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NUMBER PLATE RECOGNITION USING IMPROVED SEGMENTATION

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Abstract

Automatic Number Plate Recognition (ANPR) is a real time embedded system. It is an active area of research. Now a day the requirement of ANPR system is increased due to different formats of number plates. In this paper Indian vehicle number plate recognition system is proposed. The proposed algorithm uses region props function in Mat lab for localization and segmentation of number plates. By using only captured images this system is used in car parking, in car theft issues and many more.

steps:

- Pre-processing
- Segmentation
- Recognition
- Comparison

Keywords: Vehicle number plate recognition, region props, optical character recognition.

1. Introduction

The aim of this paper is to build application which recognises number plate at the entrance of a gate. By using camera, the system captures the number plate of a car and processes them. Once the number plate is detected, recognition is done with the help of database. The aim of the project is to avoid traffic issues and similar problems. The algorithm which is used in this project includes following

2. Proposed system

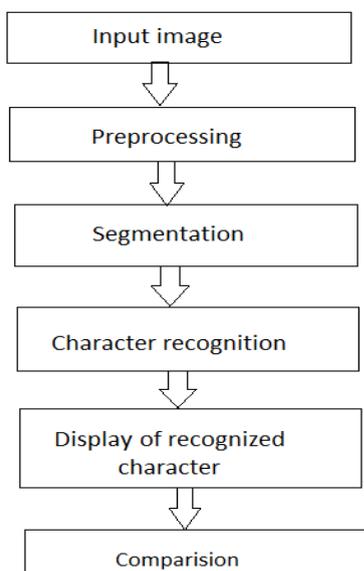


Fig 1. Proposed ANPR Process

I Input image

The first stage of image processing for number plate is the image captured by Electronic devices such as optical (digital/video) camera, webcam etc . For this project, vehicle images will be taken with a digital camera. The images will be stored as colour JPEG format on the camera. The distance between image and camera should be 5-6 meters. After that the captured image is converted into gray scale image



Fig 2. Original image for recognition

II Pre-processing

The RGB image is then converted into a gray scale image for easy analysis as it consists of only two colour channels. Median filtering is used to remove salt and pepper noise. The aim of this process is to improve the picture quality of the image. Image Enhancement techniques consists process of sharpening the edges of image, contrast manipulation, reducing noise, colour image processing and image segmentation as well. The gray image is then cropped whereby it will extract the smallest rectangle which will contain the edge of the license plate and license plate itself. This cropping process will highly increase the speed of image processing. The figure below shows the cropped image:



Fig 3.The cropped image.

III Character Segmentation

Segmentation is one of the most important processes in the automatic number plate recognition because all further steps depend on it. In MATLAB, the function region props (for “region properties”) provide a shortcut for determining many properties of a black and white or labelled image. Measure properties of image regions (blob analysis) the regionprops syntax is `STATS = regionprops (L, properties)`, it measures a set of properties for each labelled region in the label matrix L. Positive integer means different regions of L. For example, the set of elements of L equal to 1 corresponds to region 1. The return value STATS is a structure array of length max (L (:)). The fields of the structure array denote different

measurements for each region, as specified by properties. Properties can be list of strings, a cell array containing strings, the single string 'all', or the string 'basic'. This table lists the set of valid property strings.

'Area'	'EulerNumber'	'Orientation'
'BoundingBox'	'Extent'	'Perimeter'
'Centroid'	'Extrema'	'PixelIdxList'
'ConvexArea'	'FilledArea'	'PixelList'
'ConvexHull'	'FilledImage'	'Solidity'
'ConvexImage'	'Image'	'SubarrayIdx'
'Eccentricity'	'MajorAxisLength'	
'EquivDiameter'	'MinorAxisLength'	

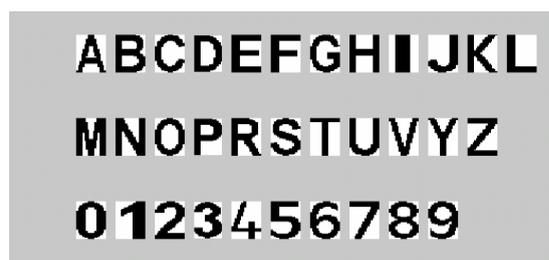
If properties are the string 'all', regionprops computes all the preceding measurements. If properties are not specified or if it is the string 'basic', regionprops computes only the 'Area', 'Centroid', and 'Bounding Box' measurements. Fig.4 shows the segmented section of the cropped image by using regionprops.

IV Character recognition

It is employed for the purpose of conversion of images of text into characters. The process of OC involves several steps including segmentation, feature extraction and classification. Each of these steps is a field onto itself, and is described briefly here in the context of a Matlab implementation of OCR.

Before recognition algorithm normalisation is done. Normalization provides a tremendous reduction in data size of the characters. For perfect match, input images must be equal-sized with the database characters. The extracted characters cut from plate and the characters on database are now equal-sized.

The next step is comparison. In this character image is compared with the database and the best similarity is measured. To measure the similarity d correlation is used. This method measures the correlation coefficient between a number of known images with the same size unknown images or parts of an image with the highest correlation coefficient between the images producing the best match.



The output of OCR on the segmented license plate shown above is:

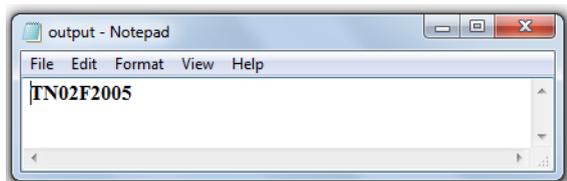


Fig 6. The output of OCR on the segmented license Plate.

V Comparison

Database is a collection of information or data which it is being orderly organize, thus it can be accessed easily and updated. Database can be in the form of text, contents and images. Database is needed to make sure that the image space can contained enough characters which have been extracted and the vehicle license plated number stored in the notepad for the purpose of comparison. The database would be enlarged in order to improve the accuracy and better chances of obtaining the correct result. The class recognition will check if the computed ratio is correct. It will ignore the class if the image thresholding is too low. If the class has match correctly, it will be compare with data set in the database and provide an output if the image is recognized correctly. Characters are compared to determine whether the input image is authenticated or not. Which is done by comparing the recognised license plate with the database .the database contain the list of license plate which are authorised.comparision is done line by line and by checking every character in each line. If all characters are matched then message will come as “authenticate”.

Results

The system’s accuracy in locating the number plate is more than 98%. The problem encountered in the earlier systems in locating the number plate when vehicle bodies and their number plates have similar colors was overcome. Thereby achieving higher accuracy in number plate extraction step. As the fonts vary from one number plate to the other, ambiguous situation may arise in recognizing the characters ‘G’ and ‘C’, ‘I’ and ‘l’, ‘7’ and ‘T’ and alike since OCR template was developed for one particular font. But some of them were overcome by “character categorization” approach.

Table1.Results of the Test

Units of LPR System	Number of Accuracy	Percentage of Accuracy
Extraction of Plate Region	332/340	%97.6
Segmentation	327/340	%96
Recognition of Characters	336/340	%98.8

Conclusion

The development of the Vehicle license Plate Recognition System is quite successful Implemented using MATLAB version 7.5. For this project, I have listed out the process report that needed to be done.

- Read the colour image into Matlab
- Manually crop the license car plate region from the colour image
- Analyze the cropped image in its red, green blue frames
- Convert the image from RGB to gray value.
- Noise Reduction using median filter.
- Extract each character and number from the image using segmentation techniques.
- Training of the database.
- Send the character and number to database for recognition
- Results is to be displayed in Matlab
- A GUI will be developed after the techniques has been tested.

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Fig.7. Graphical User Interface for the Demo program

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