



Novel Approach towards Number Plate Recognition

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Abstract - As the population is increasing every day need of individuals prompts increment in transportation framework. As we know the each vehicle contains the number plate which especially recognizes the vehicle individually and used for different kind of reasons. Number plate because of high Intensity can be effectively read by people yet when the task comes to PC is getting complex. Some issue getting increment in situations when pictures is caught from the longer distance, high distortion, low contrast, low spatial resolution, blurred type and furthermore relies on upon the climate condition.

Presently in today time the need of technology and quick innovation has opened the entryway for the analyst in this field of Number Plate Recognition (NPR). The paper here provide an approach using Artificial Neural Network (ANN) towards Number Plate Recognition how the number in text form can be achieved from an image of vehicle containing number plate. Using standard OCR result was achieved up to 94% while using ANN approach accuracy improved up to 95.5% in recognition.

Keywords - Number Plate Recognition, Connected component analysis, Morphological Operations.

I. INTRODUCTION

In all aspects of modern life there was a demand for information systems for data processing in respect of vehicles. Here the purpose of our paper is to develop a real time system which would recognize the number plate of vehicle. Where the number detected from the process can be further used for the purpose of traffic monitoring, payment of parking, authentication of vehicle, automatic visual inspection of system, toll collection and handling etc. Many our developed system is based on the PC and the available software package MATLAB and the Digital camera will be required for capturing the image [1].

The system developed needs a general algorithm which includes the general steps:

- Image Preprocessing: Input image is converted or other operations required are performed.
- Region of Interest Extraction: Sub image is to be achieved containing plate region.
- Character Segmentation: For further process character are needed to be separated.
- Character Recognition: final result of recognition achieved by matching.

II. RELATED WORK

NPR 2004 systems use the mainly canny edge detection, fuzzy map. While the binarization of image and connected component analysis for image region extraction was adopted. Furthermore huge transformation was also implemented for alignment purpose. And standard OCR taken into account accuracy achieved 93.7%. [2]. Near about 2006 system was implemented with the technology like sauvola method for binarization, Sliding Concentric Window for ROI extraction purpose. And PNN network was adopted for the purpose of recognition in last step and accuracy was achieved 89.1%. [3]. in phase of 2007-08 use mainly the present techniques like edge statics, CCA for

used area extraction, Histogram preprocessing and also Statistical/Hybrid Classifies. Where the method for recognition also the template matching through OCR take place. When the implementation carried carefully result achieved was 98.8% [4], [5]. In 2010-11 use the NTSC method for gray scale conversion, mean filtering, Ostu method for threshold, ANN, histogram approach for contrast extraction purpose. When the approaches applied in this phase provide the result accuracy up to 90-95% [6], [7]. In current phase around 2013-14 techniques used previous and the further more in new era was implemented in this phase like vertical and horizontal projection, histogram technique, Neural Network, NTSC method etc. was applied for the automatic number recognition. And accuracy was achieved up to the range of 90-98% [8], [9], [10].

III. PERPOSED WORK

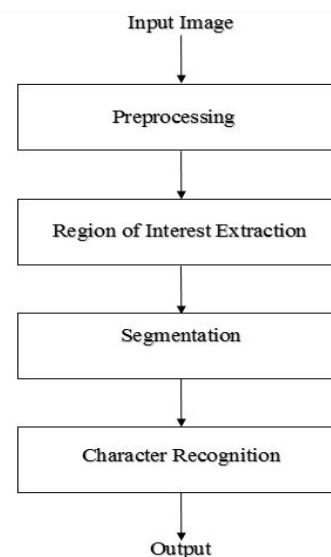


Figure 1: Steps in Number Plate Recognition

IV. PREPROCESSING

In initial of NPR system image acquisition take place image. Where the image captured using the digital camera Nikon. First the image uploaded is taken into account 1200 x 1600 pixels for further processing like conversion or noise removal etc.



Figure 2: Image Acquisition

A. GRAY SCALE CONVERSION

As the image is uploaded to the system the preprocessing of image was taken into account so that the further operation to be perform can take place efficiently. RGB color image is converted to grayscale format. There are many methods in MATLAB to implement this task we will consider the NTSC method [6] only when the work is to done one pixel color value carefully because that method work on color values [10].



Figure3: Converted Image from Color to Grayscale

B. MEDIAN FILTERING

Now we have the grayscale converted image for further processing. As we know image in real world contains the lot of noise so further the process of noise removal take place into the above image and the median filtering is applied to the image achieved in gray scale conversion process. Each pixel value is replaced with the median of the gray image values in the region of pixel [1].



Figure4: Filtered Image after Noise Removal Process.

V. REGION OF INTEREST EXTRACTION

Now we have the filtered image with less or minimum noise up to which extend we can remove properly. In our next step our aim is to find the sub image where further process take place of number recognition in which Canny edge detector applied which is the method of edge detection operator that uses the multistage algorithm for detecting a wide range of edges in images [11], [12]. Canny edge detection process is implemented as result achieved are like given in the below image



Figure 5: Image after Edge Detection

As the image obtained after edge detection we need the area contains the number plate. Then CCA method was adopted for that purpose. Based on pixel connectivity in CCA scans and labels the each pixels of a binarized based image into components. Every pixel labeled with the value depending on the component to which was it assigned. Connected components are then analyzed for filtering out long and wide components and only then left the components based on the defined values [2].



Figure 6: Image after CCA Process

After applied the process to the above data image achieved we get the segmented region by excluding the region which is unimportant part of image.

VI. SEGMENTATION OF CHARACTER

Now we have the segmented area containing number plate. Now MATLAB, the function region props for region properties having a shortcut for determining many of the properties of a black & white or labelled image. Some measure properties of the image regions blob analysis the regionprops syntax carried is STATS = regionprops (L, properties) which measures the set of properties for each labelled region for the label matrix L. And also positive integers elements of L correspond to the different regions [12]. Where the character segmentation method is provided by theregionprops provide and further we achieve the result like as shown in below figure.



Figure 7: Final Segmented Characters.

VII. NUMBER PLATE RECOGNITION

The last phase of NPR system is to recognize the individual characters by processing on the images of data achieved from previous phase. After splitting the extracted number plate into individual character images the character in each image can be identified. If we see the previous work and processthere are many methods used to recognize the sperated characters. We have proposed the system process by implementing two techniques. In the proposed system one we are using Optical Character Recognition which is an inbuilt feature MATLAB. And in case of second method we have implemented the concept of ANN (Artificial Neural Network) [5] in case of Character recognition process. Final result of our overall implemented system is discussed below.

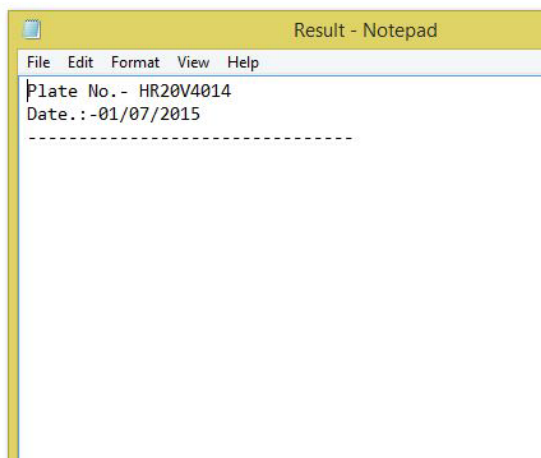


Figure 8: Output

VIII. RESULT

Our proposed Number Plate Recognition (NPR) system implemented over 220 images captured in different weather conditions. Mainly we have applied two types of recognition techniques in recognition phase one the standard OCR and other another one Neural Network approach. While the standard approach provides the result accuracy up to 94% and the neural network approach provides up to 95.5% result. While the detailed result of each step separately discuss below withaccuracy.

Steps Involved In NPR		Output/Input	Accuracy
Region Of Interest Detected		212 / 220	96%
Character Segmentation		210 / 220	95.5%
Character Recognition	Standard OCR	206 / 220	94%
	ANN Method	210 / 220	95.5%

Table 1: Result Analysis

Here are some Images in which number plate recognition was not take place correctly which can be due to low resolution, Blurred Image, Low Contrast, Over Expose, Bad light Condition etc.



Figure 9: Blurred Image



Figure 10: Overexposure in Image



Figure 11: High Distortion



Figure 12: Low Contrast



Figure 13: Low spatial resolution

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