

# Number Plate Reorganization using Image Processing and machine learning Approaches: A Review

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## Abstract:

For detecting the number plate from the moving vehicle there are many algorithm has been developed but still this area always remain evolving each every year, Now a days it is very important to apply image processing and machine learning techniques in various field license plate recognition or number plate recognition is widely used application of image processing and machine learning here in this paper we are going to discuss different methodologies used for recognition of number plate and extracting numbers and characters from number plate and also the accuracy reorganization and future scope of different available methods.

**Keywords** - Number plate recognition, template matching, Segmentation.

## I. Introduction

Number Plate Recognition (NPR) is one kind of artificial intelligent systems which is being used for many potential applications in Transportation areas [5]. It can be considered as a replacement for automatic radar and light running systems. Such systems are established to recognize vehicles by the contents of their Number plates. The fundamental logic in number plate recognition is high efficiency and recognition speed [1]. Due to the massive increase in number of vehicles, Number plate recognition technique became the major research area for researchers. Most previous researches and systems have faced some kind of poor performance due to the diversity of plate formats, the non uniform outdoor illumination conditions during image acquisition, noisy patterns connecting characters and poor edge enhancement. OCR techniques have always been a challenge to researchers because of some issues like working conditions, such as limited views, backgrounds, different illumination, and different type of Number plate, vehicle's speeds and ranges of the distance between camera and vehicle. Several techniques have been developed to achieve this job.



Figure1: Automatic Number Plate Recognition System  
[15]

## II. Related works

The methods discussed in preceding sections are common methods for Number plate recognition. Apart from these methods, various literatures are also discussed method for plate recognition. As most of the methods discussed in these literatures use more than one approach, it is not possible to do category wise discussion. Different number plate segmentation algorithms are discussed below.

In this paper presented unique way for recognition of characters from number plate FSC apply sum preprocessing step to reduce the available noise in image after that they apply optical character recognition technique to separate characters from number plate then at second step they applied some image processing based approach to identify the characters and numbers finally they analyze the output on the basis of some predefined algorithms [1]. The license plate recognition method is applied in this paper for identification of characters and numbers from license plate firstly apply segmentation method to separate the characters and ID then to identify the lines and characters they use hop transform finally each character is analyzed on the basis of accuracy of recognition and the claim that accuracy was very high then other existing methods[2].

This paper uses automatic number plate recognition system using image processing method they implemented the system on the entrance of many e important and restricted zones like government offices optical character recognition technique identifies the character tested the performance of the implemented method on various real time images[3].

Another similar technique proposed in this paper which uses morphological image processing operations for detection and segmentation of characters from number plate basically work on the light conditions of weather and how's that their system can work in low light conditions also the claim the accuracy of system near about 92%[4]. In this paper, author presented the deep learning based number plate recognition system where they used convolutional neural network model for identification and detection of number plates here first they try to detect the vehicle and then they go for their number plates all the images of number plates are send to the convolutional model for detection of characters and numbers from the number plate[5].

Another method for license plate recognition presented in this paper where the claims that the binarization and local and global feature extraction from number plate may increase the accuracy of detection of characters from number plates to perform this cast they are fly first binarization on the image then identify the color of numbers and number plate and finally recognize the characters using optical character recognition technique[6]. In this paper, author presented an Android-based application for recognition of number plate basically the uses the similar method which have been applied in previous papers they just tried to apply this method on the Android mobile system that they got a very good accuracy while using automatically number plate reorganization system on Android phone[7].

Another novel approach use by some authors to reduce the time needed for recognition of character from number plate here the presented a unique way that is sliding window character recognition system which can reduce the time upto 20 times then the available methods the claims that the accuracy of system is also acceptable and the time required for the organization was very less [8].

### III. Methodologies:

#### A. Information Recognition Method:

In this method there is no need of segmentation process unlike other traditional approaches. This method begins directly after the Number plate extraction phase; and will be called herby as information recognition phase (IRP). The proposed system is shown in figure 2.

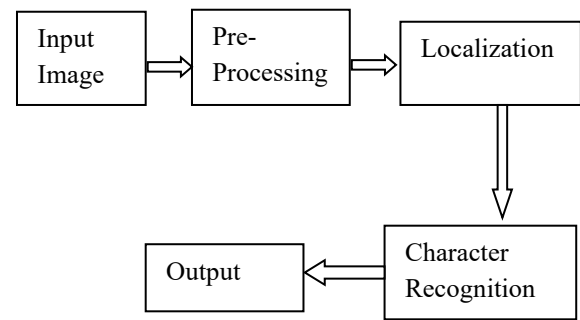


Figure2: The general proposed system

#### B. Automatic Number Plate Recognition (ANPR):

Most of the author uses automatic number detection system, this method includes 4 steps, as follows:

**Step1:** an automatic camera is connected with the system to capture the number plate image from car, then this image is send to the computer for recognition purpose.

**Step2:** at second stage it segmentation is performed to separate the numbers from back ground using thresholding technique.

**Step3:** In third step a OCR (Optical Character Recognition) system is attached to detect the numbers and characters accurately,

**Step4:** At final stage, number is send to the display device.

#### C. Template Matching:

The template matching approach recognition of number plate, first trained the network using different templates of all alphabets and all number as the format and style of character and number can be different in various number plate show the accuracy of system will only depends on how many types of template are used to train the model the limitation of this approach is that if you train any model with a particular type of style then it could not detect the character or number of different phone describe so accuracy will be the limitation of system. To improve the accuracy we can create the templates of all the available font style to train the system[1,2].

#### D. Detection Based on Morphological Operations:

Uses morphological based operation for detection of number plate which includes following steps

**Step 1:** Firstly, input image is binarized using any global thresholding multiple thresholding algorithm then

**Step 2:** Some morphological operations like erosion dilation opening and closing are applied to increase the visual appearance of a character or number these operations totally depends on the quality of input image.

**Step 3:** Once, numbers and characters are separated and are clearly visible then we can extract some features of characters or numbers for recognition purpose in this

step we can also apply template matching method for reorganization of numbers and characters [3].

### E. Deep Learning Based Approach

Deep learning is one of the most useful technique in today's Era for recognition detection and classification purpose so various author uses deep learning approach for the classification of number plates which are more powerful than other methods what the claim that this approach could not be applied on small data set and it takes lots of memory and lots of processing time so it could not run on Simple computer but at the same time due to capability of automatic feature extraction and very powerful pretrained models. As in the case of number plate input will be in the form of image so show various researcher applied convolutional neural network model for recognition purpose this model gives an average accuracy of more than 94%[5]

In CNN model various convolutional layer and max pooling layer are arranged in different format to extract and reduce the features of input image and finally pre trained models are applied for the classification purpose[6].

### IV. EXPERIMENT RESULTS

Experiments performed by different researchers in their work, and get various type of recognition output which are tabulated below in table 1:

**Table 1: Comparison of various number plate recognition methods**

Reference	Method	No of Characters in Number Plate	Average Accuracy
[1]	OCR	10	80%
[2]	Morphological	9	92%
[3]	OCR	7	100%
[4]	Structured Element	6	92%
[5]	CNN	9	94%
[6]	CNN	6	92%
[7]	Android Application	6	100%
[9]	ML	9	100%
[10]	CNN	9	99%
[11]	Embedded system	7	94%
[12]	Localization	8	78%
[13]	NN	8	87.5%
[14]	BPNN	8	96%
[15]	PNN	8	98.5%
[16]	OCR	7	95%

[17]	ANN	7	98.2%
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### V. Conclusion

Table 1 we can easily conclude that there are various number plate recognition methods available some are image processing based some uses character recognition and some using machine learning and deep learning approaches for the organization of number plate. Here in conclusion we propose that the use of deep learning models can help in live recognition of number system with high accuracy. This model also can be reconstructed by adding removing and rearranging the available convolutional and pooling layers. The average accuracy achieved by Deep learning method is near about 98%.

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