Localization and Recognition of High Security Registration Plate for Indian Vehicle

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Abstract— Recently India has launched new Licence plate format according to the CMV rules in which each plate assigned with a unique Permanent Consecutive Identification Number (PCIN) and a hologram system. A chromium-based hologram is put and 'IND' in blue is inscribed using hot stamping foil. Almost all the states are implemented this new format called HSRP Licence plate system. At this scenario Indian traffic system needs a robust automatic License recognition system according to the new HSRP format. In this paper we proposed a robust method for automatic detection of license plate under Indian environment. For this system we use strong pre processing techniques for improving the identification accuracy.

Keywords— License plate recognition, HSRP Licence plate, Image Localization, Character Segmentation

I. INTRODUCTION

In the current era of information technology there is variety of technology used by the different departments of the government for surveillance monitoring. As a part of the traffic network, there are thousands of cameras across the country near to roadside and parking for surveillance monitoring. Automatic license plate recognition plays an important role in various real-life applications, such as automatic parking area, security control of restricted areas traffic law enforcement, and automatic toll collection. The vehicle number plate in India composed of white background with black foreground color for private cars and for the commercial vehicle used yellow as background and black as foreground color. Vehicles belonging to foreign consulates have white lettering on a light blue background. Military vehicles have a unique numbering system as it has first character is an upward-pointing arrow. The High Security Registration Plate Scheme (HSRP) Scheme was launched in 2011. It has chromium-based hologram with 'IND' in blue is inscribed using hot stamping foil and a unique Permanent Consecutive Identification Number [1]. The vehicle number plate in India consist country code, state code, district code, type of vehicle and finally the actual registration number as shown in figure1.

Figure 1 HSRP Format

This paper presents a method for the development of a HSRP License Plate Identification and number recognition system designed for the various different applications. A license plate recognition system generally consists of two main parts first License Plate Localization and second is characters segmentation & Recognition [2].

Figure 2 License Plate Localization & Detection

Script identification of Indian Scripts has been a challenging research problem in a multilingual and bilingual environment over the last few years of

development of OCR. Basically the works on script identification are classified into two as local or global approach. Various works has been proposed till using local approaches [1, 2]. Generally local approaches use different features like water reservoir principle morphological features, profile, cavities, corner points, end point connectivity, top and bottom profile based features. In local approaches, the features are extracted compare and classify using different standard algorithms. The accuracy rate of the local approach depends on the pre-processing steps taken and applied in appropriate way. The very first issue occurs that features extraction perform on segmented line, segmented word and segmented character level, which are obtained only after using segmenting the underlying document image up to appropriate level. So, the success rate of identification depends on the effectiveness of the preprocessing steps such as, Line, Word and Character segmentation, noise removal etc. In this paper we proposed a world level script identification of Latin script from Devanagari script document using global features. Theses global features are detected using projection profiles of the segmented words of both the scripts.

II. RELATED WORK

In the earlier work for License plate recognition for different applications under various environments has presented. The problem of Automatic License Recognition is being research area since the 90's and for Indian environment some of the research still in process [5]. Most of the early approaches were based on feature of boundary lines and other geometrical features. The input images are first preprocessed to improve the visual quality and then being processed to enhance boundary line-information and features detection. This process implemented by using algorithms such as filter, and results in the formed of edges based image. For preprocessing first it was converted to its binary counterpart and then processed by certain standard approaches, like Hough transform to detect lines. In most cases couples of parallel lines detected were considered as a License plate [6].

One more approach category was proposed with variation based on the morphology operations of elements in an image [7]. This type of approach emphasis on the properties of vehicle plate images in such a way that their brightness, contrast, symmetry and angles are considered. On the presence of these features, this type of methods used to detect the similar properties in similar images and locate the position of number plate regions. The third category

approach was proposed by various authors for different character recognition techniques. This type of methods is based on statistical features of the image elements [3, 4]. At very first in these approaches, text regions were detected using statistical features of the text such as variance of gray image pixels, number of edges in the whole image, edge densities in the region of interest etc. This type of approach was commonly used for locating text in the target images, and recognizing candidate numbers in the plate areas as it includes alphabets and numerals. In addition, recently few approaches are also proposed based on the artificial intelligence and genetic algorithms [2]. These systems generally used the features like for edge detection and edge based statistics and then using AI techniques to detect the location of the number plate area.

III. PRE-PROCESSING

In the real scenario traffic camera captures vehicle images in different angles & environment which needs pre processing for accurate identification of the owner. While image acquisition there is chances to noise in the image which need to identify and remove before the actual processing. Therefore few of the preprocessing phases are implemented such as gray color conversion, dilation & erosion, skew correction etc [5].

Gray Conversion

System takes input image in gray tone having pixels intensity values between (0-255) and using a threshholding approach color image converts from RGB to Gray tone.

Dilation and Erosion

Dilation and erosion are two morphological operations use for the restructure the pixel elements of image. Basically Dilation adds pixels to the boundaries of elements in an image. While images capturing few of the pixel points missed and due to noise and it need to recover for appropriate recognition. In other hand erosion is the process which removes pixels on elements boundaries of the image. The number of pixels added or removed from the elements in an image depends on the size and shape of the structuring element used to process the image [6].

Skew Correction

Perspective disorder of scanned image due to error in acquisition process called skewed image. Skew detection and correction is the basic preprocessing step required to align the text characters in the whole

image. In general character recognition process there can be two type of skewed image occur Global and Local skewd, but in case of number plate only global skewed can be occur which is rectified before the main process of the system.

IV. NUMBER PLATE LOCALIZATION

License plate localization is an important part of the subject of license plate recognition; it limits the search space of the recognition part, so it can be computed faster. License plate recognition is an important subject in today life. There are nowadays many motor vehicles on the road. It is useful to identify the motor vehicles for a lot of applications. For example for automated tolling systems, traffic monitoring, public safety and security, speed control and road prizing. In this paper we proposed method based on edge density. For locating region of interest i.e. Number Plate the whole image is broken to multiple blocks based on threshold value. After changing an image to Gray tone it is divided into small blocks to evaluate the element density. The basic geometric feature of the number plate is that it holds several of vertical edges. In Figure 3 shows one by one process of candidate image detection from the whole image. Every block of the image scan from left top to the right bottom for vertical stroke density and after this selected blocks consider for the height and width ratio proportion. At the last selected blocks tested on the geometrical features of number plates extracted from the image such as intensity value of background and foreground frequently change.
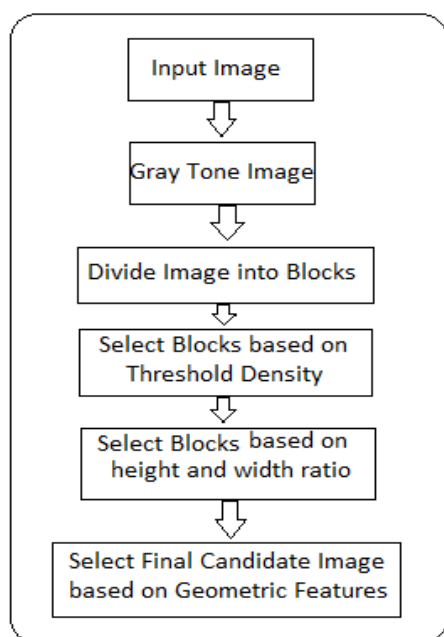

Figure 3 Number Plate Localization Process

In several images there is more than one candidate license plate area detected. From the candidates the true license plate has to be selected on the second and third feature extraction phase.

V. NUMBER PLATE RECOGNITION

At the second part of the work extracted number plate image need to convert into editable text. It is employed for the purpose of conversion of images of text into corresponding editable characters. Optical Character Recognition system is used for this purpose. Before the recognition of character it must be segmented into individual character image.

Character segmentation

To isolate the characters of number plate from each other, many techniques have been used; the extracted license plate is resized into a standard threshold template size. At this template, all character positions are given in advance. After resizing, the exact location is calculated for the characters. This method robust and it has high accuracy rate. In case of shift in extracted license plate, the results in background instead of characters.

Character Recognition

The character recognition approach has two basic parts feature extraction and the feature classifier. Feature analysis determines the descriptors, or the feature set used to describe all characters. Given a character image, the feature extractor derives the features that the character possesses. The derived features are then used as input to the character classifier. Template matching or matrix matching, is one of the most common classification methods. Here individual image pixels are used as features. Classification operation is performed by comparing input characters with a set of templates from the dataset of each character. Each comparison results in a similarity measure between the input characters with a set of templates. One measure increases the amount of similarity when a pixel in the observed character is identical to the same pixel in the template image. If the pixels differ the measure of similarity may be decreased. After all templates have been compared with the observed character image, the character's identity is assigned the identity of the most similar template. Template matching is a trainable process as template characters can be changed.

Initially a database is created for twenty-six English alphabets of 4 standard fonts. Similarly we create a database for 10 digits of these standard fonts. These

are alphabets/digits that we consider to be ideal ones. The alphabets/digits are stored in order starting from first font saving vectors for all the twenty-six alphabets and then starting it with the new font. There is no limit to the fonts that can be stored but there exists a tradeoff between the size of database and accuracy.

VI. EXPERIMENTAL RESULTS

In this section we evaluate the proposed method of recognition of High Security Registration Plate. For implementation we used MATLAB. The performance evaluation of the system carried out on the input images taken under different conditions. The proposed method expressed here in this paper is tested on 100 different images and the success rate of plate place is received to 98% and character recognition reached to 99% so this result shows the high efficiency method.

VII. CONCLUSION

In this paper we tried to show a robust method for the best result in this system and success rate of 99 percent. In several applications we need a success rate of approx 100 percent, because we need the license plate numbers of every car for most applications. A license plate localization that doesn't point out the license plate localization system made in this project is useless, but when implementing it in a real application it needs newer technique to achieve a higher accuracy rate.

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