

DIGITAL IMAGE PROCESSING

FINAL PROJECT ON

AUTOMATIC NUMBER PLATE DETECTION SYSTEM



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Presented by:-

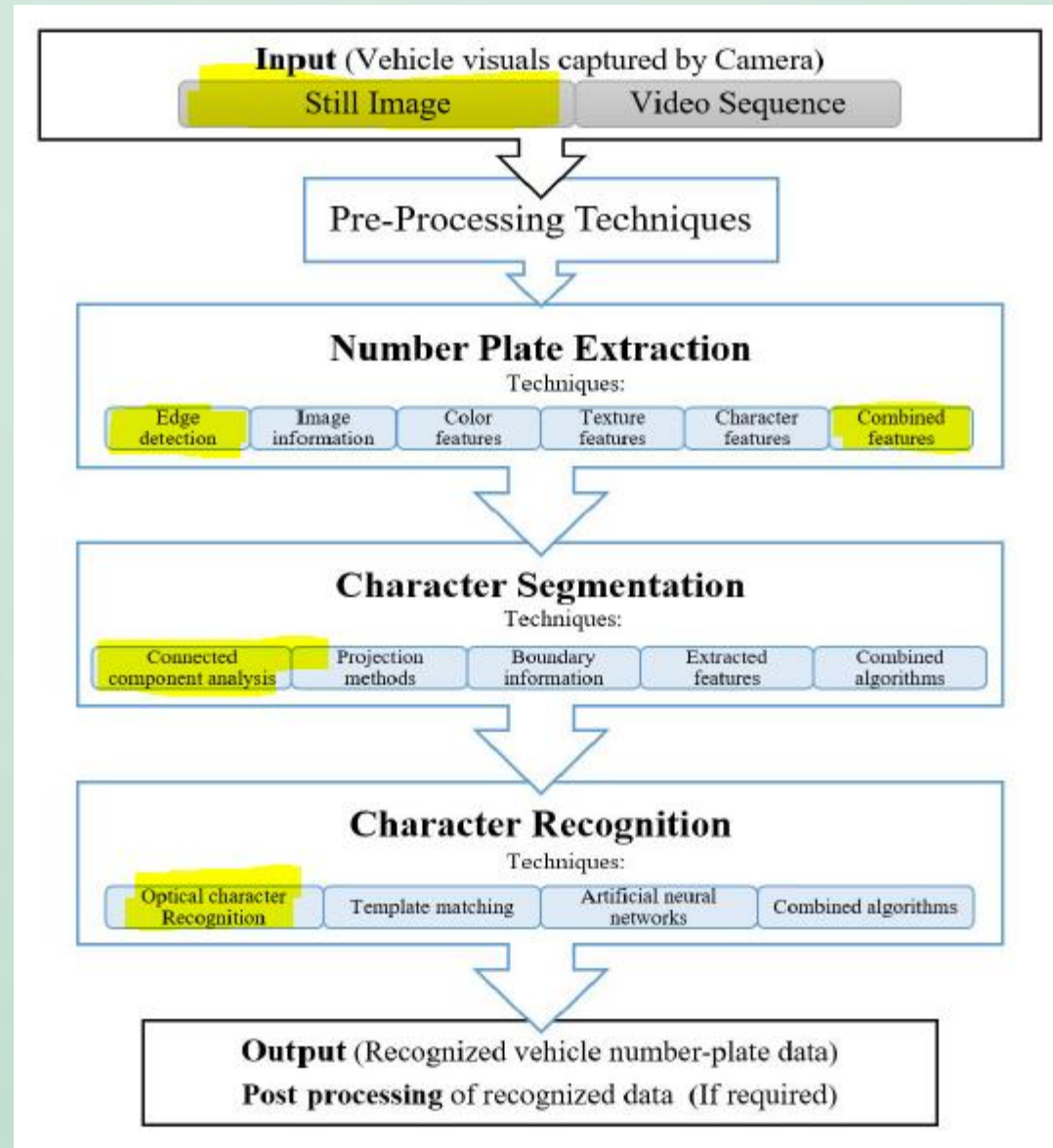
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INTRODUCTION

ANPR(NUMBER PLATE RECOG.)

- (ANPR) technology leverages image processing algorithms to store the registration number of the vehicle which is captured as in image or video via surveillance cameras.
- Our project objective is to design an efficient automatic vehicle number identification system by using the vehicle *Image*.
- We will implement ANPR using two ways and compare our results and accuracy on 50 cars images.

GENERAL PROCESS FOR DIFFERENT METHODS FOR ANPR



Source: Lubna; Mufti, N.; Shah, S.A.A. Automatic Number Plate Recognition: A Detailed Survey of Relevant Algorithms. Sensors 2021, 21, 3028. <https://doi.org/10.3390/s21093028>

DETECTION USING METHOD-1

In this method, we will employ classical DIP algorithms such as Canny edge detection , contour finding using OpenCV library to extract the number plate and EasyOCR in order to extract the text from the plate.

The steps involved in this method are listed below:-

1. Import and install dependencies
2. Read-in image, convert to grayscale and denoise the image
3. Apply dilation filter and find edges for localization
4. Find contours and apply the mask to extract plate
5. Use Easy OCR to read text
6. Render Result

DETECTION USING METHOD-2

In this method, we are going to use CNN based method to obtain the region occupied by the number plate and then use character recognition to display the text out there. *(We have used a pre trained YOLOv4 model to detect number plate in an image)*

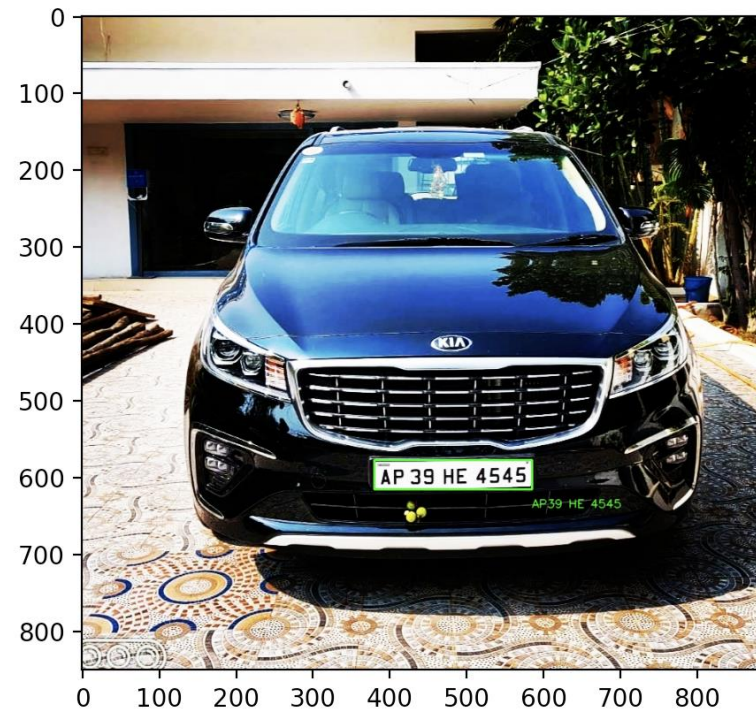
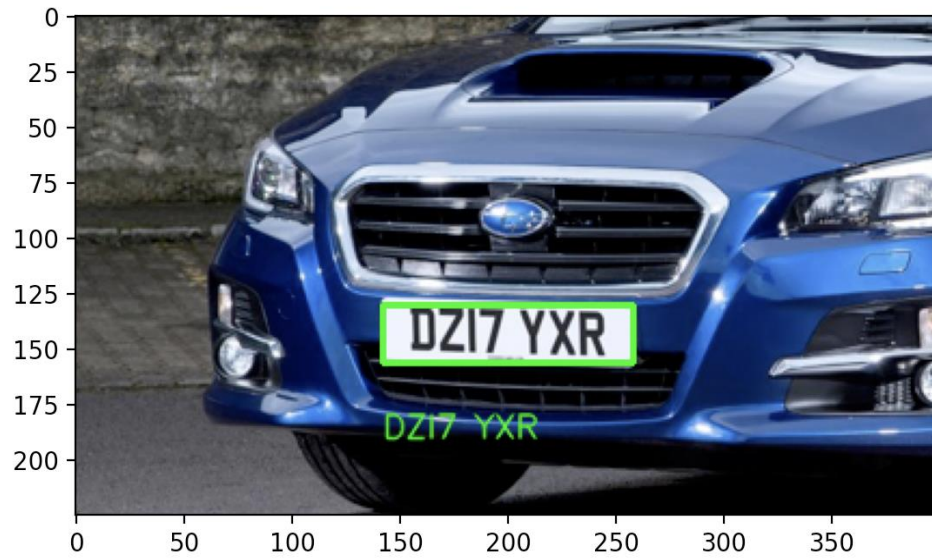
The following steps are used to implement this method:-

1. Import and install dependencies
2. Collecting car images with license plate data
3. Training a CNN model
4. Detecting License Plates
5. Applying OCR to text
6. Output Results

COMPARISON OF METHOD-1 AND METHOD-2

- Accuracy : On 50 test images we are getting around 40% accuracy using edge detection and contours finding while around 85% accuracy in 2nd method that leverages neural network to extract number plate.
- Data Required : No data collection is required in classical DIP method but huge training data(images and coordinates of number plate in each respective image) is required to train the multi layer YOLOv4 deep neural network.
- FPS : Classical method can be used with high FPS to detect number plate and output in a video based input as compared to YOLOv4 based plate detection.

SUCCESSFUL OUTPUT OBTAINED FROM METHOD-1



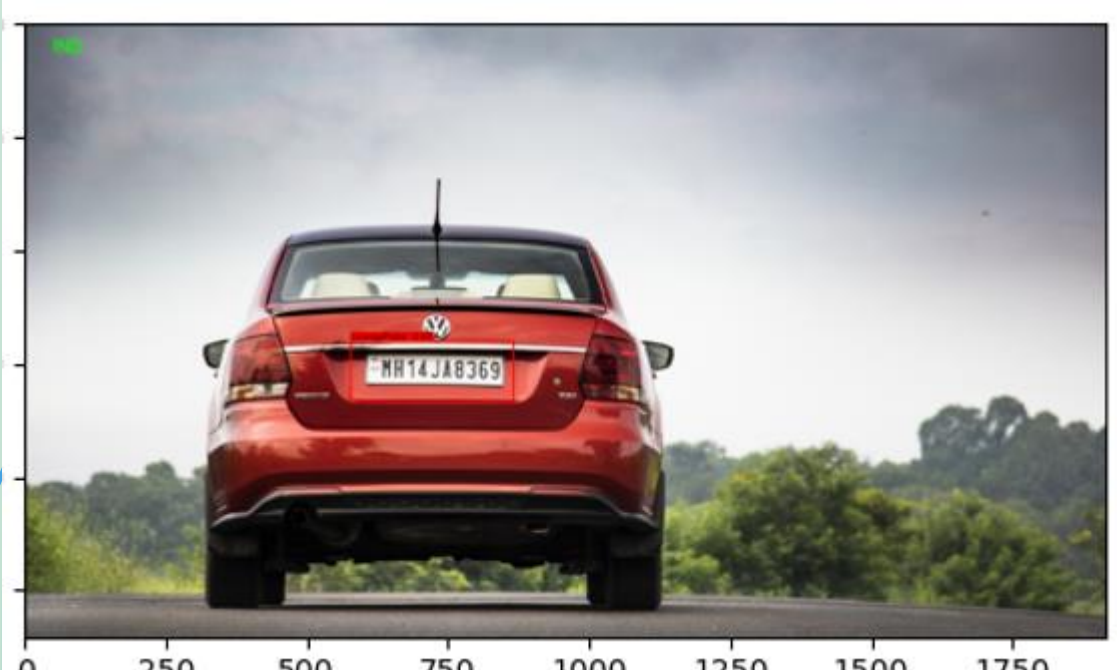
FAILED IMAGES FOR METHOD-1



OUTPUT OBTAINED FROM METHOD-2



FAILED IMAGES FOR METHOD-2



SUMMARY TO SOME MODULES/ALGORITHMS USED

- **EasyOCR** is a python package that allows the image to be converted to text . It is built with Python and Pytorch deep learning library. The detection part is using the CRAFT algorithm and the Recognition model is CRNN. It is composed of 3 main components, feature extraction , sequence labelling and decoding . Easy OCR is around 95% accurate and can process multiple languages at the same time .
- **OpenCV findContour()** Contours are basically an abstract collection of segments and points that correspond to the shapes of the objects that are present in the images that have been processed (edge detection). findcontour() to collect all such contours in a given image.
- **Canny Edge Detection** is a multi stage image processing method used to detect edges in an image while suppressing noise(image smoothing , gradient magnitude and orientation , nonmaxima suppression and double thresholding).

- **approxPolyDP()** is used to approximate the shape of contour to another shape consisting of a lesser number of vertices in such a way that the distance between the contours of shapes is equal to the specified precision or lesser than the specified precision. The contours present in image determined using `findContours()` function is then passed through `approxPolyDP()` to find the closest one to a rectangle for detecting number plate
- **YOLOv4** is a real time object detection system that could recognize several objects from a particular image. It is based on a single Convolutional Neural Network (CNN). The CNN divides an image into regions and then it predicts the boundary boxes and probabilities for each region. It simultaneously predicts multiple bounding boxes and probabilities for those classes. YOLO sees the entire image during training and test time so it implicitly encodes contextual information about classes as well as their appearance.

The background features a light blue gradient with a series of concentric circles centered in the upper half. On the left and right sides, there are stylized circuit board traces in a darker blue, with small circles at the end of the lines, suggesting a technological or digital theme.

THANK YOU