

# OCR Based Character Recognition in ALPR

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**Abstract** - Automatic License Plate Recognition is a technology that uses an optical character recognition to automatically read the license plate characters. This technique may be used to spot peoples who violate track signals or driving in over speed, as a mechanism for electronic toll collection, to identify suspicious objects at a scene, or find uninsured Motorist. ALPR systems typically consist of modules addressing the following three tasks: character recognition, license plate segmentation of characters. This step is the main part of the system and is called as Character Recognition step, where each characters are recognized. Character Recognition is also known as Optical Character Recognition (OCR) is the mechanical or electronic conversion of scanned images. It is widely used as a form of data entry from some sort of original paper data.

**Keywords** - Automated License Plate Recognition, Optical Character Recognition, License Plate localization, character segmentation.

## I. INTRODUCTION

ALPR not only recognizes and counts vehicles, but distinguishes each as unique by recognizing the characters in the license plates. Here , a camera captures the vehicle images and a computer processes the captured images and recognizes the information on the license plate by applying various image processing and optical pattern recognition techniques. Automatic License plate Recognition not only recognizes and identify vehicles, but distinguishes each as unique by recognizing the characters in the license plates. Here a camera captures the images and a computer analyses the captured images and identifies the information on the license plate by applying various image processing and perform pattern recognition techniques [1]. Due to different working conditions, this techniques vary from one application to another application [2]. Although this method is a well proper technology, if several reasons wants to be solved. Recognition of characters is the last step in the this system. A good Character Recognition methods have been considered for individual character recognition. These options can be broadly classified into matching-based methods and learning-based methods.

License plate capture is typically performed by specialized cameras designed specifically for this. Lines which cause some mistakes for scanned imaging cameras include speed of the vehicles being identified, ambient colorful conditions, and headlight glare harsh different

applications conditions. license plate scanned cameras will incorporate infrared illumination in order to solve the problems of lighting and plate reflectivity.

## II. RELATED WORKS

In this paper, a four-task module is defined to illustrate the license plate recognition system: 1) image acquisition, 2) license plate localization, 3) character isolation, and 4) character recognition. ALPR plays an important role in numerous applications and a number of techniques have been proposed. Due to different working environments, ALPR techniques vary from application to application. ALPR plays an important role in numerous applications.

### A. Image Acquisition

License plate recognition is realized by acquiring images with a sensing system and then by image processing algorithm for identification.



Figure 1 Closed-circuit camera [3] such as these can be used to take the images scanned by automatic number plate recognition systems.

License plate recognition is realized by acquiring images with a sensing system and then by image processing algorithm for identification. The cameras used can include existing road-rule enforcement or closed-circuit television cameras, as well as mobile units, which are usually attached to vehicles. Some systems use infrared cameras to take a clearer image of the plates. The performance of LPR system is determined by the quality of acquired images. There are two broad categories of approaches for image acquisition: triggered approach and non-triggered approach. License plate capture is typically performed by specialized cameras designed specifically for the task. Factors which pose difficulty for license plate imaging cameras include speed of the vehicles being recorded, varying ambient lighting conditions, headlight glare and harsh environmental conditions. Most dedicated license plate capture cameras will incorporate infrared illumination in order to solve the problems of lighting and plate reflectivity. Most existing license plate recognition systems use triggered approach, where hardware is used to indicate when the image should be captured, which in turn triggers the license plate recognition process.

In the non-triggered approach, the camera continues capturing images at a predefined frame rate as long as the system is activated. The system software needs to deal with the entire video sequence to find if there exists a vehicle in a certain frame.

#### B. License Plate Localization

Prior to the character recognition, the license plates must be located from the background vehicle images. This task is considered as the most crucial step in the ALPR system, which influences the overall accuracy and processing speed of the whole system significantly. Many methods have been proposed to segment the license plate from the car images. They are texture-based methods, vertical edges-based methods, and color-based methods. The main idea of the texture-based methods is based on the consideration that, the characters in the license plate always have a distinctive grey level to the background of the license plate, which indicates following important properties that can be utilized to locate the character regions:

- 1) The area of license plate has a relatively high sensitivity in the car image;
- 2) The grey level changes are more frequent in the license plate area. which in turn results in strong grey level variations and high density of edges, especially vertical edges;
- 3) If a candidate area indeed contains a plate, the foreground pixels are distributed evenly compare the areas with simple structures. The second class is based on line detection. It is observed that most of the vehicles usually have more horizontal lines than vertical lines. If frames of the license plate are detected correctly, four corners of the license plate can then be located. In Color-based License plate localization. License plates have been

appointed different colors in their background and foreground characters which can be utilized to distinguish the license plate area from the car images.

#### C. Character Isolation

Before the character recognition processing, each character images need to be isolated or segmented from the extracted license plate image. The license-plate-same regions extracted by the labeling process may include the objects such as trees, street signs, and frames, which are situated in the candidate regions. Projection-based method is simple and fast to isolate each character images. To recognize a character from a bitmap representation, there is to point out feature properties such bitmap.

*Step1-* Normalization of a high brightness and contrast of scanned image segments.

*Step2-* The characters contained in the image segments must be then resized to uniform dimensions.

*Step3-* After that, the feature extraction algorithm extracts appropriate descriptors from the normalized characters. This chapter deals with various methods used in the process of normalization.

#### D. Character Recognition

Recognition of characters is the last step in the ALPR system. A wide variety of Optical Character Recognition (OCR) methods have been considered for individual character recognition. These methods can be broadly classified into matching-based methods and learning-based methods.

License Plate Recognition has a wide range of applications since the license number is the primary, and well popularly accepted, readable and automatically identified several vehicles. License Plate Recognition provides automated access of the content of the license plate for computer systems managing databases and processing information of moving motors.

### III. LICENSE PLATE RECOGNITION ALGORITHMS AND TECHNOLOGY

Automatic license plate recognition has two issues. First one is the quality of the license plate recognition software withitsapplied recognition. Second one is the quality of the image acquisition technology, the camera and the illumination. there are two key technological parts of a license plate recognition algorithm that basically determine its quality level - a robust, very high accuracy and intelligent OCR technology that allows intelligent structural analysis. The robust, very high accuracy Optical Character Recognition (OCR) technology is a very essential requirement. Generally, ALPR systems are composed of two units: an *image acquisition unit* (e.g., a camera) and the *image analysis unit* (general purpose computing device). The image acquisition unit is situated over a pole focusing on the adjacent road lane or installed

above the vehicle lane targeting the incoming vehicles so as to capture their images.

IV OPTICAL CHARACTER RECOGNITION IN ALPR



Figure 2 .The OCR task

To get better perception of the nature of recognition accuracy, consider the below examples: consider the plates have an average of 7 (seven) characters as license plate number. If the overall plate recognition points is required to be above 96%, than the recognition accuracy of the individual characters should be at least 99.5%. Out of 1000 characters not more than 5 misread/misrecognised:  $(99.4\%)^7 = 0.995^7 = 0.997 \cdot 0.997 \cdot 0.993 \cdot 0.999 \cdot 0.997 \cdot 0.995 \cdot 0.996 = 0.9655 = 96.9\%$

If someone speaks about 99% overall recognition accuracy, than the recognition rate of the individual characters has 99.85%. But the above calculation is only a very simple estimation of the maximum acceptable OCR error rate: it is not the real error rate the OCR can have! The real OCR error rate has to be much lower than the one given by the above estimation, as there are several other parts of the entire algorithm than can make mistake. And the recognition accuracy level point is the multiplication of the accuracy of the individual (and independent) sub-algorithms.

For example, suppose that there are three additional sub-algorithms before the OCR: a plate localization sub-algorithm, responsible for finding the plate on the picture, having 98.7% accuracy, a contrast or normalization small-algorithm, responsible to equalize the plate picture, having 99% accuracy, and character segmentation sub-algorithm, responsible for finding and cutting out the individual characters on the plates and pass them to the OCR, having 99.6% accuracy. The OCR has a 99.5% scanned image's accuracy on the individual characters. The overall license plate recognition accuracy level is then only 94.2%, as  $0.987 \cdot 0.992 \cdot 0.996 \cdot 0.995^6 = 94.4\%$  The image acquisition technology determines the average image quality the license plate recognition algorithm has to work on. So to say that the best the quality of the input images are, the better conditions and properties of the license plate recognition algorithm has, and there for the

top license plate recognition accuracy point can be expected.

V EXPERIMENTAL RESULTS

The data set consists of Vehicle Images captured using Digital and IR Cameras were supplied to license plate recognition software and stored the output.



Figure.3 Input Image



Figure. 4 After Character Recognition

VI DISCUSSION AND CONCLUSION

Vehicle license plate recognition systems play a very important role in many trac management and security systems such as speed control, automobile theft prevention, and parking lot management. The process of vehicle number plate recognition requires a very high degree of accuracy when we are working on a very busy road or parking which may not be possible manually. To overcome this problem, many efforts have been made by the researchers across the globe for last many years. A similar effort has been made in this work to develop an accurate and automatic number plate recognition system by OCR tool .Four suggested methods for vehicle license plate recognition was given in this paper as well as a comparison of the methods. The method uses a combination of Hough trans- form and Contour algorithm in order to have a faster detection method. Automatic License Plate Recognition (ALPR) is a technology that uses Optical Character Recognition (OCR) to automatically read license plate characters.

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