

A Novel Approach for Indian Car Number Plate Recognition

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Abstract:

Vehicle number plate recognition is one of the important task which is related with security concern application. In India there are many states and sometimes ago the number plates issued by transport department to vehicles was not contains a unique format. But from little time ago government implants a project in which whole country's vehicle number plate contains a same format and ten letters are there. Now it becomes helpful for researchers to make a security based application called Vehicle number plate recognition which is related with antitheft security system or secure parking. It is also helpful to prevent unauthorized vehicle to enter into restricted area. Different methods are available for Number plate detection but as number plates vary from country to country, so it is necessary to develop a particular algorithm for different kind of number plates and this research work is presented here.

For Referring this Paper:

Lalit G. Patil, Devasi H. Chocha (2014), A Novel Approach for Indian Car Number Plate Recognition, *International Journal of Research (IJR)*, Volume-1, Issue-4. Page757-762. ISSN 2348-6848.

Keywords:

Pattern Recognition, Security system, Character recognition, Correlation, Image Processing

Introduction

Vehicle Number Plate recognition is the application which is applicable in real field where to recognize a numbers from real environment is a challenging task for camera as well to process on that recognized numbers. The most challenging is to recognize correct letters. Number plates contains alphabetical letters which may vary from A,B,C,D...X,Y,Z as well

numeric digits which vary from 0,1,2...8,9. There are many letters and numeric digits looks same like G and 6, L and 1, o and 0. We require a powerful algorithm which overcomes this limitation, and it should be capable of to detect particular correct character. In this paper we are going to discuss such a powerful algorithm which recognizes this letters correctly. We need to pre-define this Alphabetical characters and numerical numbers in image form for our algorithm.

Algorithm

Numerous algorithms are proposed for Number plate recognition. But as we know car number plate characters as well number of characters in each plate vary from one to another country. So, it requires to pre-define a characters style in image format for our algorithm to run accurately. Images for each character are created same as characters which are on number plate. In MATLAB, program file is created from this images.

The Programming Algorithm is as follows:

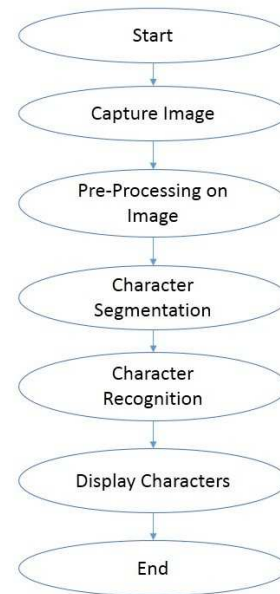


Figure 1: Algorithm for Vehicle Number Plate Recognition

The characters we need to pre define are



These are Numerical characters, and



These are alphabetical characters.

From this we are creating a template file.

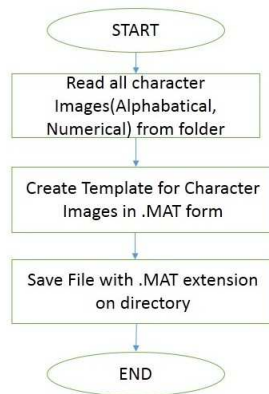


Figure 2: Algorithm for Creating Templates of Character images

Before recognizing characters from number plate it is necessary to do pre-processing on captured number plate, to remove noise. Noise removal increases a percentage accuracy in recognizing correct characters image as there may be always a confusion in '0' and 'O', '6' and 'G', '1' and 'l' etc.

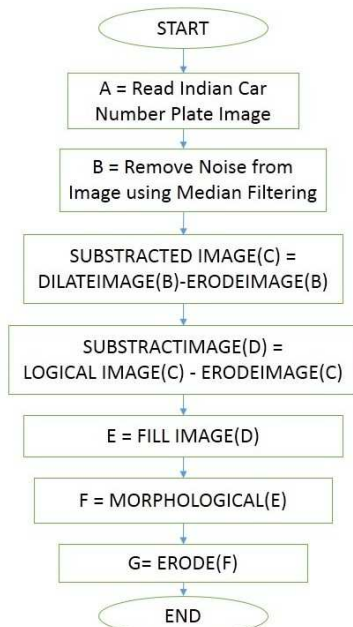


Figure 3: Pre-processing on captured Image

After Pre-processing on Acquired image, we go through following steps, to recognize correct words of Indian car number Plate.

1. Remove small objects from binary image
2. Label connected components in 2-D binary image
 - Run-length encode the input image.
 - Scan the run, assign preliminary label and record label equivalence in a local equivalence table.
 - Resolve the equivalence classes.
 - Relabel the run based on the resolved equivalence class.
3. Measure properties of image regions (Bounding Box)
4. Histogram of width of all Bounding Box
5. Find the number of ten characters in Image
6. Find Number plate Size
7. Segment each ten characters
8. Find 2-D correlation coefficient between each character and Pre-stored data

Cor-relation Equation is given as,

Correlatio r

$$= \frac{\sum_m \sum_n (A_{mn} - \bar{A})(B_{mn} - \bar{B})}{\sqrt{(\sum_m \sum_n (A_{mn} - \bar{A})^2)(\sum_m \sum_n (B_{mn} - \bar{B})^2)}}$$

Where, \bar{A} = mean (A), and \bar{B} = mean (B)

Result

This is the Indian Car number plate, from which we need to recognize characters. After going through developed algorithm, characters are recognized correctly and saved in Notepad file which can be used for further application.



Plate 1

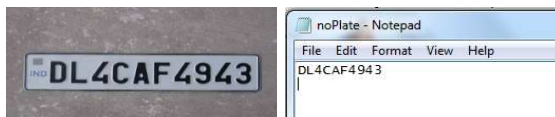


Plate 2

Figure 4: (a) Number Plates (b) Acquired result

Conclusion

Using this algorithm we can conclude that Vehicle number plate recognition using this algorithm gives higher accuracy as shown in below table. We noted that, this algorithm gives higher accuracy for Indian Government RTO approved number plates.

Number Plate	Accuracy
GJ 06 HD 4358	100%
DL 4C AF 4943	100%
MH 12 DE 1433	100%
KA 03 MG 2825	90%
MH 02 BG 2413	100%

Table 1: Accuracy and Conclusion table

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