

Chapter 7

Ergonomically Designed System for License Plate Recognition Using Image Processing Technique



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Introduction

By using our technology, we are using image processing to stumble the vehicle plate. LPR is employed at several places like malls, parking heaps, etc. This facilitates us to make sure the security. But it is terribly difficult once the background and number plate are analogous [1].

The proposed method makes use of morphological ROI operations to extract the vehicle plate. We can distinguish between background and number plate through the use of morphological operations [2, 3]

Morphological operations are classified into erosion, dilation, opening, and closing.

- (1) **Erosion:** The worth of the output constituent is that the minimum worth of all pixels. It may be delineate as if any of the close constituent values is zero, then the pixel cost is about to zero.
- (2) **Dilation:** The value of the output pixel is that the most worth of all pixels. It may be outlined as though any of the neighboring pixel values are one, then the pixel cost is about to 1.
- (3) **Opening:** It can be outlined as removing objects from foreground and places in background. In beginning, erosion procedure is observed by means of dilation [4, 5].
- (4) **Closing:** It may be defined as doing away with small holes in foreground and converts them from background to foreground. In closing, dilation is observed with the aid of erosion.

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At the start, the input image is preprocessed by means of using neighborhood maxima-minima binarization technique, observed by means of threshold segmentation then character recognition.

Literature Survey

The motive of this paper is to confirm security. This manner is split into three foremost steps together with processing, segmenting, and recognition of vehicle plate. For this analysis, input image of a vehicle is taken. Here, the output suggests the GUI of registration code [6, 7].

Preprocessing

Binarization approach is manner of adjusting colored image to black and white image. In binarization method, worth of every pixel is calculated. Pixel value stages from zero to 255.

$$\text{No. of. pixels} = \text{pixel columns} * \text{pixel rows}$$

Here, we use local maxima and minima to calculate threshold value. In this technique, threshold measure is calculated via considering most and stripped-down pixel values within the image. By the usage of the non-heritable threshold value, the given input image is remodeled to black and white [8, 9].

Character Segmentation

Initially, it extracts the ROI from whole image and performs threshold segmentation that separates background and foreground. Here, number is taken into account as foreground.

In [10, 11] developed an license plate recognition depending on learning protocol. In this protocol, camera captures the image and provides output as candidate region. The two TDNS which are using as the horizontal and vertical filters provide the license plate.

In [12, 13] suggested a device which will give high-quality images of license plate. In this technique, they used a dual camera developed by author. One camera is stationary and another is pan tilt zoom camera. And an CNN classifier is used to recognize license plate.

Sahas Tabriz et al. present a techniques for recognizing license plate exactly using K-nearest neighbor calculation and SVM techniques [14].

According to Sandipan chowdhary et al. to find out the characters from the dataset and extract the license plate.

According to Muthusamy et al. [15] developed an self-synthesized function of CNN which distinguishes the vehicle plate by its state [16].

Proposed a technique to recognize the license plate by using convolutional neural networks. It uses 53 convolutional model layers, and in second stage, it will do image segmentation for recognition of characters.

According to proposed an ANPR method. In this method, they use two candidate detection algorithms, one is for matching edges and other is for matching the template.

According to Devika et al. [8] developed an ALPR system. In this method, they used two stage identification of characters using simple data augmentation technique.

Proposed Work

There are two principle plate identification strategies utilizing morphological activities: top-hat technique and base-hat strategy. These activities can adequately discover progressively obvious edge areas. Since these techniques are utilize do distinguish edges, they can cause errors if there are solid edges out of sight.

To tackle this issue, we propose the LPR strategy utilizing MROI map as appeared in Fig. 7.1. MROI map comprises of the standard deviation of morphological open and close image. It uses to discover to the brilliance contrast between the background in the plate and the characters. It is imperative to distinguish the plate locales that have exclusive expectation deviations and furthermore are plainly recognized from the background (Fig. 7.2).

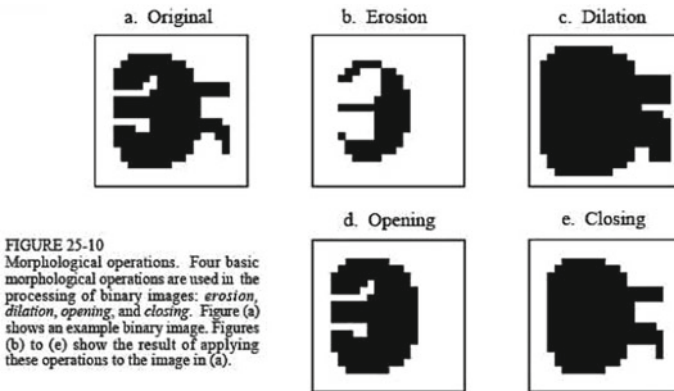


FIGURE 25-10 Morphological operations. Four basic morphological operations are used in the processing of binary images: erosion, dilation, opening, and closing. Figure (a) shows an example binary image. Figures (b) to (e) show the result of applying these operations to the image in (a).

Brainbitz

Fig. 7.1 Morphological operations

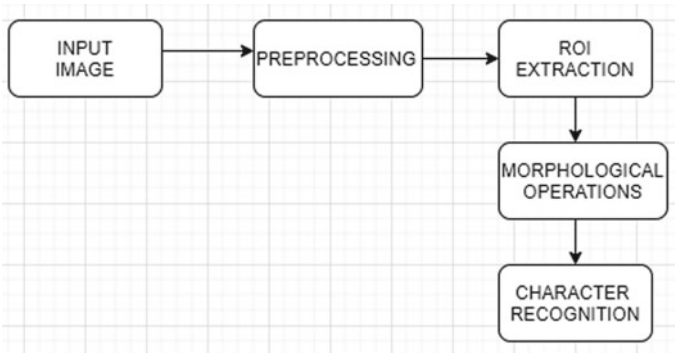


Fig. 7.2 Block diagram

Input Image

A. RGB Image

An RGB image is usually spoken as a real color image. It is a 3 dimensional channel with eight bits of red, 8 bits of green, and eight bits of blue (Figs. 7.3 and 7.4).

B. Grayscale Image

A gray level image is solely one during which the sole colors area unit reminder gray. The rationale for differentiating such pictures from the other variety of color image is that less data need to be supplied for every picture element (Fig. 7.5).

$$Y = 0.299r' + 0.587g' + 0.114b'$$

Fig. 7.3 RGB image



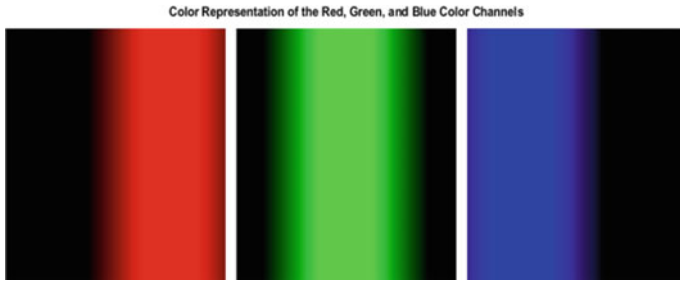


Fig. 7.4 RGB channels

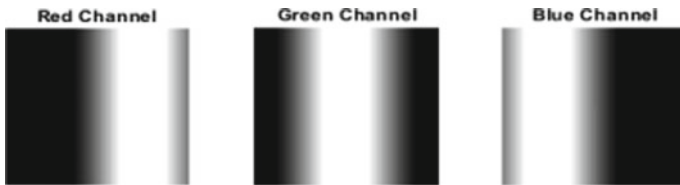


Fig. 7.5 Grayscale image

Preprocessing

A. Image Acquisition

This includes filtering a report and putting away it as a image.

B. Binarization

Image binarization is that the manner of taking a grayscale image and changing it to black and white, by considering the threshold worth as 127 that is half of 255.

Each pixel value levels from 0 to 255.

Black=0, white=255

Initially, the input image is processed by play acting binarization. Initially, it calculates each pixel value.

Each pixel worth ranges from zero to 255.127 is taken into thought as threshold value. If (pixel value>127)

Converts to white

Else

Converts to black

But if we have a tendency to restoration the threshold value, the results might not be true.

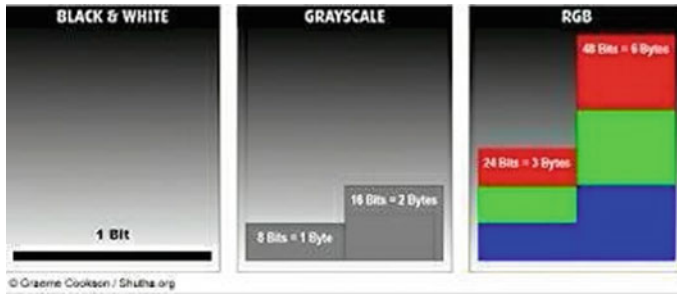


Fig. 7.6 Binarized image

Here, we use local maxima and minima to calculate value of the threshold. In this approach, threshold value is calculated with the help of brooding about most and minimum pixel values at intervals of image (Fig. 7.6).

C. Connected Component

It is a crucial procedure in parallel picture preparing that checks an as of now binarized picture and mark sits pixels into segments dependent on PEL availability (four-associated, typically, eight-associated) [3]. When all gatherings of constituents are resolved, every PEL is marked with an incentive as per the segment to which was allocated.

Removing and marking of different disjoint and associated segments in a picture are fundamental to many robotized picture investigation applications, the same number of supportive estimations and highlights in double articles might be separated [3].

D. Noise Removal

It is going to be outlined as smoothening of image by obtaining eliminate dots that has additional intensity. Noise removal is completed when binarization is done. It is going to be administrated for each colored and black-white pix.

Character Segmentation

A. ROI Extraction

A ROI may be a part of picture that you simply wish to channel or do some alternative activity on [2]. You outline ROI through developing a binary mask that may be a binary image that is the equal length because the image you wish to technique with PEL that outline the ROI set to one and every one alternative PELS to zero [8].

B. Morphological Operations

Dilation and erosion are 2 essential morphological operations. Erosion gets eliminate PELS on item boundaries, whereas dilation provides PELS to the boundaries of gadgets in an photograph [7].

Character Recognition

Segmentation procedures can be extensively ordered into 3 classes:

A. Explicit Segmentation

In this, information word picture of a grouping of characters is parceled into sub-pictures of individualist characters, which are at that point ordered [5]. This procedure is named as a dissection.

B. Implicit Segmentation

It is additionally called recognition-based segmentation. It is methodology is to part words into fragments that ought to be characters, and afterward pass every section to a classifier. On, off chance that the characterization results are not palatable, call division again with the input data about dismissing the past result.

C. Holistic Approaches

It is otherwise called segmentation free methodology.

By utilizing this methodology, one can extricate the whole info as apart from a string [6]. This methodology legitimately worry with words, not letters. Utilization of this methodology is restricted to a predefined lexicon.

The OCR uses correlation technique for the character recognition.

Results

See Figs. 7.7, 7.8, 7.9, 7.10, and 7.11.

By seeing above output, we clearly understood that if we take an image of nameplate then with the help of our algorithm, it will convert into string.

Fig. 7.7 Colored image





Fig. 7.8 Colored image to grayscale



Fig. 7.9 ROI extraction of binarized image



Fig. 7.10 Character recognition

Fig. 7.11 Output



Conclusion

Based on our algorithm, the image processing to the vehicle license plate is implemented. By the above examples, we can draw a conclusion that our algorithm can easily recognize the license plate, and recognition accuracy is high. It is used for several functions like tollway regime use this device for permitting the car to travel into the road by way of detection their quantity plate mechanically and supply them with payslip once that open the road for that specific car. Parking government additionally uses this appliance for permitting the car to park of their space. It facilitates us to ensure the security.

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