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Comparative Analysis of EasyOCR and TesseractOCR for Automatic License Plate Recognition using Deep Learning Algorithm

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Abstract- License plate recognition are used in toll plaza, surveillance cameras, intelligent car parking, etc,. This paper proposes three modules for number plate recognition: Image acquisition, License plate detection and Character recognition. Firstly, a pytorch library OpenCV is used for retrieving the data. YOLOv5, a family of You Only Look Once (YOLO) model is used for detecting the number plate. Finally, OCR methods i.e., Tesseract OCR and EasyOCR are used for recognizing and extracting the characters from the number plates. A dataset from github is used for training and testing the proposed model. The result shows that EasyOCR has resulted in more than 95% accuracy for predicting the number plate when compared to Tesseract OCR which has only resulted in 90% accuracy. Hence, EasyOCR outperforms Tesseract OCR as it uses deep learning approach for object recognition and it is efficient in real time prediction.

Keywords- YOLOv5 - You only look once version 5, EasyOCR, OCR - optical character recognition, TesseractOCR, ALPR - Automatic license plate recognition

I. INTRODUCTION

With the intense development in the vehicular sector every day, tracking individual vehicles has become a very difficult task. This idea proposes an automatic vehicle monitoring system for vehicles moving very quickly. Obtaining real-time vehicle movement is an extremely time-consuming task. Speed and accuracy is the main concern for object recognition, in recent years there are many models and in fact versions of the same model are upgraded by showing a better performance than previous versions and models. [7] shows the advancement of different versions of YOLO concerning accuracy as the criteria.

Similarly, [2] shows the comparison of different Convolutional Neural Network (CNN) models. Our Proposed work deals with an efficient deep learning model, which is You Only Look Once (YOLO) version 5 along with OCR methods used for Automatic License Plate detection (ALPR). one of the most extensively used computer vision applications, is the subject of the proposed work. It includes technologies such as object identification, OCR, character segmentation, and character recognition, among others. The system only requires a camera and a good GPU.

This paper proposes OCR methods for License plate recognition. i.e., Easy-OCR and Tesseract-OCR these are the commonly used OCR methods. EasyOCR shows better speed and detection of the numbers in the License plate than Tesseract OCR. The results can be better compared by plotting and visualizing [10].

II. LITERATURE REVIEW

The ALPR (Automatic License Plate Recognition) system is generally of two parts viz. Localization and Recognition. [1] shows survey on the recent works done in ALPR and which specific technique to use for detection shows that single-stage deep learning-based LP detection has higher performance than multi-stage object detection. [2] have combined region proposals with CNN and called it R-CNN and it outperforms CNN in object detection and segmentation, Ross et al2015. [3] again continues his research and proposes Fast R-CNN by using deep convolutional networks which increases the speed of training and testing data and accuracy of the detection.

[4] have analyzed performance of the three models YOLOv3, Faster R-CNN and SSD on a pill identification dataset where YOLOv3 shows eight-time faster detection speed than Faster R-CNN and SSD was not in the race.

[5] approaches a robust ALPR based YOLO object detection method on two datasets, SSIG and UFPR-ALPR where it uses an advanced CNN based approachand results in more percentage in accuracy than the existing models. In [6] the overall LP detection rate was 98.52% on a motorcycle dataset. This work is alsobased on the YOLO algorithm.

The different versions of the YOLO (You Only Look Once) model and their advancements are listed in [7] among that YOLOv5s with improved ASPP module has more accuracy and reduces the phenomenon of missing and false detection of vehicles.

A single shot detector to localize the license plate and OCR (Optical Character Recognition) to recognize LP viz. Accuracy of Tesseract OCR and Easy OCR is compared in [8] and found Easy OCR is more accurate since it follows a deep learning approach forcharacter recognition. License plate detection using DNN and LP recognition using LSTM Tesseract is done on real time Indian number plate detection [9], result shows 95% accuracy using LSTM Tesseract OCR Engine.

II. PROPOSED METHODOLOGY

The proposed work consists of object detection with automatic license plate recognition (ALPR) and in addition to that extracting the text and number from the detected number plate image using Optical character recognition (OCR). So, it's a combination of both object detection (detecting number plate) and OCR. Easy OCR and Pytesseract OCR are the two popular OCR methods used to compare the accuracy rate of the dataset.

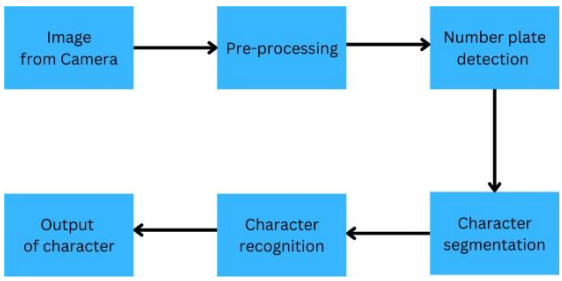


Fig-1: System Framework

A. Image Deblur

Python has different types of inbuilt libraries for image and video processing in this the most popular library is OpenCV. OpenCV has its own advantages Such as fast, low ram usage of the machine, etc. OpenCV helps to capture a snapshot from the video. This image is later sent for pre-processing operation and as a final step recognition will take place.

B. Pre-Processing

Pre-Processing is considered one of the most important operations in object detection. This module is done before segmentation so that the image should be ready for segmenting. The first step of pre-processing is to convert the RGB image to a gray color image by greyscaling to reduce the color levels because RGB consists ofthree colors such as red, blue , green which makea 3 dimensional array which is 3 different channels each channel consist of 8 bits so this shows that it consist of lot of data which is unnecessary for the project so by converting it to grey color we have only single channel which promote to save lot of computational power. The final step of preprocessing before segmenting the image would be applying the filter and finding the edge for localization.

C. Object detection (ALPR)

Object Detection is a technology that involves OpenCV, deep learning, and image processing. The primary use case of object detection is tracking, and counting objects or detecting anomalies and outliers in an environment. There is an effective approach called Haar Cascades
-used for object detection which is a machine learning-based algorithm where it has been trained with positive and negative images so that due to this training it can detect objects from other images. Basically it has a large individual
.xml file with a lot of features which helps to detect in unique scenarios. There are several object detection algorithms available like CNN, YOLO, etc. In our project, we have implemented YOLO which is known as You only look once as the name resembles the model will look at the image only once [10,11]. There are several versions available in Yolo and we have implemented the stable version of yolov5. There is a major advantage with yolo compared to other object detection algorithms is yolo does boundary boxes + confidence and probability map in a single step whereas others do in two different steps this makes this algorithm time efficient. Yolo divides the grid into 16x16 matrix which is small so small objects also can be found easily. And it have 45 frames per second magnitude compare to other algorithms. It is a single-step-deep-learning object detection model that uses a machine CPU or GPU for image accuracy basically better the GPU better the accuracy rate of a image can be obtained. In the YOLO family, Ultralytics have used Binary Cross-Entropy with Logits Loss function from PyTorch for loss calculation of class probability and object score.

The network architecture of Yolo is divided into three parts: Backbone, Neck, and Head.

1. Backbone: It acts as a Feature extractor which is nothing but a convolutional layer.

2. Cross Stage Partial Networks help to obtain the character and it is said to be the backbone of the YOLOV5 algorithm.

3. Neck: the network was designed to perform multi-scale prediction. It helps to detect objects of different sizes by sending images into different grid values where smaller grid images detect larger objects as well as vice- versa.

4. Head: This layer is used at the end of the detection of an image and it is responsible forthe final output. It uses an objectness score and bounding boxes as evaluating parameters.

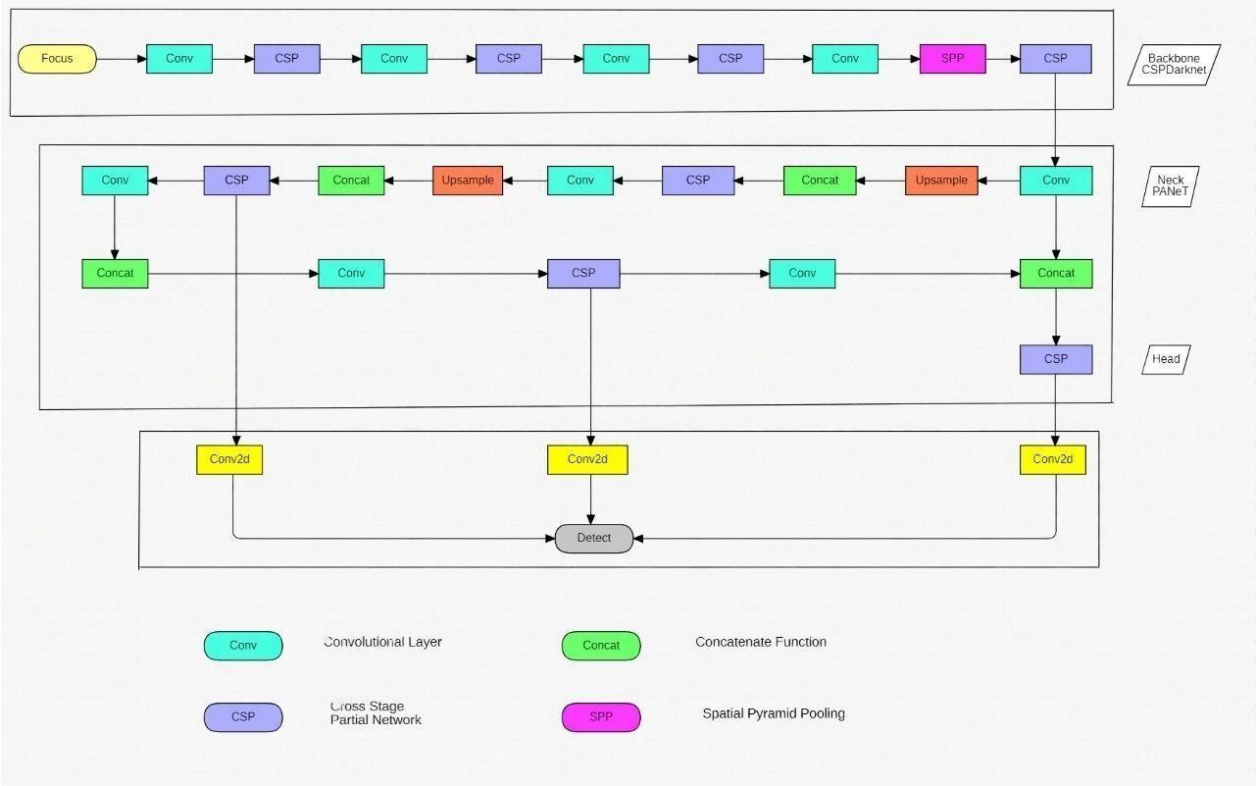


Fig-2: Network Architecture YOLOv5

D. Character Segmentation

After the pre-processing operation, image segmentation is one of the important operations to detect the number plate location. In pre-processing, the captured image is sent into greyscaling. The grayscaled image will be applied to the filter which is known as Sobel edge detection which helps find the horizontal edge [12]. Basically, on the license plates, the characters are written horizontally instead of vertically this is an additional advantage so that edge detection can be done easier.
The grayscaling approach is processed once again it makes the kernel detect the character accurately. Cropping the plate, representing the detected contours by drawing rectangles around the edges. Contour analysis is based on aspect ratio. When the detected contour is lying outside the constraint it is rejected and the remaining will be cropped as a license plate [12]. There are two methods in computer vision one is dilate and another is eroded where the dilation technique is used to expand the image and erode is used to shrink the image this technique is used for contour analysis. Thresholding is a method of image segmentation in general, it is used to create binary images. This step ensures the unwanted logo or text mentioned on the license plate gets rejected.

E. Character Recognition

In this step, segmented characters are extracted from the input grayscale image. This is considered to be the final step of license plate detection. Optical Character Recognition (OCR) plays a vital role in the recognition of input images. The main role of the OCR is to read numerical and verbal characters from the image and it has several libraries such as Easy ocr, Pytesseract ocr, and Keras ocr. In our project, we have compared the Easy ocr and Pytesseract ocr using the yolov5 object detection algorithm to showcase which ocr method performs well in detecting license plates.

EasyOCR: EasyOCR is a Python-based PyTorch library that falls upon good GPU to show accurate results. There are three main components such as feature extraction, sequence labeling, and decoding. It doesn't have many software dependencies like tesseract ocr, it can directly be used with its API. The main feature of easy OCR is that it reads characters from images and returns the coordinates where it was located [8]. It consists of 70+ languages like Hindi, English, Chinese, etc.

Tesseract OCR: Tesseract is an open-source optical character recognition Engine. It can be used directly or by using an API to extract letters and numbers from images. Compared to easy ocr, it supports fewer languages. Tesseract ocr is best in detecting the letters from the image as compared to easy ocr. There is an adaptive classifier at the end of the process for accurate recognition in Tesseract OCR.

III. EXPERIMENTAL RESULTS

Two different models are developed for detecting Automatic Number Plate Recognition using OCR methods. i.e, EasyOCr and Tesseract OCR. The datasets have been taken from open-source sites such as GitHub which consists of 1200 images. On Further process, the images have been split into 800 and 400 for training and testing respectively. The complete recognition of a License plate takes around 3seconds [13]. In datasets, the images with harsh conditions and with regional language license plates [14-16] are excluded then EasyOCR shows a 95% accuracy and Tesseract OCR shows 88% we come to know that EasyOCR performs well with numerical and Tesseract OCR performs well with letters. The evaluation of the model is calculated by Character Error Rate(CER) one of the model used for calculating accuracy of OCR methods. For each test image the CER value is calculated and the overall average is taken and considered as accuracy of the model. We observed an error in recognition is false detection of license plate especially in characters. Here in our project we used 680px image to overcome it higher resolution image can be stored.

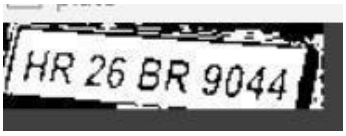
Parameter	Test Data 1	Test Data 2
Original Image		
Character Recognition using EasyOCR	'HR.26 BR.9044', 0.5167916087717548)]	'POLBCAF5030', 0.30806908725519727)]
Character Recognition using Tesseract		

Fig-3: Testing of EasyOCR and Tesseract OCR

IV. CONCLUSION

In our work we used the YOLOv5 model and OCR methods to build a real time license plate recognition model and we compared between the two OCR methods. i.e., EasyOCR and Tesseract OCR. These models use GPU for better performance. As we run multiple epochs we came to conclude that EasyOCR performs well with numerical and Tesseract OCR performs well with letters. On training datasets EasyOCR shows 95% accuracy than Tesseract OCR, which concludes that EasyOCR is better in real time license plate recognition.

V. FUTURE WORK

In our proposed work we implemented object detection using YOLOv5 and ANPR with two types of OCR methods i.e, EasyOCR and PyTesseract OCR, and compared their accuracy rate.
This work can be further carried out by training custom datasets with non-standard license plates, datasets with harsh conditions, and license plates with regional language for detection [17,18]. The result can be calculated by the accuracy of precision and recallvalue.

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