

A SURVEY ON LICENSE PLATE RECOGNITION SYSTEM

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ABSTRACT

A License plate is a rectangular plate which is alphanumeric. The license plate is fixed on the vehicle and used to identify the vehicle along with honor of that vehicle. There is a huge nos. of vehicles are on the road word wile so that traffic control and vehicle owner identification has become a major problem.

The automatic number plate reorganization (ANPR) is one of the solutions of such kind of problem. There is nos. of methodologies but it is challenging task as some of the factors like high speed of vehicles, languages of number plate & mostly non-uniform letter on number plate effects a lot in recognition. The license plate recognition (LPR) system have many application like payment of parking fees; toll fee on highway; traffic monitoring system; border security system; signal system etc.

In this paper, the different method of license plate recognition is discussed. The systems first detects the vehicle and capture the image then the number plate of vehicle is extracted from the image using image Segmentation optical character recognition technique is used for the character recognition. Then the resulting date is compared with the database record so we come up the information like the vehicle's owner, vehicle registration place, address etc. it is observed that developed system successfully defect & recognize the vehicle number plate on real image.

Keyword: Number plate reorganization; character recognition; image segmentation; vehicle number plate character segmentation; template matching.

1. INTRODUCTION

License plate recognition (LPR) is a form of automatic vehicle identification. It is an image processing technology used to identify vehicle by only their license plate [1]. License plate recognition (LSR) is one of the fundamental technique of Intelligent traffic system (ITS) & its plays on important role in numerous application such as such as unattended parking lot, Security control of restricted area such as automatic toll collection [3], road traffic monitoring, searching of stolen vehicle, airport gate monitoring, speed monitoring [4].

The LPR system is similar to the ANPR. The ANPR was invented in 1976 at the police scientific development branch in the UK. However, it gained much interest in last decade along with the improvement with the digital camera & the increase in computational activity, it is simply the ability to automatically extract & recognition a vehicle number plate character from as image. In essence it consist of a camera or frame grabber that has capability to grab an image, find the location of the number in the image & extract the character for character recognition tool to translate the picture in to numerical readable character [4]. It can be used to detect and prevent criminal activities & for security control of restricted area like military zones or area around top government office.

The LPR system works in three steps. This is shown in fig1

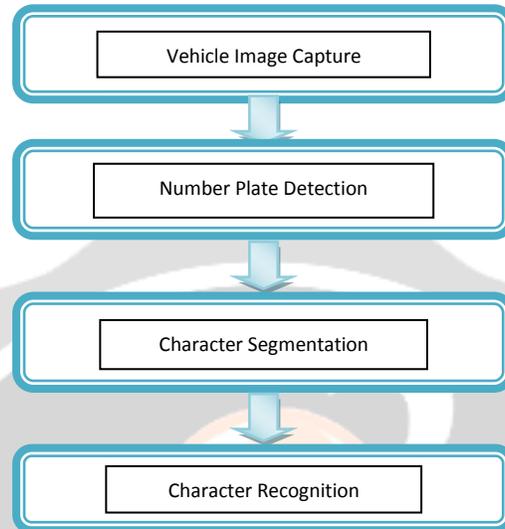


Fig. 1 Conventional LPR System

The first step is the detection & capturing the vehicle image. The second steps are a detection & extraction of numbers plate in an image. The third section used the segmentation technique to get individual character & optical character recognition [OCR] to recognize the individual character with the help of the data base stored for each and every alphanumeric character [5].

2. SYSTEM OVERVIEW

The overall LPR system can be subdivide into two parts: software model and hardware model.

A. Software Model

The main and most important portion of this system is the software model. The software model use MATLAB, LABVIEW, etc. The LPR algorithm is divided into three parts,

- Capture image
- Extract the plate from the image
- Recognize the number from the extracted plate [5].

B. Hardware Model

The hardware model consists of sensors to sense presence of vehicle, camera to control the barrier on the entrance, PC on which algorithm is executed and microcontroller for controlling the complete hardware of the ANPR system [5].

3. IMAGE ACQUISITION

Image acquisition is the first step in LPR system and there are a number of ways to acquire images. It is essential part of the LPR system. To acquire an image, high resolution, digital camera is used, image are taken in some different background and various distances of camera to vehicle [11].

4. NUMBER PATE DETECTION

Most of number plate detection algorithms fall in more than one category based on different techniques. To detect vehicle number plate following factors should be considered.

Plate size: A plate can be a different size in a vehicle image.

Plate Location: A plate can be located anywhere in vehicle.

Plate Background: A plate can have different background colors based on vehicle type for example, a government vehicle number plate might have different background than other public vehicle.

Screw: A plate may have screw and that could be considered as character [6].

A number plate can be extracted by using image segmentation method. Number plate extraction is done in following steps:

- Convert image to grey scale
- Apply vertical edge detection
- Candidate plate area detection
 1. Morphologically close image
 2. Fill hole in image
 3. Morphologically closed image
- Filtration of non plate region [1].

4.1 Related Work in Number Plate Detection

In [11], Duan, Duc, Du presented the boundary line-based method that optimized speed and accuracy by combining the through transform and contour algorithm. In order to detect regions of number plate image, the author firstly apply contour algorithm for detecting closed. Boundary objects however, this algorithm has difficulties in processing bad quality image due to scratches. In these cases, the contour algorithm produced incomplete closed boundary lines that do not contain correctly the number plate image.

The author's second approach was applying Hough transform to binary image to extract lines from object image.

In [5], Muhammad Tahir Qadri and Muhammad Asif presented a yellow search algorithm used to extract the likelihood ROI, image is then filtered using different filtering technique.

In [12], V. Koval et al. described image fusion and thresholding operation used to identify number plate of vehicle. The main purpose of using image fusion is to receive as more deblurred image as possible. To determine the regions of the image that contains the license plate, the different objects presented in the image founded and labeled. The labeled objects are then analyzed and those that possess geometrical characters similar to license plate characters are selected.

5. CHARACTER SEGMENTATION

After extracting number plate; characters are segmented from the extracted image. The number plate can be segmented based on rectangular projection. The segmentation is one of the most important processes in number plate recognition because all further steps reliable on it [11]. The resultant cropped image obtained after image segmentation is inverted i.e. all white pixel are converted to black and black pixel are to white. Now the text is in white & background is black [5]. Apart from the characters, noise can also be segmented by this algorithm and treated as an output. The character are identified as the optical character recognition algorithm before applying OCR, the individual line in the text are separated using line separation process and individual characters from separated line. Steps for character segmentation are:

- Binarization of plate image

- Scan line algorithm for row segmentation
- Vertical projection for column segmentation [1].

5.1 Related Work in Character Segmentation

In [13], P. Ramasubramanian et al. proposed system that uses histogram equation to solve the low contrast and dynamic- range problems and eight- neighbor technique is used to remove the unwanted area in the image. In character segmentation, the proposed hybrid binarization method is used to reduce the annoying problem caused by drift.

In [14], L. Zheng et al. proposed system presented the character segmentation. The process of segmentation is successful through the step of character verity height estimation of a license plate into blocks and the identifying of character blocks. The techniques used include image binarization, vertical edge detection, horizontal and vertical image projections and blob extraction.

6. CHARACTER RECOGNITION

After all the character are segmented by, they all are then stored in separate variable. The OCR is now used to compare the each individual character against the complete alphanumeric database using template matching. The OCR actually uses correlation method to match individual character and finally the number is identified and stored in a string format in a variable. The string is then compared with the stored data base for the vehicle authorization. The resultant signals are given according to the result of comparison [5].

6.1 Related Work in Character Recognition

In [8], H. Zhao et al. proposed system constructs several classifiers using least square support vector machine (LS-SVM) to implement the license plate character recognition. Each classifier adopts binary tree structure some sub-classifiers.

In [2], Roy A and Ghoshal proposed system that uses a multiple layer perception (MLP) neural network in the supervised learning mode. It consists of 225 input nodes (225 pixel values of the training image) and the output nodes consist of 36 nodes (26 upper-case letters & the 10 digits). This neural network is based on the general gradient-descent algorithm.

In [4], J. Sharma et al. proposed system that uses an algorithm novel adaptive image segmentation technique (sliding concentric window –SCW) and connected component analysis in conjunction with a character recognition neural network. The screw is used for describing the local irregularity in the image using image statics.

7. CONCLUSION

License plate recognition system mainly consists of four steps such as vehicle image capture, license plate detection, character segmentation and character recognition. From the papers surveyed, it is realized that there are different methods and algorithms used for license plate detection, character segmentation and character recognition. In character recognition, methods like template matching, support vector machine (SVM), artificial neural network (ANN) are used.

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