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Extraction of Text from Vehicle Number Plate Of a Specific Region Using Template Matching

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ABSTRACT

The registration number of a vehicle is extracted from the image of the number plate in a text format using morphological processes and template matching for character identification. Due to non-standardization of the number plates in India, many a times there is an interchangeable detection of alphabets and numbers in the extraction process. A region specific algorithm has been implemented, based on the region specific number plates. For instance, in India, the registration number is 10-digit alphanumeric code, with first, second, fifth and sixth character as alphabet and other characters as number. This methodology increases the accuracy of text identification by removing the probability of an alphabet being produced as the result of correlation at the place of a numeric and vice versa

I. INTRODUCTION

Text extraction from vehicle number plate is of great importance as it serves multiple purposes like vehicle tracking, automating services like toll tax collection etc. Presently the system which is adopted on the traffic signals require a manual help of reading and verifying from the live streaming video being captured from the high resolution CCTV. Automatic text identification is still not reliable as it has some limitation. If the number plate is of poor quality, if the numbers are damaged, if characters have poor font to differentiate between characters like '0' and 'O'. Using artificial neural network is one alternative which can differentiate between such characters but with an issue that it requires long learning time. On the contrary if specialized region specific plate identification is carried out using template matching then it serves as a better alternative.

II. METHODOLOGY ADOPTED

Stages in vehicle number plate recognition:

1. Pre-processingPreprocessing is basically done on input image to render better quality image. It reduces error in the system. It increases quality of image and reduces unwanted noise.
2. Extraction of characters
   After completing pre-processing, we justseparate each character and make new images out of each of them.

3. Recognition using template matching
   In this step we just compare those images with each of the template we already have in data base and get the result.

Following process is performed in this method:

A. Vehicle image captured by camera

Vehicle's image is captured using camera whose number plate is to be identified.

Figure 1 Original Image

B. Extraction of number plate location:
Captured colored image is converted into grey image. Since colored image occupy more space so grey image is used in image processing.For this morphological process is used.

Figure 2 Grey Image

C.Median Filter
Median filter is used to minimize the noise present in grey image. It is a non-linear filter which is used to minimize the salt and paper noise.

Figure 3 Median filter image

D.Dilation
Rectangle structure elements are used to dilate binary image once at horizontal direction and another time at vertical direction then we get common area. It is basic operation in mathematical morphology. It is used to expand the shapes contained in input image. Dilation adds pixels to the boundaries of object image.

Figure 4 Dilation

E. ErosionStructure elements are used in erosion operation. It is used to remove pixel on the objects boundary. Structure element is a matrix of 1's and 0's.Erosion operation is followed by dilation process. It is known as opening operation.

Figure 5 Erosion

Figure 6 Subtract Dilation and Erosion

F.Convolution
This process is used to increase the brightness of edges of image.It is a linear operator. Purpose of this is extraction of features from input image.

Figure 7 Convolution

Figure 8 After Filling Hole

G.Final Image
This is the final process in number plate extraction technique.On the basis of this result only we get test in MATLAB output window.

Figure 9 Final Image

III. TEMPLATE MATCHING

Optical character recognition using Template Matching is a system prototype that is useful to recognize the character or alphabet by comparing two images of the alphabet [4].In this method templates of all alphabets and numbers, i.e. total 26+10=36 templates are stored. Templates are nothing but Bitmap image format file or we can say a 12 x 12 bitmap matrix. The selected segmented character image is primarily processed to remove the noise, after that it is converted to grey scale image to reduce its memory size. After that it is resized to match the template size. Correlation process is then carried out which give out a value which is a measure of similarity with each template. The template corresponding to maximum correlation value is then extracted as the text character. As there is no absolute value for which the template is considered corresponding to the character image, there are chances, in case, the image has quality issues of the resolution of the image is poor, that template of a similar character gets the highest correlation value and is taken as text output. Examples of this includes mismatch between '8' and 'B', '5' and 'S', 'A' and '4', and many more. To overcome this issue if we fix the template directories to be searched while correlation corresponding to the character place, then the mismatch between number and alphabets and numbers can be prevented. The vehicle number in the Indian region has fixed places for alphabets and numeric. First, second, fifth and sixth place corresponds to the alphabets and the rest belongs to numeric characters. Implementing the algorithm which search only the alphabet's templates for these places and numeric's directory for other six places serves the purpose.

IV. APPLICATION

This system finds application at number of places.

1. Toll plaza: - With automatic number plate detection automatic toll collection can be done without the need manual payment i.e. auto debit.
2. Parking: - It can be used for keeping the log of parking vehicles and calculating the parking fee.
3. Traffic control and management: - It can be used to detect the vehicles breaking the traffic rule and automatic fining system can be implemented using this.

V. CONCLUSION

In this paper we have presented a different, region specific approach for text extraction from the vehicle number plate. In this paper we have focused on the text extraction for the vehicles specifically in the Madhya Pradesh region. This approach can be further extended to PAN India level. The vehicle number in the region is of the form MP 07 CC 6607, where first two alphabets denote state code, the next two codes denote the district code. The purpose of proposing a region specific code is to overcome the drawback of the template matching technique and the non-standardization of the number plates in the region. Presently there is no standardization of the font and size of the number plate. Implementation of artificial neural network was another alternative approach which can even differentiate hand written characters but with a drawback of very large learning time. Therefore, it is for now proposed to use template matching with region specific algorithms so that errors like the detection of '5' in place of 'S' and '0' in place of 'O' and similarly others can be prevented.

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