Vehicle Insurance Verification System Using Modified Otsu's Binarization Technique in Image Processing

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Abstract

Vehicle insurance verification system has become an important tool to verify whether the vehicle is insured. This system has been employed in various countries except India as they have certain standards such as number plate, background, number plate size, boundary of number plate, etc. for localizing the number plates. In India though the number plate standards exist they are rarely practised. In this paper the entire system is divided into two segments extraction and verification. Our proposed system consists of following steps: number plate recognition, extracting the characters, retrieving the vehicle number followed by insurance verification. For Indian condition the well-suited method is feature based number plate localisation which consists of various algorithms. NTSC standard method is used to convert RGB image into gray level images and Otsu's method is used to convert gray level images into binary image. For the identification of number plate contours are drawn followed by masking the remaining part of the number plate. From the image configuration the license number of the vehicle is obtained. From the obtained vehicle number, the owner details and the vehicle details are shown along with the insurance details from the database. Therefore, we can verify whether they have insured or not.

Keywords: *Extraction: Verification: NTSC method: Otsu's method: contours: Segmentation*

1. Introduction

ANPR is a massive surveillance system that captures the image of vehicles and recognizes their license number. Some applications of ANPR system are automated traffic surveillance system and tracking system, parking toll collection system, automation of petrol stations. Such systems automate the process of recognizing the license number of vehicles. But in ANPR systems they use specific features found on their number plates such as background and foreground colour, boundary of number plate, number plate size, and font style of the characters in the number plate. These criteria's, though they exist had been rarely practised in India. As a result of this system, the variations in the font type, character size etc. are found. The ultimate aim of the localization is to eliminate all the background and preserve only the number plate area. Then the individual characters are identified, and the number is recognised.

2. Literature Survey

Otsu's method is one of the efficient techniques in binarization used to convert the gray scale image into binary image [1]. The entire system works under the following algorithms. NTSC (National Television System Committee) method for conversion from RGB image into Gray scale image followed by Otsu's binarization for conversion of gray scale image into binary image [3]. For Indian condition such as number plate colour variation, font style of the characters, etc [2].

3. Proposed System

The feature-based number plate recognition algorithm involves the following steps: extracting the image of the license plate, extracting characters from the license plate image, retrieving the vehicle number, and finally verifying the insurance of the vehicle. Initially the number plate of the vehicle is captured and processed through various algorithms. Then the number plate is localized by feature based number plate localization that consists of many algorithms. Then the image is sent to character extraction from where character is being recognized. Then from the database connectivity the insurance details had been extracted and verified. The system flow chart is given in the figure1.

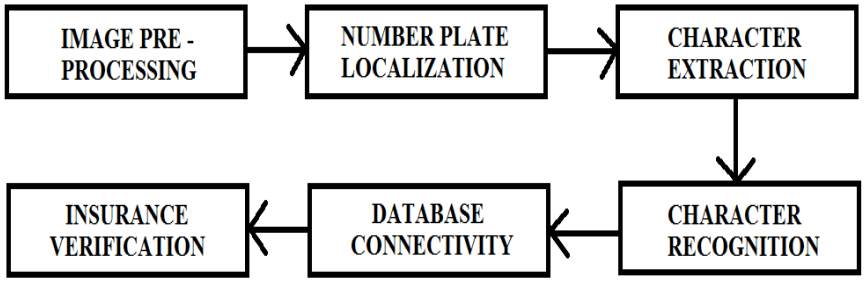

Figure.1. System flowchart of license plate recognition

4. Implementation

The input image is initially processed to improve its quality and prepare it to next stages of the system. The input image is the original RGB image as shown in figure 2.

Figure.2. Original RGB Image

4.1 Gray Scale Conversion

First, the system will convert RGB images into gray level images using the NTSC standard method. For pre-processing the input RGB image(figure2) is converted into gray-scale image (figure 3) and is adaptively converted into binary image as shown in figure 4.

Figure.3. Input Gray Scale Image

The function **cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)** is used for converting binary image into gray scale image by importing the cv package in python IDLE.

4.2 Binary Image Conversion

Further the system will convert gray scale images into binary images using the otsu's standard method as shown in the figure 4. The function **cv2.bilateralFilter(im_gray,9,75,75)** will filter the image of gray scale image for the removal of the noise and further the image undergoes thresholding process.

Figure.4. Output of Otsu's Method

The thresholded image is further processed by otsu's method as follows
cv2.threshold(noise_removal,thresh,255,cv2.THRESH_BINARY+cv2.THRESH_OTSU)

4.3 Requirement Masking

For the contours selection the four corners are given as an input and the number plate is localised with selecting the four corners of the number plate as shown in the figure 5. Further the contours are drawn by the following function

cv2.drawContours(image, [screenCnt], -2, (0, 255, 0), 3)

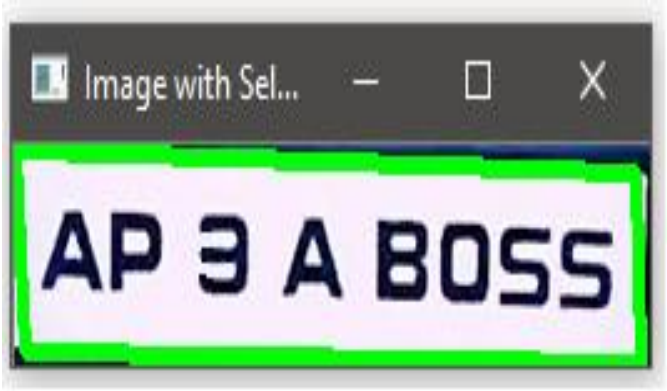

Figure.5. Contours Selected Image

mask = np.zeros(im_binary.shape,np.uint8)
new_image = cv2.drawContours(mask,[screenCnt],0,255,-1,)
new_image = cv2.bitwise_and(image,image,mask=mask)

Figure.6. Output of Image Masking

For Masking the above-mentioned function is used and the resultant output of the masking would be displayed as shown in figure 6.

4.4 Character Recognition

The OCR is used to compare each and individual character against the complete alphanumeric database. The OCR actually uses correlation method to match individual character where the number is identified and stored as a string format in a variable.

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

number_plate	owner_name	address	phone_no	insurance_detail
TN30BJ2661	sivagopal	fairlands-salem	8148120385	insurance paid
TN23CW0720	raveendran	KCC Nagar-hosur	9865214157	insurance paid
AP3A8055	shalini	junction road-salem	9876875120	insurance not paid
TN45BF0724	soundarya	T-Nagar-chennai	8838020519	insurance not paid

Figure.7. Database Connectivity

After that the string is compared with the stored database using MySQL database connectivity for the vehicle authorisation and continually the recognized number plate string is compared with authenticated database file. The database file includes license plate number,

owner name, address, phone number, insurance details. If both the value is same, it will retrieve the required details from the database including insurance details.

```
#replacing the characters
string=[i.replace('B','8')for i in string]
string=[i.replace('o','0')for i in string]
string=[i.replace('O','0')for i in string]
string=[i.replace('s','5')for i in string]
string=[i.replace('S','5')for i in string]
string=[i.replace('b','6')for i in string]
string=[i.replace('z','2')for i in string]
string=[i.replace('Z','2')for i in string]
string=[i.replace('I','1')for i in string]
string=[i.replace('i','1')for i in string]
string=[i.replace('A','4')for i in string]
string=[i.replace('g','9')for i in string]
string=[i.replace('q','9')for i in string]
string=[i.replace('l','1')for i in string]
```

Figure.8. Replacing the characters

Then the string is processed for replacing with numbers for alphabets in last four serial. The replacing technique is shown in figure 8.

5. Experimental & Results

The system was developed using python IDLE, MySQL database connectivity. The system was tested with a set of images not used during testing, having wide variation in illumination conditions. The complete recognition process takes an average of 2 seconds. This can be further improved by optimizing the code. Due to natural condition during the capturing the image some noise was added, it disturbs the edge detail preserving filter to restore the image. Then the noise removed image is converted into binary image. Then the system is connected to the MySQL connector and the database from which contains the insurance and the owner details.

```
License plate Number= AP3A8055
VEHICLE NUMBER PLATE= AP3A8055
OWNER'S NAME= shalini
OWNER'S ADDRESS= junction road-salem
PHONE NUMBER= 9876875120
INSURANCE DETAILS= insurance not paid
```

Figure.9. Final output of the number plate

Then the resultant detected number is compared and verified with the database and the details are retrieved. If cases where the number plate script is non -English or the number plate is badly distorted are excluded, then 90% of the plates were recognised correctly.

6. Conclusion

In this paper, an approach for localization of Indian number plates is presented. Given an input image, it should be able to first extract the license plate. The proposed system will search the image for high density edge regions which may contain a license plate. After the cleaning process and by the noise removing method. After that the plate will be passed to extraction of numbers. Number plates having variation such as white background black script, yellow background black script can be easily localized. Unwanted conditions such as screws and unwanted text on the number plate are not considered while extracting the number. As per Indian conditions, the major sources of error were the tilt of the number plate, the non-English script, fancy stickers, and extreme variation in the dimensions of characters, containing number plates will be avoided for the better accuracy. Thus, a new framework will be generated to implement this system fully in India.

7. References

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