Efficient Scale Adaptive License Plate Detective System

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Abstract: *Every day a new technology is launched that simplifies people's lives and increases comfort, as well as travel, be it a private or public vehicle. The number of vehicles increases rapidly, it is very difficult to track each vehicle to check the application of the law, traffic control, stolen cars, etc. The OCR technology can automate the manual work of writing the license plate number and then checking it afterwards, which is long and time consuming, especially with the growing number of vehicles. Firstly, the system will acquire the image of the car, then send the image to the OCR software that first recognizes the position of the license plate in the image and then dissociates it from it. After separating the plate, we will perform a series of steps to improve the image using image processing for better results later. In the next step, we will perform the separation of the characters so that we can recognize each character individually. After obtaining the separate character, we will identify the characters using CNN that are trained in a large number of data series. ANN increases the success rate more than the pattern matching technique to recognize the previously used character*

Keywords: *ALPR, Character Segmentation, Convolutional Neural Networks, Edge Detection, License Plate Extraction, Morphology, OCR.*

1.INTRODUCTION

Optical character recognition (OCR) is a technology primarily used to recognize typed or human typed texts in scanned documents, images and then convert them to editable form. By expanding its application, we can use OCR in a computer-driven traffic system, that is, an intelligent traffic system that can work alone with minimal or no human intervention. License plate recognition will play an important role in the construction of any intelligent traffic system. Due to the increase in the number of vehicles, the main problem that arises is the problem of traffic management and the increase in vehicle information necessary for the treatment of stolen cars as in [1], violation of traffic rules. Therefore, it is necessary to have a system that reduces the burden on human operators.

2.BACKGROUND

An input image of a car that goes through the image pre-processing stages that enhances the image quality for better results in later stages. Then it converts the RGB image into grayscale and further Binarization is done to restrict the color shades to 2 colors only (viz. Black & White). Then with the help of Sobel's edge detection algorithm or Smearing algorithm, we extract the license plate from the binarized image. After acquiring the license plate, the system will segment the character on the license plate by horizontally scanning the image. Then

with the help CNN, we recognize the characters. After recognizing the characters, we can use them for verification of license number or extracting the information about the vehicle owner based on the license plate number. The whole process is shown in below figure.

Input-Output of the system

3.EXISTING WORK

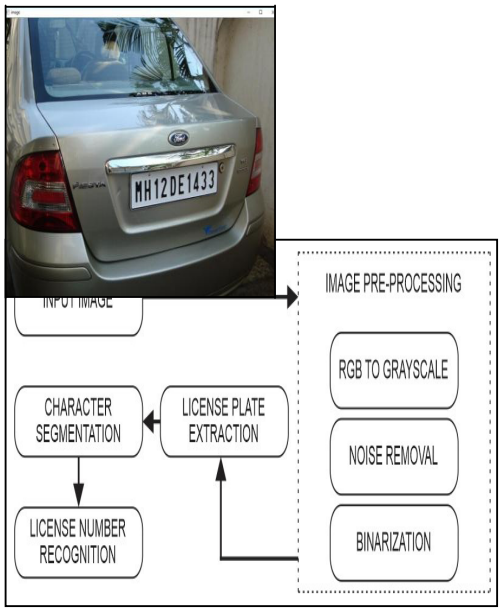
In the previous work, there were many techniques proposed to develop the ALPR system. Because these documents include many advantages and disadvantages, we try to use the best methods used in different documents to build our system, which makes our system more reliable and more efficient over time. Reference provides some of the trivial methods used in the field of character recognition using various methods that make the system unreliable and complex. The following references provided methods that made the previous system more advanced and reliable.

According to the document, the proposed algorithm used the extraction of the characteristic to extract the plate from the given image. In the last phase, ANN was used to recognize the extracted characters. According to the document, the concept of mathematical morphology was introduced to extract the plate region from the input image. The plate segmentation was performed by digital image labeling and character recognition by comparing the models. According to document, the edge detection algorithm and the vertical projection method were used to extract the region from the plate. There were several steps of filtering, thinning, vertical and horizontal projection for segmentation process. According to the document, the system designed for the Indian plates used the position of the plate based on the characteristics to identify the plate from the image and for the image of segmentation of the character. According to the document, exceptional characteristics were used to identify the plate inside the image. The projection of the function was used to segment the characters on the plate.

4.PROPOSED WORK:

The proposed detector is built on the general one by Torralba et al., which relies

on a deformable part-based model over local features and a boosting algorithm. As previously mentioned, we propose two innovations to the baseline model. First, we have designed a scale-adaptive part-based model which, through a discretization of the scale space avoids the search at several scales at test time, and takes advantage of the inter-scale correlations; and second, the relative position of each part of the part-based model with respect to the center is represented by means of a two-dimensional Gaussian distribution that allows us to properly model small spatial deformations according to training data. Before describing our model in detail, we will introduce the



baseline model and discuss some particularities that arise from the application of such a general object detector to our particular LPD problem.

5.MODULE:

The firstly the image of the vehicle with license plate is acquired which in our case is taken from an already existing set of images been acquired with the help of various devices (viz. high speed cameras etc.).

Image pre-processing is an important step in any image analyzing system. Without a proper pre-processing, the recognition will be ineffective or may give improper results in later stages. The main motive of pre-processing is to enhance the quality of the image that will be processed for recognition. Various processes that we are going to apply are converting RGB image to Grayscale, noise reduction and Binarization of image

The inputted image is in RGB format. This process is applied to reduce the number of colours as shown in Fig

InputimageConverted to grayscale

Image noise is image distortion caused by camera failure or poor visibility due to varying weather conditions. Noises are also the random variation of pixel intensity levels. Noise can be of various types, such as Gaussian noise, salt and pepper noise. In this proposed method, we use a bilateral iterative filter to eliminate noise. Provides the mechanism for noise reduction by preserving edges more effectively than the median filter. Below

images shows reduced noise and noise, respectively.

Image withnoiseImage with reduced noise

Binarization is the process of converting an image into an image with two pixels' value only i.e.containing white and black pixels. Performing next process before detecting and extracting license platefrom the image will make the task of detecting license plate easier as edges will be more easily in binary image. Threshold value. After selecting the value, the process will analyze the pixel values in the image. If it's greater than threshold, then make that pixel fully white or black accordingly. This is a simple method in threshold which may not yield proper result by selecting a global threshold value. Hence to overcome this, we use an adaptive thresholding method in which instead of selecting a global threshold value we calculate threshold of smaller region in the image which gives betterresult

In license plate extraction, it is important to take in mind the boundaries of the plate in the image as in. For doing so, we have many methods such as Sobel's edge detection method and Hough's Line detection method. Now the method of the connected component helps us to discover what the shape really is by means of the

grouping method of the intersecting points of the forms.

Further by getting the intersection points of the shapes, we come to known whether it is a rectangle or not depending upon the number of points in that respective group. Since now we have got the points of rectangles, we can successfully extract the rectangular parts from the image out of which we can get the license plate depending upon some properties of the license plate such as major axis length, minor axis length, area, bounding box etc. as shown in Figure.

Now the extracted plate is actually an inverted binary image of it from the actual image of the car. Further steps cannot be applied on such an image. Thus we convert the image into binary image for further operations as shown in Figure

Extractedlicense plate

Inverted binary imageofLP

The segmentation of the characters is performed in the binary image of the extracted plate. The algorithm used is the horizontal scan that uses a scan line that finds the conditions that satisfy the initial and final position of the character as in.

The pseudo code for the same is given below.

Pseudo-code ofcharactersegmentation The segmented characters are shown Below.

Segmentedcharacters

In order to recognize the segmented characters efficiently, we used artificial neural network training to train our system over a dataset downloaded from. After this training, we used the same neural model to recognize the characters.

We use a CNN with 2 convolution layers at the beginning and 2 layers completely connected at the end. We use a data set to train CNN as mentioned in. The data set consists of 1,000 sample images for each of the 36 characters. Of the 36,000 samples, we used the first 30,000 samples as training data and the remaining 6,000 samples as test data. First of all, let's form the model with a number of training steps of 100 followed by tests

The CNN has 784 input nodes. The first convolution layer has 5x5 kernels followed by a pooling layer of size 2x2.

```
global var start_pos
global var end_pos

function start_of_char(img)
{
increment the scan_line
start_pos=position(scan_line)
until(finds(any_one_pixel(scan_line)),1)==true)
else goto function end_of_char(img)
}

function end_of_char(img)
{
increment the scan_line
end_pos=position(scan_line)
until(finds(all_pixel(scan_line),0)==true)
else exit
}
```

Output layer has 36 nodes. We used tensor flow to train and test our model.

6.CONCLUSION

Automatic plate recognition is a large field that can be implemented using different algorithms and techniques. Each method has its advantages and disadvantages. Our proposed methodology initially performs pre-processing steps that include RGB conversion to grayscale, noise elimination and image binarization. After that the plate is extracted using Sobel's edge detection algorithms. Thus, the characters are segmented by the horizontal scan provided as input to the CNN to correctly recognize the character. The formation of our system with the help of ANN has made our system more reliable and efficient to correctly recognize the characters.

While we can see that so many algorithms have been implemented in several previous projects, in order to create a robust system for automatic plate recognition, there are still many holes in the system that can be filled to make the system more future-proof and reliable

.However, our project works with simple font styles that are normally used on license plates according to the rules set by the traffic department government bodies as in [18]. But to handle cases where people do not follow these rules, they can be managed in future projects implemented in this license plate recognition field.

Some of the various fields which can be explored in this project are as follows:

- Car modelrecognition
- Multi-lingual character recognition
- Fancy character recognitionetc.

7.REFERENCES

[1] http://timesofindia.indiatimes.com/city/delhi/40-vehicles-stolen-in-Delhi-every- Amarjot Singh, KetanBacchuwar, and AkshayBhasin; A Survey of OCR Applications; *International Journal of Machine Learning and Computing, Vol. 2, No. 3; June2012*

[2] Stuart J. Russell and Peter Norvig, *"Artificial Intelligence A Modern Approach, Second Edition"* PearsonEducation

[3] S.Rajasekaran and G.A.VijayalakshmiPai*"Neural Networks, Fuzzy Logic and Genetic Algorithms"* PHILearning

[4] S.N.Sivanandam, S.N.Deepa*"Principles of Soft Computing"* Second Edition, WileyPublication.

[5] Indian Central Motor Vehicle Act, Bear Act, Rule no.49,50day/articleshow/14619149.cms

[6] S.Zhang,M.Zhang,andX.Ye,"Carplate characterextractionundercomplicatedenvironment,"inProc.IEEEInt.

Conf. Syst. Man Cybern., vol. 5. Oct. 2004, pp. 4722–4726

[7] K.K.Kim,K.I.Kim,J.B.Kim,andH.J.Kim,"Learning-basedapproachforlicenseplaterecognition,"inProc.

IEEE Signal Process. Soc. Workshop Neur. Netw. Signal Process, vol. 2. Dec. 2000, pp.614–623

[8] O. D. Trier, A. K. Jain and T. Text, "Feature Extraction Methods For Character Recognition- A Survey", Pattern Recognition, *Vol. 29, No. 4, pp.641-662,1996*

[9] AnandSumatilal Jain, Jayshree M. Kundargi; Automatic License plate Recognition Using Artificial NeuralNetwork;

[10] Rajesh Kannan Megalingam, Prasanth Krishna, Pratheeshsomarajan; Extraction of License Plate Region in Automatic License Plate Recognition; *International Conference on Mechanical and Electrical Technology (ICMET); 2010*

[11] Kumar Parasuraman, Member, IEEE and P.Vasantha Kumar; An Efficient Method for Indian Vehicle License Plate Extraction and Character Segmentation; *IEEE International Conference on Computational Intelligence and Computing Research;2010*

[12] PrathameshKulkarni,AshishKhatri,PrateekBanga,KushalShah;AutomaticNumberPlateRecognition(ANPR) System for Indian conditions; *IEEE;978-1-4244-3538-8/09;2009*

[13] Zhenxue Chen, Guoyou Wang, Jianguo Liu and Chenyun Liu; Automatic License Plate Location and Recognition Based on Feature Salience; *INTERNATIONAL JOURNAL OF COMPUTATIONAL COGNITION (HTTP://WWW.IJCC.US), VOL. 5, NO. 2; JUNE2007*

[14] http://blog.ayoungprogrammer.com/2013/04/tutorial-detecting-multiple-rectangles.html/

[15] TranDucDuan,TranLeHongDu,TranVinhPhuoc,NguyenVietHoang;BuildinganAutomaticVehicleLicense-Plate Recognition System; *Intl. Conf. in Computer Science – RIVF'05; February 21-24, 2005*; Can Tho, Vietnam

[16] http://www.ee.surrey.ac.uk/CVSSP/demos/chars74k/

[17] Er. Kavneet Kaur, Vijay Kumar Banga; NUMBER PLATE RECOGNITION USINGOCR TECHNIQUE;