18CSE390T - COMPUTER VISION

PROJECT REPORT: NUMBER PLATE SCANNER

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NUMBER PLATE SCANNER

A PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report titled "**HOME WIRELESS NETWORK DESIGN**" is the bonafide work of " **JACK PRAVEEN RAJ ILANGO [Reg No: RA1811026010004] , ANUSHKA CHOUDHURY [Reg No: RA1811026010006] AND SHUBHAMDEEP JHA [Reg No: RA1811026010008]** ", who carried out the project work under my supervision. Certified further, that to the best of my knowledge the work reported herein does not for any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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1. ABSTRACT

The massive integration of information technologies, under different aspects of the modern world, has led to the treatment of vehicles as conceptual resources in information systems. Since an autonomous information system has no meaning without any data, there is a need to reform vehicle information between reality and the information system. This can be achieved by human agents or by special intelligent equipment that will allow identification of vehicles by their registration plates in real environments. This vehicle number plate detection system is used to detect the plates, then to recognize the vehicle based on the number found on the plate. That is to extract the text from an image with the help of a Convolution Neural Networks (CNN) and calculation modules that use location algorithms, segmentation plate and character recognition. The objective of the program given is to detect object of interest (Car) in video frames and to track the same object through multiple frames. The two big motivation behind the project is the startling losses both in human lives and finance caused by vehicle accidents and the high difficulty of detecting vehicles in images acquired from a moving platform.

2. Introduction:

Objective Of The Project:

Automatic Number Plate Recognition (ANPR) is an image processing technology which uses number (license) plate to identify the vehicle. The objective is to design an efficient automatic authorized vehicle identification system by using the vehicle number plate. The developed system first detects the vehicle and then captures the vehicle image. Vehicle number plate region is extracted using the image segmentation in an image. Optical character recognition technique is used for the character recognition.

Today, many new technological developments have occurred. As a result of these technological developments, people may face several crucial problems. Some of the negativities to be experienced with the detection of such problems can be minimized through various approaches. This can be achieved by human agents or by special intelligent equipment that will allow identification of vehicles by their registration plates in real environments. Among intelligent equipment, mention is made of the system of detection and recognition of the number plates of vehicles. The system of vehicle number plate detection and recognition is used to detect the plates then make the recognition of the plate that is to extract the text from an image and all that thanks to the calculation modules that use location algorithms, segmentation plate and character recognition. The objective of the program given is to detect object of interest(Car) in video frames and to keep tracking the same object. The two big motivation behind the project is the startling losses both in human lives and finance caused by vehicle accidents and detecting vehicles in images acquired from a moving platform is a challenging problem.

In this study, vehicle detection and deep learning approaches are combined using pre-trained model, Computer Vision techniques with OpenCV and Character Recognition with Convolution Neural Network.

3. Related works:

In first paper that we have referred, the candidate region is cropped in 78 X 228 pixels by using bicubic interpolation and then subjected to SCW for segmentation. The authors used threshold value of 0.7 for optimization of the results. After the character segmentation process, each character is resized to pixel size of 9 X 12.

Prathamesh Kulkarni conclude that blob coloring and peak-to-valley methods are not suitable for Indian number plate. The authors proposed image scissoring algorithm in which a number plate is vertically scanned and scissored at the row where there is no white pixel and this information is stored in the matrix. In case of more than one matrix, a false matrix is discarded based on the formula given in this paper. Same process is repeated for horizontal direction by taking width as a threshold.

CCA is very useful technique for processing binary image. Horizontal and vertical correction and image enhancement are performed as pre-processing steps for character segmentation. CCA is used in horizontal and vertical correction. After performing these steps plate is transformed to black characters / white background and then resized to 100 X 200. Then all the characters are segmented to the unique size of 32 X 32. Image binarization and connected component labelling methods are used.

Three matrices are used to storing plate location and binarization in one of the projects, number of columns in BW and number of row in BW respectively. Then after precise location of top and bottom boundaries are detected, which are followed by vertical projection and Thresholding to segment the characters. H.Erdinc Kocer used contrast extension, median filtering and blob coloring methods for character segmentation. Contrast extension is used to make image sharp. As per H.Erdinc Kocer the histogram equalization is a popular technique to improve the appearance of a poor contrasted image. In median filtering unwanted noisy regions are removed. Blob coloring method is applied to binary image to detect closed and contact less regions. In this method, an L shaped template is used to scan image from left to right and top to bottom. This scanning process is used to determine the independent regions by obtaining the connections into four directions from zero valued background. The four directional blob coloring algorithm is applied to the binary coding license plate image for extracting the characters. At the end of this process the numbers are segmented in the size of 28 X 35 and letters are segmented in the size of 30 X 40. Another algorithm based on blob detection is proposed.

The character segmentation process consists of character height estimation, character width estimation and blob extraction. Character height estimation contains three parts: color reverse, vertical edge detection and horizontal projection histogram. Color reverse is used to make color of license plate characters as black by using statistical analysis of edges. Vertical edge detection is used to detect finalized number plate. Sobel mask and

image binarization algorithms are used to perform it. Horizontal projection histogram is used to find top and bottom boundary of a character. The distance between upper and lower boundaries is considered as height of a character. Character width estimation contains: image binarization and vertical projection histogram. Image binarization is used to make color as black and white. Vertical projection is used to find gaps between characters. The process is similar as horizontal projection. Blob extraction is a two- step procedure including Blob detection and blob checking algorithms. The blob detection algorithm is an extension of CCA. Blob checking is used to remove non blob characters from the segmented characters.

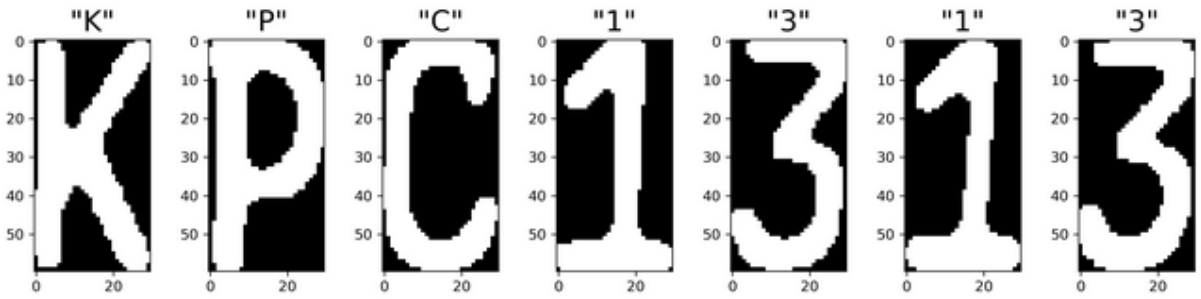
4. Proposed Method:

This project is divided into three parts as follows:

- Implementing a pre-trained model to detect and extract License Plates of vehicle images from 10 different countries (India, China, Germany, Vietnam, Japan, Thailand, Saudi, Russia, Korea, USA):

- Plate character segmentation with OpenCV:

- Train a Neural Network to predict segmented characters obtained:



Tools and Libraries Used In The Project:

- Python 3.7
- Keras 2.3.1
- Tensorflow 1.14.0
- Jupyter Notebook
- Numpy 1.17.4
- Matplotlib 3.2.1
- OpenCV 4.1.0
- Keras==2.3.1
- sklearn==0.21.3

Project Code:

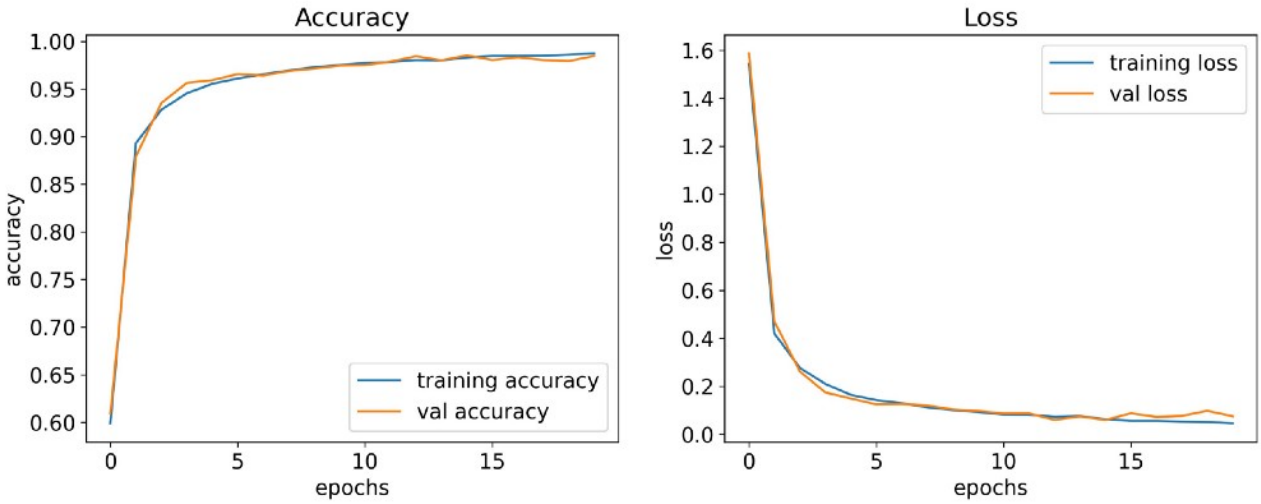
```
import cv2
import pytesseract

# Read the image file
image = cv2.imread('car0.JPG')
# Convert to Grayscale Image
gray_image = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)

#Canny Edge Detection
canny_edge = cv2.Canny(gray_image, 170, 200)

# Find contours based on Edges
contours, new  = cv2.findContours(canny_edge.copy(),
cv2.RETR_LIST, cv2.CHAIN_APPROX_SIMPLE)
contours=sorted(contours, key = cv2.contourArea, reverse =
True)[:30]

# Initialize license Plate contour and x,y coordinates
contour_with_license_plate = None
license_plate = None
x = None
y = None
w = None
h = None

# Find the contour with 4 potential corners and creat ROI around
it
for contour in contours:
      # Find Perimeter of contour and it should be a closed contour
      perimeter = cv2.arcLength(contour, True)
      approx = cv2.approxPolyDP(contour, 0.01 * perimeter, True)
      if len(approx) == 4: #see whether it is a Rect
         contour_with_license_plate = approx
         x, y, w, h = cv2.boundingRect(contour)
         license_plate = gray_image[y:y + h, x:x + w]
         break

# Removing Noise from the detected image, before sending to
Tesseract
```

```
license_plate = cv2.bilateralFilter(license_plate, 11, 17, 17)
(thresh, license_plate) = cv2.threshold(license_plate, 150, 180,
cv2.THRESH_BINARY)

#Text Recognition
text = pytesseract.image_to_string(license_plate)
#Draw License Plate and write the Text
image = cv2.rectangle(image, (x,y), (x+w,y+h), (0,0,255), 3)
image = cv2.putText(image, text, (x-100,y-50),
cv2.FONT_HERSHEY_SIMPLEX, 3, (0,255,0), 6, cv2.LINE_AA)

print("License Plate :", text)

cv2.imshow("License Plate Detection",image)
cv2.waitKey(0)
```

Program Output:

5. Results And Discussion:

The proposed vehicle detector has been successfully trained by using CNN deep learning methods on the sample vehicle datasets and the vehicle detection process has been successfully performed by the trained vehicle detector being tested on the test data set. The only drawback of this model is that the number plate can not be detected if the image of the plate has been obscured or altered due to weather conditions and motion. The accuracy of the model has been given below:



6. Conclusion and future work:

The process of number plate recognition in this project has been examined in two stages: license plate Localization and extraction from the scene followed by the separation of the characters from the previously extracted license plate region background. Various approaches for license plate detection in an image, and extensive experiments have been devised to test them are presented. The purpose of this thesis has been to investigate the scope of automatic license plate recognition under minimal restrictions. The system developed investigates the possibility of automating the whole process of license plate recognition for a wide range of environments. Given an input image, the system extracts the license plate, isolates the characters, and finally identify the characters and thus the whole process of Number Plate Recognition is automized. This could lead many great advancements in security technologies and traffic control.

The proposed algorithms are designed for the best performing License Plate Localization and Recognition. These kinds of algorithms in the future can turn their course to work towards the following improvements. Image acquisition should fulfil the preliminary assumptions. Future developments for the algorithm may include:

- Improved method to decide thresholding value for character extraction.
- Representation should be more improved so that the data can be used quick tracking and security purposes.
- Adapting the same algorithm for live CCTV camera feeds and other live recoding machines.

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