is the detecting time per vehicle [5]. One reference document reported the vehicle number plate detection using OCR technique[7]. A method using texture information of license plate region as a feature [2] was proposed with an accuracy of 98.5%[8]. To texture information of license plate clearer, a technique based on obtaining horizontal image difference was presented in [10]. This method however is

sensitive to the license plate dimensions and is not robust enough to handle all practical.

III. SYSTEM DESIGN

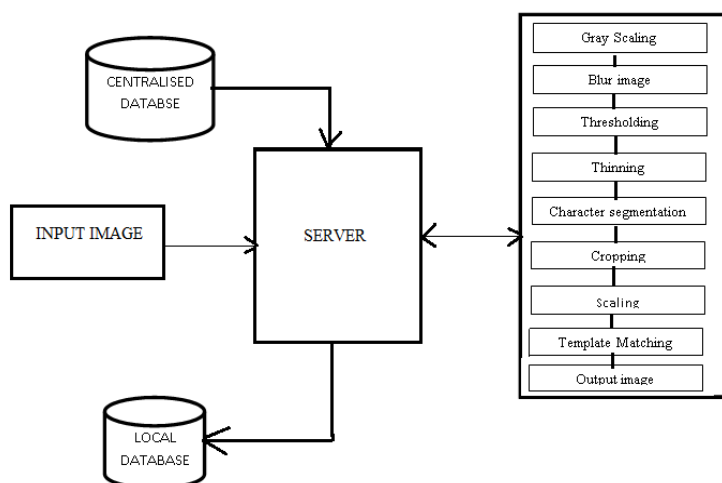


Figure1: Block diagram of License Plate Recognition

In our system, we are going to take the image of the number plate of any type of vehicle through the web camera. Various methods will be applied on this image such as grayscaling then the image is blurred. After this the blurred image and then thresholding is done and then thinning and then finally OCR technique is applied. The goal of Optical Character Recognition (OCR) is to classify optical patterns corresponding to alphanumeric or other characters. The process of OCR firstly involves character segmentation, secondly scaling, thirdly cropping and then finally we move to template matching. Then if the image is new image then the image is stored into the database.

Vehicle number plate recognition system has three main components in it.

1. Breaking the image into smaller pieces of images which are the high frequency parts of the original image.
2. Choosing the number plate from the image pieces returned by the above module, and parsing the plate to extract out the character part.
3. Recognizing the characters in the image pieces.

IV. IMPLEMENTATION

On the input image the following algorithms are performed. In this algorithm, each color pixel is described by a triple (R,G,B) of intensities for red, green, and blue. To map this to a single number giving a gray scale value we have following steps the lightness method, the average method, the luminosity method. Then the image is blurred to remove the unwanted interrupts. After that the blurred image should be binarized after that its row wise histogram is taken to find out which number of rows is showing ridges. The threshold value is used to indicate the starting and ending point of the ridges. In this the average of the minimum value is taken as the threshold value and then once the ridges of the image are obtained then the column wise pixels are calculated. This will further refine the image by removing those columns from the row ridge which do not possess much detail. After this all x and y coordinates of all high frequency pixels are known. We need to pick each ridge in the histogram therefore the minimum value of the histogram was chosen as the thresholding value.

Then finally the OCR technique is applied on the image. The characters are segmented pixel by pixel, then the image is cropped in few cases to get select the exact part. Then finally comes to template matching algorithm in which the following steps are performed.

1. Build a template for each of the letters to be recognized. The first approximation for a template is to the intersection of all instances of that letter in the number plate. However, more fine-tuning of this template must be done for good performance.
2. Erode the original image using template as structuring element: All 1 pixels in the resulting image correspond to all matches found for the given template.
3. Find the objects in the original image corresponding to these 1 pixels.

Then finally the output image is obtained and then it is stored into the database.

V. RESULT

We have designed a system for number plate detection with toll collection application. So the application runs on two machines ie. a client and a server.

The following are the different resultant forms showing working of the toll application system.

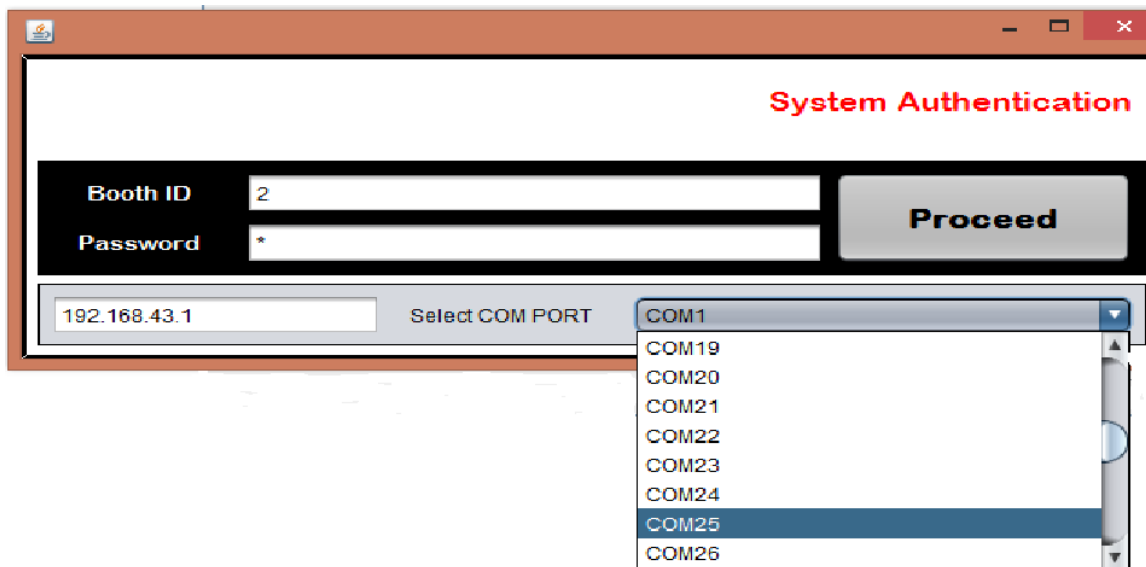


Figure 2: welcome form with com port selection

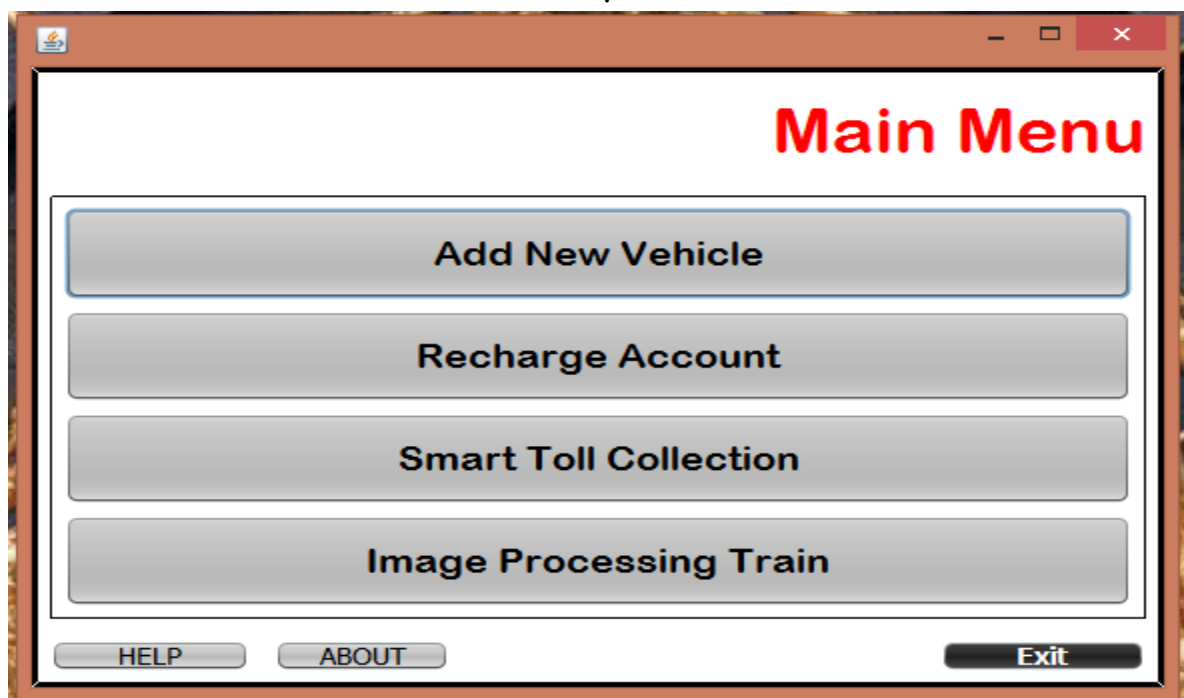
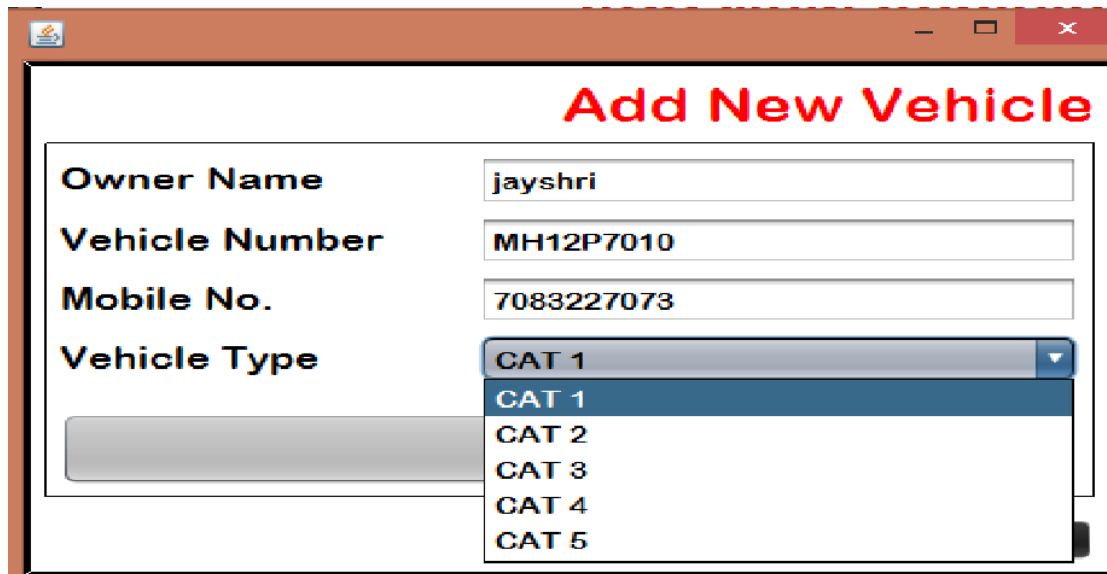


Figure3: Main menu with correct COM port



Add New Vehicle

Owner Name

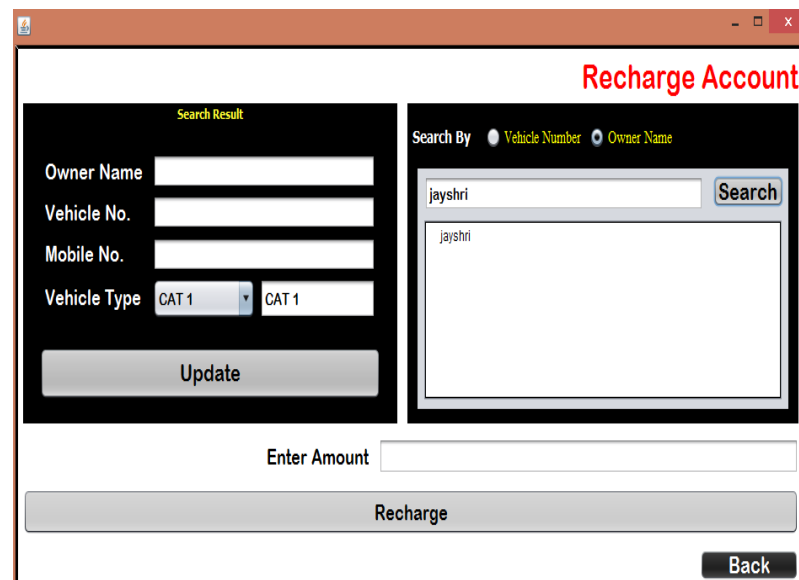
Vehicle Number

Mobile No.

Vehicle Type

- CAT 1
- CAT 2
- CAT 3
- CAT 4
- CAT 5

Figure4: form to add new vehicle



Recharge Account

Search Result

Owner Name

Vehicle No.

Mobile No.

Vehicle Type

Update

Search By ☐ Vehicle Number ☒ Owner Name

Search

Enter Amount

Recharge

Back

Figure 5: form to Search record

Figure 6: NPR system & Toll collection

Figure7: Template matching to detect character

IV. FUTURE SCOPE

The system project can be expanded to mobile license plate recognition systems. The system performance will also improve if better OCR's or high resolution input images are applied for processing. In our project a centralized server is designed using MySQL. Further it can be extended by using the concept of BiGdata for the database server. This system is research system, improvements can be made in it. Thus it is open for further research.

V. CONCLUSION

Our system project converts the captured image of a number plate into the textual format, which is used to recognize the vehicle number. For this, the system uses OCR technique. Thus the project uses Image processing concepts. This project is mainly used where it is required to form quick and efficient image detection. We prepare a cloud

server for maintaining database. Thus we acquire knowledge of over view of cloud computing concept. This system has real time application in surveillance of cars in parking, traffic monitoring systems with unattended parking lots, automatic toll collection and also for criminal pursuit.

REFERENCES

- [1] Hao Wooi Lim , Yong HaurTay, Detection of License Plate Character in Natural Scene with MSER and SIFT unigram Classifier, 2010.3976
- [2] Khalifa , O., et al., Malaysian Vehicle License Plate Recognition. *The International Arab Journal Information Technology*, 2002.4(4): p.359-364.
- [3] Hao Wooi Lim , Yong HaurTay, Detection of License Plate Characters in Natural Scene With MSER and SIFT unigram Classifier, 2010 3976.
- [4] Qadri, M.T. and M. Asif, Automatic Number Plate Recognition System for Vehicle Identification using Optical Character Recognition. *International Conference on Education Technology and Computer*, 2009: p.335-338.
- [5] Wei Wang, Qiaojing Jiang, Xi Zhou, Wenyin Wan, Car License Plate Detection based on MSER 2011.
- [6] Chen, Z.-X., et.al., Automatic License-Plate Location and Recognition Based on Feature Salience. *IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY*, 2009.58(7): p.3781-3785.
- [7] Verilog Course Team, [Online] Available: info@verilogcourseteam.com, www.verilogcourseteam.com
- [8] Z. Chen, C. Liu, F. Chang and J. Xu, "A Novel Algorithm of License Plates Automatic Location Based on Texture Feature," *IEEE International Conference on Automation and Logistics*, Shenyang, 5-7 August 2009, pp. 1360-1363.
- [9] Hamey, L.G.C and C. Priest, Automatic Number Plate Recognition for Australian Conditions. *Proceedings of the Digital Imaging Computing: Techniques and Applications*, 2005: p. 8.
- [10] W. Pan and N. Yang, "A New Method of Vehicle License Plate Location under Complex Scenes," *2nd International Conference on Advanced Computer Control (ICACC)*, Shenyang, 27-29 March 2010, pp. 134-138.