License Plate Identification Based on Image Processing Techniques

Mr. Joshi Sanjay Bhaskarrao[1], Mandhare Sunil Shivajirao[2]

[1]DVVPCOE, Electrical Enginnering, joshisanjay9973@gmail.com,0000-0003-2691-1673

[1]DVVPCOE, Electrical Enginnering, instur10@yahoo.com

Abstract

This paper presents an image segmentation technique to segment out the Region of Interest (ROI) from an image, in this study; the ROI is the vehicle license plate. Vehicle number plate recognition is the most exciting and challenging research topic from past few years. Number plates are of different shape, size and also have different color in different countries. In India the most common vehicle number plate used have yellow or white as background and black as foreground colour. In this paper we proposed a system for localization of number plate for vehicles in India and segmented the numbers as to identify each number separately. We generally focus on two steps; one is to locate the number plate and second is to segment all the number and letters to identify each number separately. The project is developed using MATLAB7.4.0.

Keywords: —Number plate localization, Morphological operation, Character segmentation, Thresholding, Edge detection, Median filter

Introduction

Automatic Number Plate Identification (ANPI) is a part of digital image processing which is generally used in vehicle transportation system to categorize the vehicle. Number plate recognition systems are having varieties of application such as traffic maintenances, tracing stolen cars, automatic electronic Toll collection system etc. But the main aim is to control the traffic management system. [1].In India the traffic management system is became critical day by day. In India, the number plate containing white background with black foreground color is used for private cars and for the commercial vehicles yellow is used as background and black as foreground color.

The whole system mainly consists of two stages. First to identify the position of the number plate from the particular vehicle and second segmentation of all the numbers and letters of the number plate. For vehicle license plate detection - image acquisition, pre-processing, license plate localization and extraction of the license plate are the four basic steps. For license plate

Localization and extraction we are focusing on image segmentation and morphological image processing techniques respectively. [4, 5].

Noise on the number plate can sometimes cause error and low accuracy. There are some limitations that lead to failure in most practical applications due to the diversity of the number plate characteristics and the

intricacy of the natural environment like rain, snow, for etc. we anticipated a method mainly based on edge detection and morphological operation and decrease the noise using mid-filtering noise removal method.[12] The rest of the paper has been organized as follows, Sect. 2 describes the literature review, Sect. 3 illustrates the implementation criteria of the proposed Method, Sect. 4 shows the performance analysis of the images and Sect. 5 contains the concluding remarks of this study.

2. Related Work

Now faster changing life style of people, an advanced transportation system has become a part and parcel. As a result, the number of vehicles along with the traffic is on the rise. Therefore the concept of automatic vehicle license plate (AVLP) detection system for traffic control has emerged.

Many plate detection, segmentation algorithm have been proposed to implement ANPI system [3]. Number plate detection algorithm is mainly categorized into three classes: edge-based, color based and texture based. License plate location algorithm based on edge Detection and morphology is described to locate the number plate, first identify whether any noise is present in the plate. Several segmentation and recognition methods are used for number plate segmentation. More correct and effective segmentation of number plate will produce virtuous and more efficient recognition. Based on the above mentioned technique, many number plate localization algorithms have been established. An upgraded and efficient approach is recognized with high detection rate based on sobel edge detection and morphological operation [9].

3. Methodology

Many methods have been proposed to detect number plates from vehicle images; ranging from simple statistical methods to neural network algorithms and genetic algorithms However in real-time monitoring systems simple procedures have Advantages over complex procedures. Thus, in this work performance of a simple procedure to extract the plate region of images of rear side of vehicles (yellow number plate) was tested. The basic, method for extracting the plate region can be described by the following steps.

1. Input of the original (RGB) image
2. Identification of the yellow regions
3. Edge detection
4. Morphological operation
5. Finding the number plate region
6. Extraction of the plate region (RGB) image for number recognition

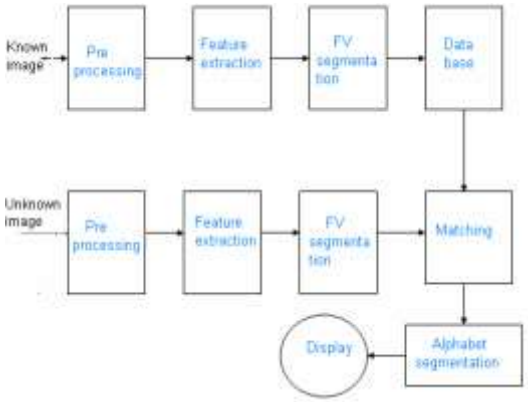

Fig1. Block Diagram

3.1 Image Acquisition

It is the process of acquiring an image from some source for further processing. For this research, the images that have been chosen contains good environment such as different lighting conditions, unwanted illuminations etc.

Fig. 2 Captured Original Image

3.2 Histogram of an Image

Fig.3 shows histogram image of an original image. Histogram is used for image enhancement intensity of different repeated pixels in the image is calculated and equalized to same level

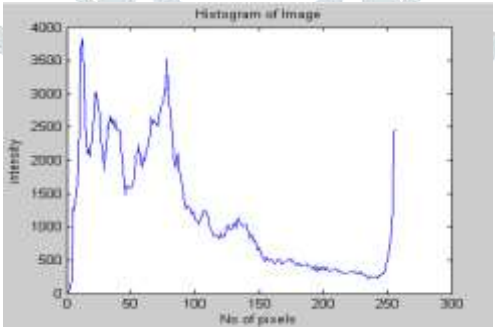

Fig. 3 Histogram of Original Image

3.2 Histogram Equalization

The image is calculated and equalized to same level Fig.4 shows histogram equalized image of original image.

Fig. 4 Equalized Histogram Image

3.4. Noise reduction

We used median filtering method to reduce the paper and salt noise. median filter (5*5) is to applied to The equalized histogram image in order to remove the noise. The median filter is anon linear filter which replaces each pixel by a value obtained by computing the median of values of pixels in an , in this case 5*5 neighborhood of the original pixel . Fig.5 shows result of the median filter to the original image.[12]

Fig.5 Filtered Image

3.5 Edge Detection

The basic step in recognition of vehicle number plate is to detect the plate size. In general number plates are rectangular in shape. Hence we have to identify the edges of the rectangular plate. Mathematical morphology will be used to detect that region. Sobel edge detector we used to high light regions with a high edge magnitude and high edge alteration are identified. Depending upon the threshold value edge will be detected from the input image. edge detection is the process for detecting discontinuities in intensity values such discontinuities can be detected by using standard first or second order edge detection operator In this sobel edge operator find edges by moving sobel operator horizontical and vertical. Matrix used for horizontal edge detection is [1 2 1; 0 0 0 ; -1 -2 -1] and [1 0 -1; 2 0 -2; 1 0 -1] fig. 6 shows the image after processing through the edge detection operator [2].

Fig.6 Edge Detection Image

3.6 Morphological Operation

After extracting edges morphological operation "dilation" is applied to the Images for specifying the plate location. Dilation is an operation that grows or thickens object in a binary image. Mathematical morphology is a tool for extracting image components that are useful in the representation of shape region such as boundaries shown in fig.7 [6].

Fig.7 Morphology Image

3.7 Character Location

Thresholding the preprocessed image to obtain binary picture. Change gray values of image in to binary values. The local neighborhood of a pixel is found if the difference between the max and min is less than the threshold t, the hole neighborhood is considered approximately the same shade of gray; therefore I assign the values of new pixels based that old pixels are bright or dark. If the difference between the max and min is greater than or equal to threshold I assign the values of a new pixel to be foreground the old pixel is closer to maximum. Fig.8 shows result of thresholding the image.

Fig.8 Threshold Image

3.8 Morphological Reconstruction

Morphological reconstruction was applied to the dilate image by using flood fill algorithm. It is very important to consider accurate bounding boxes along the specified areas by selecting the correct dimension. Number plate min area = 2670 mm Number plate max ratio = 0.67 Number plate min ratio = 0.16Selecting the number plate from the candidate choose area is the deepest region in the frame area >NP min area NP min ratio <= height/width <= NP max ratio. Area > = max (area of the candidate) /3.5 depth = -1 By selecting the bounding boxes I have got the extracted region of number plate shown in fig.9 some fellow components outside the number plate area still appears on the image and one must use the cropping process to separate other yellow region from the number plate region [8].

Fig.9 Extracted Plate Region

4 Result Analysis

All the experiments of this research were conducted by using MATLAB development environment. We applied our proposed model of AVLP detection over30images, the images were captured from various lighting conditions and natural backgrounds, and the algorithm was able to successfully detect 27 license plates from the selected dataset. The accuracy rate of the proposed model of AVLP detection algorithm is 91%. In Table, 1, below the variation of the accuracy rate of the proposed algorithm, based on the changes in the threshold value, has been given. As the threshold is determined by using a trial and error procedure, therefore, it varies from dataset to dataset [4, 5]. Table 2 represents image execution time for different pixel size of images.

Table 1.Test result of plate detection module

Sub-component	Accuracy	Percentage
Extraction of plate region	27/30	91%

Table2.Test result of execution time

Image quality	Average execution time
1600*1200	40±1 second
640*480	08±1 second

5 Conclusions

An efficient less time consuming vehicle number plate detection method is projected which performed on multifaceted image. By using, Sobel edge detection method here detects edges and fills the holes less than 8 pixels only. To removing the license plate we remove connected components less than 1000 pixels. Our anticipated algorithm is mainly based on Indian automobile number plate system. Extraction of number plate accuracy may be increased for low ambient light image

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