

# VEHICLE OWNER INFORMATION USING NUMBER PLATE DETECTION

A

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in

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## **Declaration**

We hereby declare that this submission is our own work and that, to the best of our belief and knowledge, it contains no material previously published or written by another person or material which to a substantial error has been accepted for the award of any degree or diploma of university or other institute of higher learning, except where the acknowledgement has been made in the text. The project has not been submitted by us at any other institute for requirement of any other degree.

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## **Certificate**

This is to certify that the project report entitled “VEHICLE OWNER INFORMATION USING NUMBER PLATE DETECTION” presented by Aman Singh, Somya Pratap Singh and Karunesh in the partial fulfillment for the award of Bachelor of Technology in Information Technology, is a record of work carried out by them under my supervision and guidance at the department of Computer Science and Engineering at Institute of Engineering and Technology, Lucknow. It is also certified that this project has not been submitted at any other Institute for the award of any other degrees to the best of my knowledge.

(Prof Y N Singh)

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# ABSTRACT

License plate recognition plays a significant role throughout this busy world, owing to the rise in vehicles day-by-day. Breaking of traffic rules, crimes through the use of vehicles, parking into restricted space and private property also are increasing linearly, thus to restrict this act, registration code recognition is intended. Among the different processing steps that includes detection of number plate, segmentation of characters and recognition of characters, the segmentation plays an important role. The accuracy of recognition of license plate depends on how perfectly the segmentation process is done. In order to address the issues like to process the images that are not captured from their frontal part and illumination challenges different algorithms are developed. This project presents a technique for localization, segmentation and recognition of the characters within the located plate. Images from still cameras or videos are obtained and regenerated in to grayscale images. The segmentation of gray scale image is being generated by finding edges for smoothing image. Finally, the characters within the registration code are detected. The aim is to indicate that the planned technique achieved high accuracy by optimizing numerous parameters that has higher recognition rate than the standard ways.

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# CHAPTER 1

## INTRODUCTION

The number of vehicles on the roads everywhere around the world is increasing with every single day and parallel to that is increasing the need to perceive those vehicles [1]. Identification of the license plate has played an important role in the past two decades in the form of electronic tolling to vehicles violating the civil codes of human society. Further, this system can be used to manage parking facilities, to monitor unauthorized vehicles which may enter private spaces, to find stolen vehicles, to control traffic volume, to issue tickets to over-speeding vehicles [2].

In an automatic number plate recognition system, a camera captures the vehicle images, and the images are processed by a computer and then the system recognizes the numbers on the license plate by applying various image processing and optical character recognition techniques, before the character recognition, the license plates must be separated from the vehicle images in the background. This task is considered the most crucial step in the whole system, which directly influences the overall accuracy and processing speed of the system to a large extent. Since there are problems pertaining such as poor quality of images, perspective distortion of the images, disturbance through other characters or reflection on the vehicle surface, and color similarity between the license plate and the background of the vehicle body, the license plate is often difficult to be located accurately and efficiently[3]. Generally, vehicle number plate recognition is divided into several steps including the localization of number plates, extracting image region which contains a number plate, character recognition, and character segmentation. Generally, in order to make a vehicle's license plate recognizable, the region that contains the number plate should be extracted from a vehicle image. Accurate detection of the license plate region is an essential process to proceed to the step of character recognition. There are two major methods to extract the number plate region, the first one is the edge detection method and the other one is to find rectangles in a vehicle image [4] .



This automatic number plate recognition system offers a wide variety of advantages, mostly concerning automating the manual tasks, efficient space management, and increasing the customer experience [5] .

**Automation:** The automated recognition of number plates allows automated alerts and controls for facilities. Hence, it is a key technology for smart cities in the near future.

**Analytics:** The generated data can be further used for traffic flow analytics. This is particularly important to operate intelligent transportation systems, where data processing technologies can be used to improve the mobility of people and goods, demand management, increased safety, reduced traffic congestion, and manage incidents effectively.

**Efficiency:** The precise and fast number plate recognition doesn't depend on any form of human input. Hence it leads to cost-efficient governance and causes a reduction in waiting times.

**Convenience:** It can be integrated with other IT systems to operate in an ecosystem to provide a seamless and hassle-free experience to the end-user. Hence, the technology can be used to enhance the customer experience and offer new services and products, such as automated parking payments. The Automatic number plate recognition system technology has become so important since its invention and first application in the United Kingdom in 1979 and in recent times has been greatly integrated into many aspects of human life.

**Law enforcement:** In law enforcement, the number plate recognition system plays an important role and can be used in any of the following instances: Operational Response as a vehicle approaches a number plate recognizing camera; the camera captures the vehicle's number plate and instantly checks it against the police database records of vehicles of interest In a situation where the vehicle number plate matches with the vehicle of interest on the database,

Police officers are dispatched to intercept and stop the vehicle, check it for other supporting evidence and make arrests wherever necessary [6]. Information and Intelligence- in this case, number plate recognition systems are useful in spotting and monitoring vehicles of interest linked to cases in relation to national security, terrorism, or has been linked to organized crime.

**Traffic management:** Traffic management is the umbrella term for a number of advantages that automatic number plate recognition offers. It can be used throughout cities to detect over-speeding vehicles, vehicles that are involved in driving rashly, or any accidental occurrence. It provides solutions to measure and analyze area-related traffic data of a certain area or an entire city. On a larger scale, traffic management allows insights into traffic congestion for better plans to be made relating to these issues.

## CHAPTER 2

### LITERATURE REVIEW

In early 2000s, immigration officials in the United States and Canada began promoting license plate recognition technology and cargo X-ray scanners. In 2005, patrol stations along the U.S. - Mexico border had installed the technology to record the entry and the exit of vehicles. However, little academic research on license plate recognition technology has occurred in the US. One of the most holistic studies ever conducted was in a 4-month evaluation period in 2004 which examined the effectiveness of the technology in identification of stolen vehicles and license plates, as well as vehicles driven by wanted felons. While the review of the technology was generally favorable, reports indicated that the software produced over 1.8 million scans during the research period and caused 3,286 alarms, out of which only 108 were positive. In particular, the study found out that reader could not match stacked or small characters present on a license plate. One of the companies that produced the technology for license plate recognition did claim that the device could prove instrumental in avoiding terrorist attacks. However, if the system is unable to read stacked or small characters (which are often found on state commercial license plates), this issue becomes moot. The British Home Office also conducted several researches on the effectiveness of this technology. The pilot study showed that officers which used the mobile plate recognition technology produced about 100 arrests per officer per year that was 10 times the national average of an officer.

Amr Badr *et al.*, addresses that the Automatic number plate recognition (ANPR) acts as a mass surveillance method that uses optical character recognition on images to read the license plates on vehicles[1]. They can use existing closed-circuit television or road-rule enforcement cameras, or ones specifically designed for the task.

The main focus in his research project is to experiment deeply with, and find alternative solutions to the image segmentation and character recognition problems within the License Plate Recognition framework. Three main stages are identified in such applications. First, it is necessary to locate and extract the license plate region from a larger scene image. Second, having a license plate region to work with, the alphanumeric characters in the plate need to be extracted from the background. Third, deliver them to an OCR system for recognition. This process of automatic number plate recognition consists of four main stages: Firstly they applied Preprocessing method and after that they had localized license plate, this method is called license plate localization and next step is character segmentation. It is used to separate character from number plate and in the last they applied character recognition.

Rahman *et al.*, proposed a system architecture that contains of three distinct parts: outdoor part, indoor part and communication link[3]. Outdoor part is where the cameras are installed in different intersections of interest for capturing images. The indoor part is the central control station that is responsible for receiving, storing and analyzing the captured images from all these installed cameras. Communication link can be high speed cable or fiber optic connecting all these cameras to the central control station.

Sourav Roy *et al.*, in their paper states that number plate is a pattern with very high variations of contrast[4]. If the number plate is very similar to background it's difficult to identify the location. Brightness and contrast changes as light falling changes on it. In this paper they are using morphological operations to extract the contrast feature within the plate. The work is divided into following parts: Firstly they took an input raw image and then apply image binarization and again they reduced noise using mid-filtering method and after this they have used histogram equalizer to enhance contrast and next step is plate localization and after that they had performed character segmentation.

Aniruddh *et al.*, proposed the system that solved the problem of keeping a track of number and type of vehicles currently available in the premise in the educational institutions, while also helping owners with the exact time their vehicle had left the premise in case of thefts[7]. The system consists of two major components namely first a video capturing source and second is application is developed using MATLAB. Assumptions for the proposed system is single entry gate covered by a video camera and next is single exit gate covered by a video camera and then single lane traffic, further improving to double lane traffic in later stages. The video capturing source is placed at the entry gate of Institute which does the work of providing live feed accurately even in poor lighting. The video source is placed at a position from where it can capture the entire vehicle and the required frames consisting of a vehicle.

## CHAPTER 3

### METHODOLOGY

Number plate pattern is a pattern with various contrast, skewness and brightness. If the number plate is very similar to background it's a tedious task to identify the location of the text(License Number) and then use it for further purposes which is discussed later. We are using OpenCV to perform image processing and to localize the license plate and then after this we are using Tesseract OCR which automatically recognizes the character in a number plate.

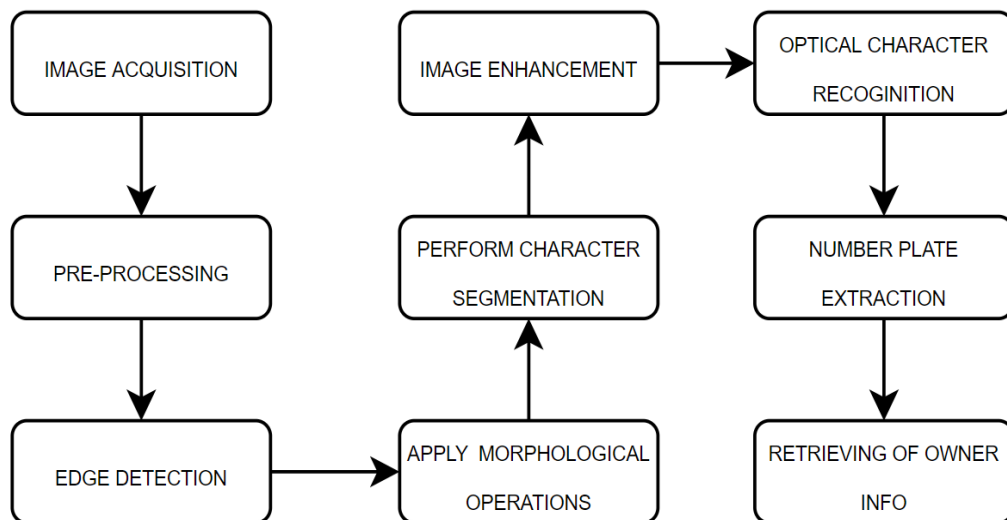


Fig 3.1 Process flow diagram

The work has been divided into several steps as mentioned in the Fig 3.1 which can be performed in the following manner.

First of all we obtain some images to maintain a database to operate upon. We can do this by obtaining images from various cameras installed on roadside shops, surveillance cameras, cameras installed in houses or some images from digital or smartphone cameras too.

These images would normally be available in the RGB format. At first, we have to reduce the noise of the image as the images are not always clear (very few images are clear). So we are basically using Gaussian Blur and then converting it into grayscale for optimization of detection and reduce amount of color in the image which can help a lot in the detection of license plate easily [7]. The functioning of Gaussian Blur is basically to make edges more smooth and clear which leads to better recognition of characters in the image. For better number plate recognition, we are binarizing the image by applying Otsu's Thresholding on the image. We are choosing this technique over all other techniques because it determines the thresholding value automatically which is really an advantage.

Afterwards Closing Morphological Transformation is applied on threshold image which eases the detection of the rectangular white box of the license plate [7]. Finding contours in the image is an essential task. Now we will try to find the minimum area rectangle (which basically represents the Number plate) and validate their side ratios and area. Here we can define the side parameters such as area of the plate whose minimum value is 4500 and maximum value is 30000 respectively.

Now we are having the perfect contour of the license plate which is basically required. After extraction of the contour from the original image we will get the image of the plate much better than before. Here the image segmentation role comes into play. To recognize the characters precisely we have to apply image segmentation. First step here is the extraction of the value channel from HSV format of the plate's image. After this we are applying Adaptive Thresholding on the image to binarize and reveal those characters [8]. We are applying Adaptive Thresholding here because several images have different lightning condition in different places, so this Thresholding is best for the purpose as it uses various threshold values based on the brightness of the pixels in nearby regions.

Now we are going to apply Bitwise not operation to find the connected components in the image so that we can extract character candidates. We will be constructing a mask here to display all the character components and then again we will be finding contours in the mask.

Take the largest one, find its bounding rectangle and validate side ratios too. This will help in finding all contours in the character candidate mask and extract those contour areas from plate's threshold image to get all characters separately. Further we are using OCR to recognize the character one by one. It converts the image to string which returns the license number. After performing the above methodology, we have extracted the license from number plate. Further we are using this to extract the vehicle owner information from the Database.



# CHAPTER 4

## RESULTS

This chapter presents the results of the model used to find the vehicle owner information through identifying the license plate number. In this model we performed different image processing steps to arrive at the final result of fetching the vehicle owner information from the database.

### 4.1 DATASET

The dataset used in this project is made by us after collecting images from different sources on the internet, and then preparing vehicle owner information database according to the images present in the image dataset. The dataset contains 46 images of cars which are of Indian origin on which we are performing our project.

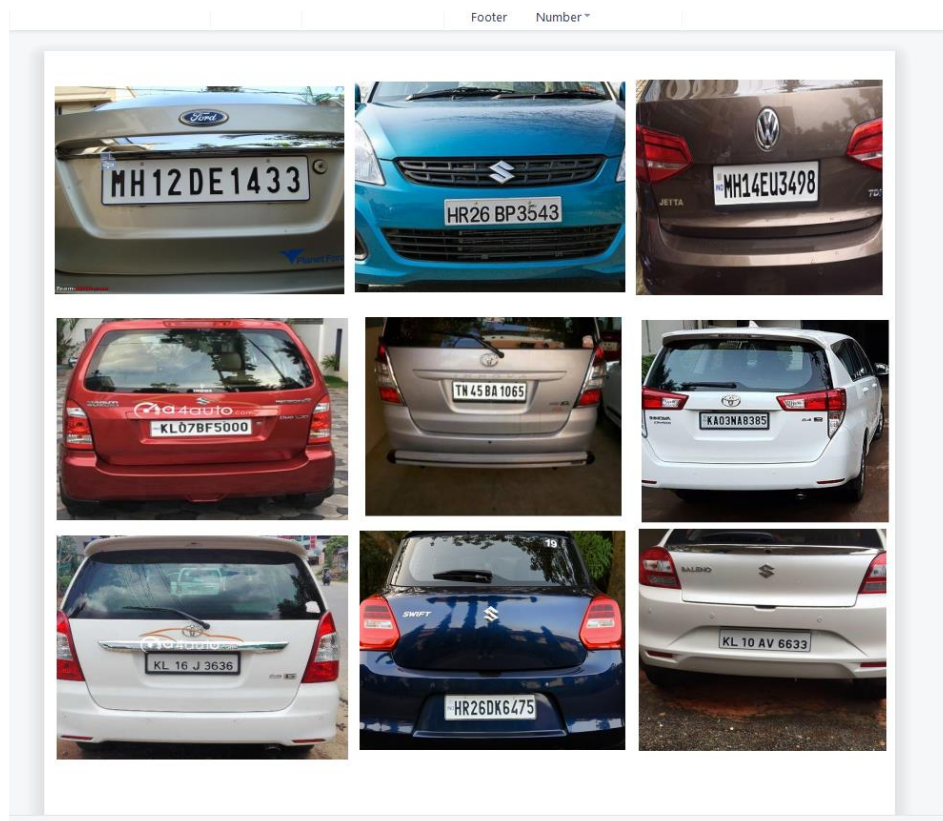


Fig 4.1 Number plate dataset

IMAGE INDEX	NAME	ADDRESS	MOBILE NUMBER	LICENSE PLATE NUMBER
1	VIKASH SHUKLA	Nelson Mandela Marg, Basant Lok Delhi	6387668837	DL12CG6648
2	SANGAM RAVAT	SHEIKH SARAI DELHI	6345290765	DL3CAY9324
3	ANKUR SINGH	MAYUR VIHAR EAST DELHI	8976432366	DL7CN5617
4	PRADEEP KUMAR	AHEMDABAD BLOCK 45 GAZIYABAD	6345980721	GJ05JD9759
5	AMIT KUMAR	GURGAON SECTOR 23 HARYANA	7873882899	HR26BR9044
6	SANJAY KUMAR	Mini Secretariat Gurugram Haryana	9984765847	HR26CK5868
7	ABHISAR KUMAR	GURGAON MINI CITY SECTOR 34 HARYANA	9946746788	HR26CK8571
8	RAKAPOOR BHARTI	CZRH PHW Mini Secretariat Gurugram	8774648689	HR26CK4475
9	SHUBHANA SINGH	Sector 56 Karnaul haryana	6327765426	HR26TC7099
10	PRAMOD KUMAR	SONIPAT HARYANA	9865343248	HR69T6969
11	RAJAN SINGH	Haryana sector 23 Rustampur	8746635362	HR99B36662
12	DHEERAJ MAURYA	UDUPI SECTOR 98 KARNATKA	8849573892	KA2JM5519
13	AYUSHI GUPTA	RUSTAMPUR KARNATAK	6798342106	KA5JM38156
14	PRAVEEN BHARTI	KOLLAM SECTOR 34 KERLA	6399762829	KL02AF6363
15	DALITESH SINGH	2 Floor A 3 Block Civil Station KERLA	6345726288	KL07CB8599
16	AJAY KUMAR	Collectorate Rd Talap Kannur KERLA	7263748726	KL13AA6340
17	ASHMIT PANDEY	Punalur Ayyappas Building KERLA	9758733882	KL25B2001
18	SACHIN PANDEY	TIRUR KERLA	6985432290	KL55R2473
19	ANKUR YADAV	Wadala Road Mumbai Maharashtra	9876736263	MH03B57778
20	KALSHLENDRA KUMAR	RAIGD SECTOR 45 MAHARASHTRA	6372763782	MH06AIW8929
21	SHASHANK VERMA	Panchavati Nashik Maharashtra	9956735637	MH15BD8877
22	SOMYA PRATAP	RUDALI MAHARASHTRA	9867542909	MH15TC554
23	AMAN SINGH	SHIVAJI PARK LUDHNOVI	9412541201	MH20CS1941
24	TUSHAR GIRI	ALAPUR JALANA CITY MAHARASHTRA	9934767637	MH20EE7597
25	KARAN KIMAR	TAI ANA CITY SECTOR 45 MAHARASHTRA	9874674667	MH20FF7598

Fig 4.2 Vehicle owner information

### 4.3 IMAGE PROCSSING ON IMAGE

#### Image acquisition

We are acquiring images from different sources from the internet or from cameras installed on roadside shops and houses.



Fig 4.3 Number plate image acquisition

## Image Processing

Gray scaling is performed so as to convert 3d matrix of RGB image to a 2d matrix of black and white image.



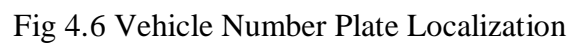
Fig 4.4 Converted color image to grayscale image

Edges are detected so as to find the position of the license plate inside the image of the vehicle.

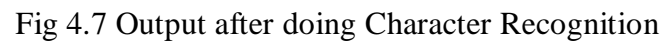


Fig 4.5 Edge detection

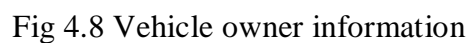
After finding the edges, number plate localization is performed so as to get a clear picture of the license plate.



Characters are extracted from image using Tesseract OCR



License plate number is checked in the database to find the vehicle owner information.



## Final result

After using the model on our database we are getting an accuracy of 86.9565 % , and an error of 13.0435 %.

```
127.0.0.1 - - [03/Jun/2022 11:06:23] "POST / HTTP/1.1" 200 -
* Detected change in 'D:\\python\\FRP\\app.py', reloading
* Restarting with stat
* Debugger is active!
NK VERMA', 'Panchavati Nashik Maharashtra', '9956735637', 'MH15B08877'), (30, 'SOMYA PRATAP', 'RUDALI MAHARASTRA', '9867542909', 'MH15C554'), (31, 'AMAN SINGH',
'SHIVAJI PARK LUCKNOW', '9412541201', 'MH20CS1941'), (32, 'UTKARSH SINGH', 'MALEGAON PANCHVATI NASHIK MAHARASTRA', '6345621097', 'MH20CS9141'), (33, 'TUSHAR GIRI',
'ALAPUR JALANA CITY MAHARASTRA', '9934767637', 'MH20EE7597'), (34, 'KARAN KUMAR', 'JALANA CITY SECTOR 45 MAHARASTRA', '9874674667', 'MH20EE7598'), (36, 'DURGA PRASA
D', 'JALANA CITY MAHARASTRA', '8743355662', 'MH20S9817'), (37, 'SHIVA KUMAR', 'PAWEL 26 SECTOR MARASTRA', '9984764736', 'MH46Z8892'), (39, 'SHUBHAM BHARTI', 'CHENNAI
TAMILNADU', '9876439083', 'TN07BU5427'), (40, 'SHIVANSH BHARTI', 'NAMMAKAL RD SHRIGRAM TAMILNADU', '8874636368', 'TN38BY4191'), (44, 'ADARSH RATHOR', 'Kannanputhoo
ers Colony Somajiguda TN', '9746474636', 'TN58BY4191'), (43, 'MITHLESH TRIPATHI', 'NAGERCOIL TAMILNADU', '8737833569', 'TN74AH1413'), (45, 'SHIKHAR YADAV', 'HYDRABAD
CENTRAL', '9986434542', 'TS09EB1458'), (46, 'DIVAKAR YADAV', 'BLOCK A SECTOR 32 NOTDA', '9845844387', 'UP16AB3726')]]
Accuracy : 86.9565%
Error rate : 13.0435%
```

Fig 4.9 Final result

## **CHAPTER 5**

### **CONCLUSION**

Our project is mainly based on Indian License Plate Number having rectangular box with White background and Black text written on it. At first image acquisition is performed proceeding towards image segmentation to get the rectangular box of license plate. Thresholding is applied further to get the characters/text written on the number plate. These characters are further derived using image segmentation and after that they are matched with those License Plate Numbers which are stored in the Database, having vehicle owner information. The license plate whose data is present in the database returns the owner's information, otherwise unregistered user/no data found is printed as the result.

### **FUTURE WORKS**

We can implement this project at the college level by maintaining a database of vehicles of students, faculties and other non-teaching staffs and thus keep a count on the number of bikes and cars present in the college at a particular time and we can also maintain a database about the entry time and exit time of a vehicle in the college campus. E-challan can be generated instantly if someone doesn't wear a helmet or skips the red light. Real time video analysis could further reduce human involvement in fetching the vehicle owner's information.

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