Number Plate Recognition using OCR

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Problem Statement

- Recognizing a Car License Plate is a very important task for a camera surveillance-based security system.
- We aim to use various computer vision techniques to detect and recognize license plates from images of vehicles.
- This is applicable in many situations such as high speed cameras, catching common defaulters of skipping a red light, etc.

Input

29A33185

Output

DataSet Description

The dataset consists of random 35 images of cars selected from the internet.

- The images are in multiple orientation to better check for detection.
- A few examples are shown on the right.
- We have also included rear-plates to better accommodate for detection.

All of the processed images can be accessed here.

Methodology

The project has been splitted up into two stages:

1. *Number Plate Detection and Generating Samples:*

   Two techniques have been applied and tested for the detection task:

   a. Detection using the **Canny Edge Detector**

   b. Detection using the pre-trained model **Haarcascade Classifier**

2. *Number Plate Recognition:*

   Using the **EasyOCR** model

Detection using Canny Edge Detector

The Canny edge detector detects edges, find contours and locate the position of the number plate in the image frame.

The flow:

- We first use the Canny function to detect all the edges.
- Another function (findContours) is used to detect all the closed edges from the detected edges.
- Once we get the locations of the points, we can apply a mask to single out the number plate.

Detection using Haarcascade Classifier

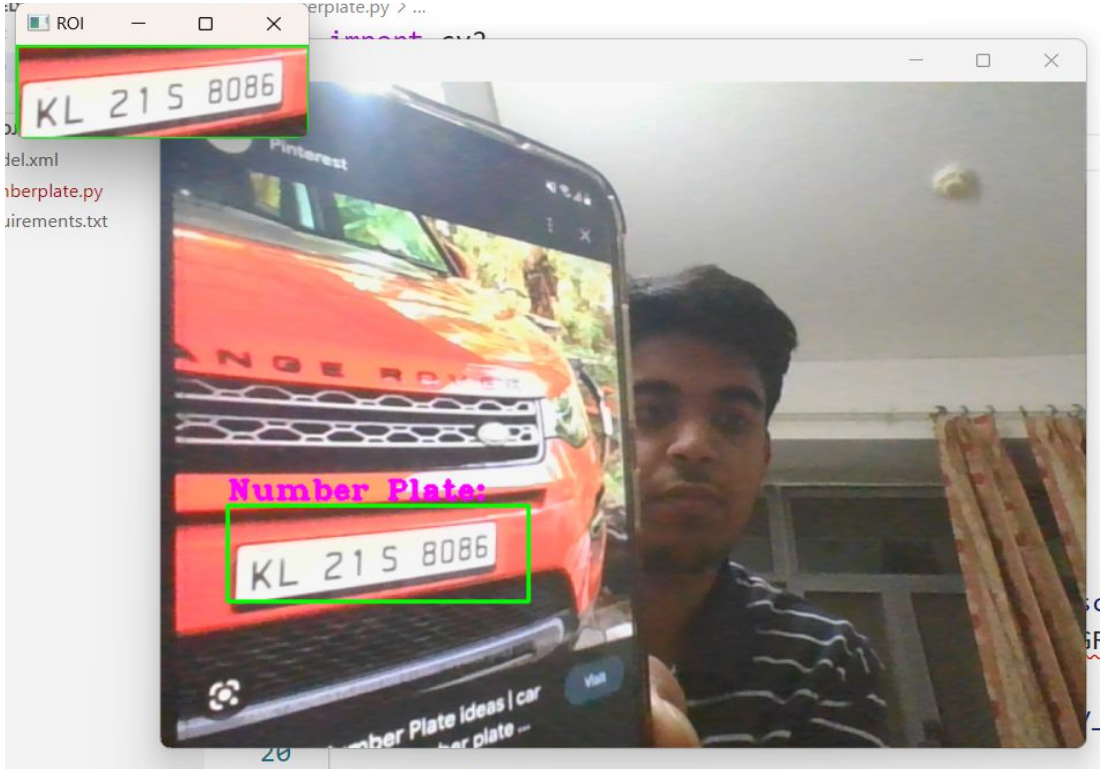
- The Haar Cascade classifier used for detecting car number plates from a live video feed captured by the webcam with detected plate.

- It applies a minimum area threshold to detect car number plates and its value different for different country. for eg. it ranges from 2000-5000 sq pixels for the vehicles with indian registration number plates.

- The Haarcascade classifier defined in a .xml file contains the model weights obtained during pre-training of model on vehicles with Indian registration number plates.

Detection using WebCam

Demonstration:



Recognition

- EasyOCR is used to recognize the characters on the license plate.

- The recognized characters are then used for evaluation purposes.

Results

- We used *Accuracy* as a metric for evaluating the recognition performance.
- We calculated 2 accuracies, accuracy of each digit detection, and the accuracy of detecting the number plate as a whole.
- The Single Digit accuracy was approximately 57%, and the accuracy of detecting the number plate correctly was approximately 18%.

True values	Predicted Values
['MH20@V2363',	['MH20DV2363',
'GSH0836',	'4SM0836',
'RJILCP',	'RJ14CP1',
'KY68WZO]',	'KY68WZO',
'IND',	'HR26DK8337',
'KZ69',	'KZ69MKM',
'BSJ}0924',	'3SJ0924',
'IT20BOM',	'IT20BOM',
'KSN',	'6298KSN',
'KL',	'KL21S8086',
'KYIGVIH',	'KYI9VTM',
'0.',	'202D9387',
'6298KSN',	'6298KSN',
'KYZIXPX',	'KY2IXPX',
'3',	'WB06F5977',
'TGL7OOLE',	'GL70OLE',
'[HR26BR9044',	'HR26BR9044',
'PO4KCZO',	'PO4KC70',
'KL07CP7235',	'KL07CP7235',
'NL22OCE[',	'ML22OCF',
'MH20OV2363',	'MH200V2363',
'GR:',	'GR5342',
'IKY20HPE',	'KY20MPE',
'KL07CP7235',	'KL07CP7235',
'DZIZYXR',	'DZI7YXR',
'4SM0836',	'4SM0836',
'UTZ0BOM',	'IT20BOM',
'KL',	'KL21S8086',
'3810924',	'3SJ0924',
'KL01CA2555',	'KL01CA2555',
'INDI',	'HR26DK8337',
'RJILCP',	'RJ14CP1',
'PGOMN112',	'PGMN112',
'0H200V2363']	'MH20DV2363']

Analysis

Possible reasons for a low Accuracy:

- The lack of a larger dataset to train upon causes the model to underfit.
- The blurriness in the detections.
- Noise in the image (any extra text on the license plate like stickers or custom text can also cause issues).
- The Haarcascade model is trained on Indian Number plates, but tested on a variety of samples considering number plates from around the world.
- Canny Edge Detector sometimes also struggles to detect edges between similar colours of the car body and license plate.

Contributions

1. *Aditya Bugalya:*

   Gathering Samples and Detection using Canny Edge Detector

2. *Rishav:*

   Detection of number plates using Haarcascade Classfier and generating scanned images

3. *Shivanshu Kumar:*

   Recognition using EasyOCR and evaluating results

Thank You