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VEHICLE NUMBER PLATE RECOGNITION SYSTEM USING MATLAB: A HISTOGRAM BASED APPROACH

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Abstract: Vehicle number plate recognition technique is used for extracting an area of number plate from captured vehicle image. We use this technique because as we know there is highly increase in number of vehicles all over the world and it keeps increasing. So for the purpose of law enforcement and traffic management it become difficult to track each and every single vehicle so to overcome this, we need this type of technique. This system is very helpful for traffic police in order to find the details of a vehicle violating the traffic rules. This technique is used for various applications such as automatic toll collection, Border crossings, parking system, Traffic control, stolen cars tracking etc. The technique used in this paper is a histogram based approach which has advantage of simple and fast response as compare to other techniques. In this paper we use various algorithms from distinct edge detection to region of interest extraction.

Keywords: vehicle number plate, region of interest, Red Green Blue

INTRODUCTION

With rising number of vehicles on roads, it is getting very difficult to manually handle laws, traffic rules and regulations for smooth traffic moment. Identify VNP quickly is beneficial for many businesses and organizations for a variety of applications such as traffic management, automatic payment systems for car parking, stolen cars, security and crime detection.

A VNP recognition System is a mass surveillance method that uses character recognition on images in order to read vehicle registration plates in the form of segmented characters. This technique also helps to get the correct result compared to manually one. The main focus of this method is the detection of the region of interest and the identification of the number plate. This whole algorithm work step wise. First VNP image is captured by camera after that image is converted into grey scale for preprocessing.

Once grey scaling is done than dilation process start. Dilation help in reducing the noise and add pixels at the boundary of image. After dilation, horizontal and vertical edge processing has been done and passed these histograms through low pass filters. Low pass filter help in reducing the unwanted region or unwanted noise from the image. After this filtering in fifth stage, image will segment, and ROI has extracted. The advantage of this approach is success full recognition of a moving vehicle.

METHODOLOGY

Methodology is shown in flowchart for detection and extraction of plate.

— Input raw image/ Image Acquisition

In this first step, an image is captured by camera at some fixed angle and taken as an input in RGB form. The quality of image depend on various factors like lighting condition, quality of camera, distance and also size of the vehicle. For a better result, quality of image should be sharp or at high resolution.

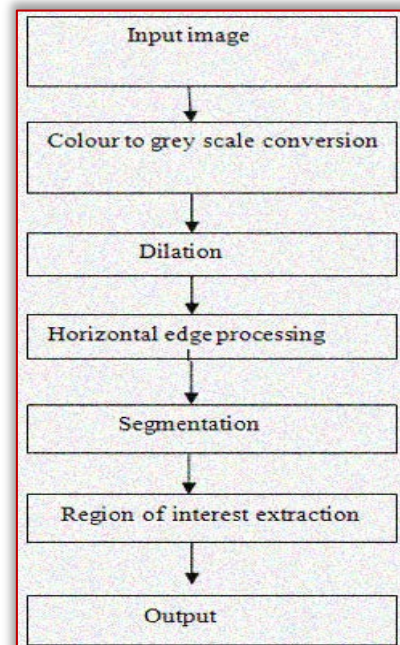


Figure 1: Recognition algorithm of VNP

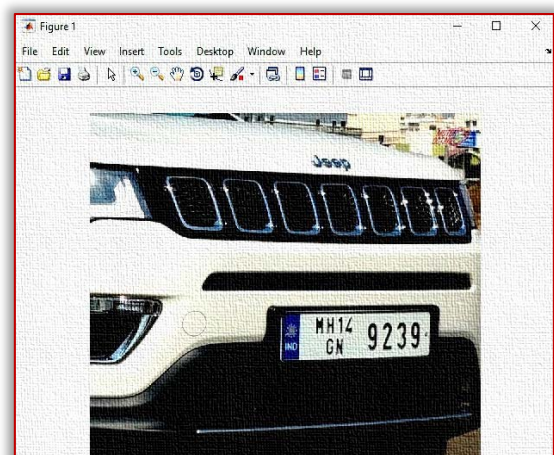


Figure 2: Input image

— Gray scaling of image

This algorithm is independent of the type of colours. In this step coloured RGB image is converted into the Gray scale image in order to reduce colours. Also it help to reduce noise to some extent. So, if the input image is a colored image represented by 3-dimensional array in MATLAB, it is converted to a 2-dimensional gray image before further processing.

— Dilation

Dilation is a process of improving the quality of an image by filling holes, adding pixels and joining the broken lines for sharpening the boundary of an image and it also help for increasing brightness. By the help of dilation, unwanted noise is reduced at large extent. By making the edges sharper, the difference of gray Dilation is a process of improving the quality of an image by filling holes, adding pixels and joining the broken lines for sharpening the boundary of an image and it also help for increasing brightness. By the help of dilation, unwanted noise is reduced at large extent. By making the edges sharper, the difference of gray value between neighbouring pixels at the edge of an object can be increased. This enhances the edge detection. Also the process of dilation help to nullify losses which occur during grey scaling.

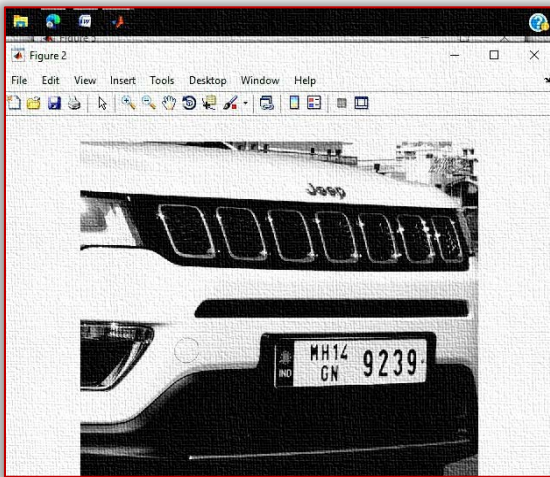


Figure 3: Gray scale image

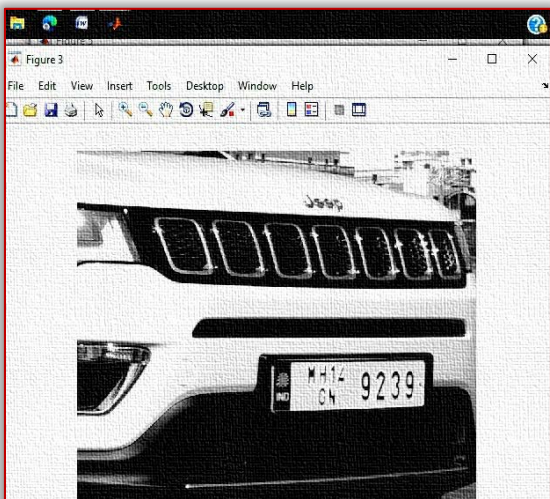


Figure 4: Dilated image

— Horizontal and Vertical Edge Processing

In this step, the dilated image from the previous step passes through successive edge processing techniques which are horizontal and vertical edge processing. These histograms represent the sum of differences of gray values between neighbouring pixels of an image, column-wise and row-wise. First we perform horizontal edge processing to get horizontal histogram. In this algorithm, it moves from each column of the image and work from second pixel from the top of image to get difference between first and second pixel. Similarly, this algorithm moves downward and calculate the difference between second and third pixel and so on. At the end, an array containing column wise is created. The similar process is carried out to find the vertical histogram. In this case, rows are processed instead of columns.

≡ Passing histograms through low pass filter

In the figures number 5 and figure number 6 shown below, we can clearly understood that the histogram values varies drastically between consecutive columns and rows. So, In order to prevent loss of important information in further steps, it is suitable to smooth out such drastic changes in values of histogram. For the smoothing, the histogram is passed through a low-pass digital filter. This step is performed by considering the right and left hand side values. This step is performed on both the horizontal histogram as well as the vertical histogram. Below figures number 5 and 6 shows the histogram before passing through a low-pass digital filter and after passing through a low-pass digital filter.

≡ Filtering out Unwanted Areas in Image

After passing the histograms through low pass filter, the unwanted region is removed from the image using another filter. The rows and columns with low histogram values are considered as unwanted regions. Because lower histogram values show very less variation with their neighbouring pixels. Since the region of VNP contain high variation of pixels therefore histogram with lower values not required. So, in this process it contain high probability of region containing number plate.

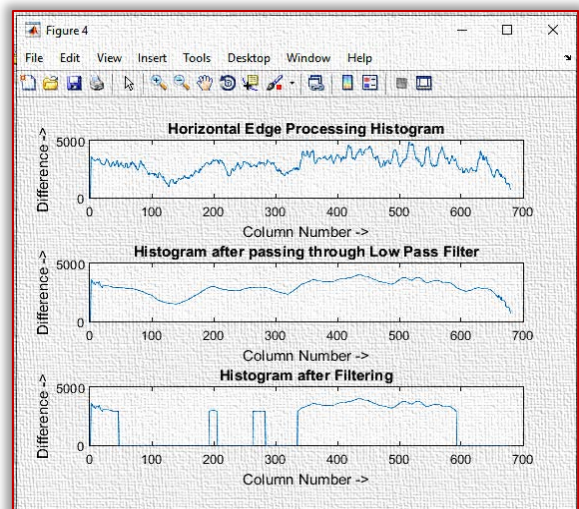


Figure 5: Horizontal Edge Processing Histogram

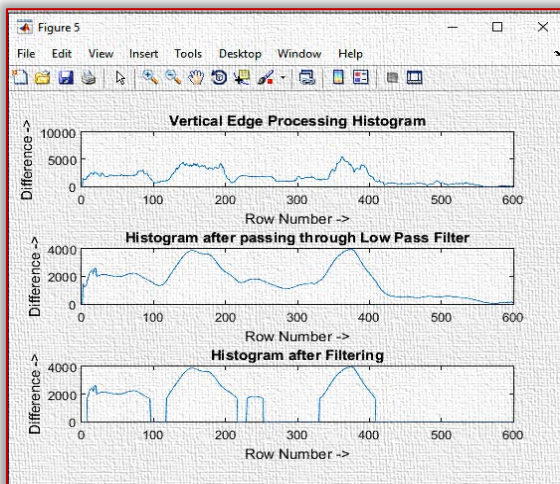


Figure 6: Vertical Edge Processing Histogram

— Segmentation of Region of Interest

In this step we find all the regions in an image that has high probability of containing a license plate. The below figure 7 shows the regions having most possibility of license plate.

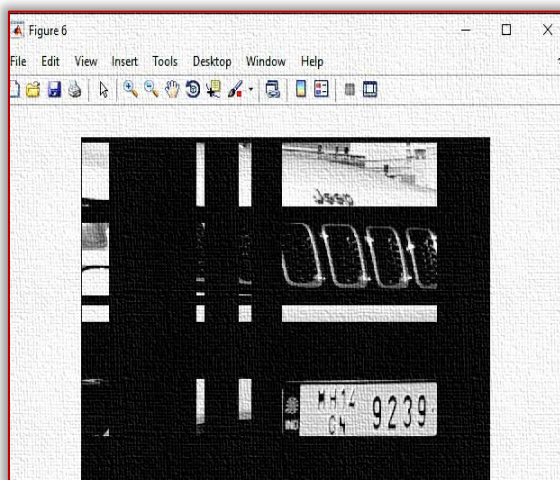


Figure 7: Segmented image

A. Extraction of region of interest

After the segmentation process, the region with maximum histogram value is taken as the most probable region for number plate. All areas are processed in rows and columns to find a common area with maximum values of the horizontal and vertical histogram. Below figure number 8 shows the output of ROI.

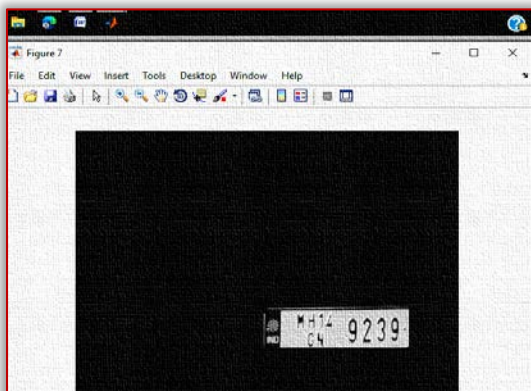


Figure 8: Final output showing VNP

CONCLUSION

In our work, we have successfully implemented vehicle number plate recognition technique. And our algorithm is successfully detect the number plate region from the image which consists vehicle number. We have applied this algorithm on many images and found that it successfully recognise the plate. The designed system can help to overcome the drawbacks of the manual system of vehicle plate identification. By optimizing various parameters further improvement can be achieved in the accuracy of the designed system.

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ISSN: 2067-3809

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