

**Copyright paper**  
**Automatic Number Plate Recognition**  
**With Python programming language**

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## **1.0. Introduction**

Automatic number plate recognition (ANPR) is a mass surveillance method that uses optical character recognition on images to read license plates on vehicles. They are used by various police forces and also as a method of electronic toll collection on pay per-use roads and monitoring traffic activity: such as red light adherence in an intersection. ANPR can be used to store the images captured by the cameras as well as the text from the license plate. ANPR technology tends to be region-specific, owing to plate variation from place to place.

It aims at extracting the license plate from a vehicle and using it for various purposes. In this paper we do a systematic study of the existing ANPR systems, the basic algorithm used, the variations in the existing algorithm to improve the overall system. We also present the list of applications where this system could be used, we elaborate one such application which is criminal surveillance. The system which we are developing recognizes a ten digit license plate which could be also modified to detect various other types of license plates as well. The algorithm mostly concentrates on localization of license plates and then goes on to extract the characters by using morphological operations such as dilation, eroding the image, dilating, filtering etc. All these morphological operations lead to the efficiency of the overall system.

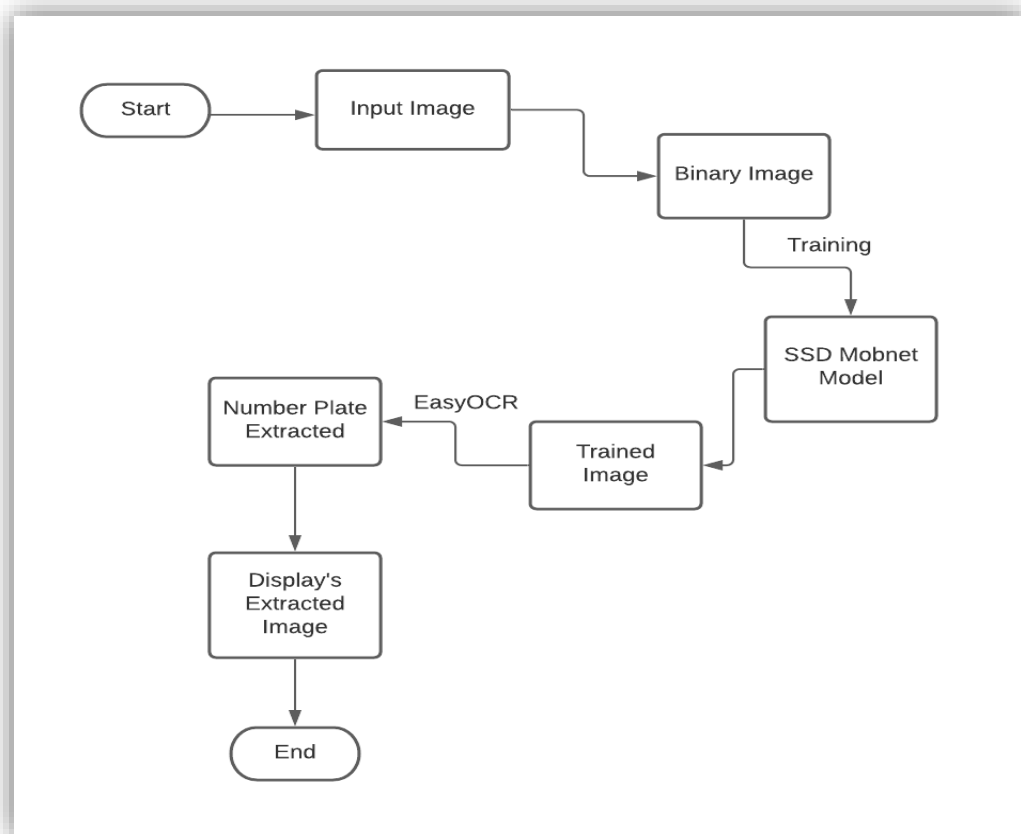
## 2.0. Literature Review

Sr. No	Author Name	Method	Observation
1.	Cheng-Hung Lin	YOLOv2 Model	In this paper a three-stage license plate recognition system based on Mask-RCNN which was used for various shooting angles and numerous oblique images.
2.	Rupali Gala	Using Neural Net with image processing	In this paper the system identifies and detects the number plate based on neural net.
3.	Sagar Khedkar	Using Machine Learning Algorithms	In this paper machine learning algorithm is used to develop number plate recognition.
4.	Anisha Goyal	Image processing techniques	In this paper system is implemented in MATLAB
5.	AmrBadr et al	Using ANN	ANPR system is proposed using morphological operations.

## 3.0. Proposed system overview

The system captures an image from the camera then that image will be converted into binary image file to increase the processing speed and that binary image is pass to the SSD Mobnet Model for training. The text from the trained image is extracted using EasyOCR.

Fig.1 Automatic Number Plate Recognition diagrammatical overview



#### 4.0. Working of Automatic Number Plate Recognition

**Image Acquisition** - Input image captured through camera.

**Image Preprocessing-**

RGB To Gray Conversion - Color image does not help to identify important edges and other features. Processing of RGB images is complex and it requires

more processing time, so first we have to convert colored images to gray scale images.

Image Enhancement - Adaptive histogram equalization is to enhance contrast of image (gray color image). In this we construct several histograms each for distinct regions in image. This is advantageous because in ordinary histograms, a single histogram is for the entire image.

**Median Filtering** - To remove noise in the image.

Edge Detection - Edge is a boundary between two regions with relatively distinct gray level properties. It detects discontinuities in intensity values. The basic step in plate recognition is to detect plate size (rectangle), thus we have to detect the edge of the rectangular plate. Using the sobel operator, the edges in the image are highlighted. This in turn reduces the amount of data in the image and processes the required data for further use.

Morphological Image Processing - Structuring element is to create output of the same size. Using dilation and by adding pixels to the boundary of the object to increase the thickness of the edges. Using Shrinking operation, thinning the image to eliminate irrelevant parts.

Segmentation - Character segmentation is a bridge between a number plate extraction and character recognition. In this, different characters on a number plate area are segmented. Various reasons such as lighting variance, plate frames and rotation are those which hinder the segmentation work. A segmentation method is also known as a boundary box analysis. By this method, characters are assigned to connected components and these are extracted using the boundary box analysis. The segmentation process is completed upon reduction of noise in the image.

Character Recognition - The method of character recognition is completed by using feature extraction to extract the features of characters and their different

classification techniques. A machine learning algorithm is used for recognition of characters from the number plate.

## **5.0. Applications provided under Automatic Number Plate Recognition**

### **1. Parking**

Parking automation and parking security: ticketless parking fee management, parking access automation, vehicle location guidance and car theft prevention.

### **2. Access Control**

Access control in general is a mechanism for limiting access to areas and resources based on users' identities and their membership in various predefined groups.

### **3. Motorway Road Tolling**

License plate recognition is mostly used as a very efficient enforcement tool, while there are road tolling systems based solely on license plate recognition too.

### **4. Border Control**

Efficient border control significantly decreases the rate of violent crime and increases the society's security. ANPR adds significant value by event logging, establishing investigate-able databases of border crossings, alarming on suspicious passings, and many more.

### **5. Journey Time Measurement**

Data collected by license plate recognition systems can be used in many ways after processing: feeding back information to road users to increase traffic security, helping efficient law enforcement, optimizing traffic routes, reducing costs and time, etc.

### **6. Law Enforcement**

Automatic number plate recognition is an ideal technology to be used for law enforcement purposes. It is able to automatically identify stolen cars based on

the up-to-date blacklist. Other very common law enforcement applications are red-light enforcement and over speed charging and bus lane control.

## 6.0. References

References plays important role in creating any project paper. It helps to collect data and understands the current situation in the particular sector. This are some references taken in above project

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