VEHICLE LICENSE PLATE DETECTION AND RECOGNITION USING YOLO AND OPTICAL CHARACTER RECOGNITION

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Abstract- Due to recent developments of highway and the increased utilization of vehicles, significant interest has been paid on the latest, effective, and precise intelligent transportation system (ITS). The process of identifying particular objects in an image plays a crucial part in the fields of computer vision or digital image processing. Vehicle license plate recognition (VLPR) process is difficult because of variations in viewpoint, shape, color, multiple formats and non-uniform illumination conditions while acquiring images. This paper presents effective deep learning based VLPR model using YOLO (You Only Live Once) for detection process of license plate and OCR (Optical Character Recognition) for the process of characters recognition in

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license plate. For the enhancement of license plate, some Image Processing Techniques are utilized.

1.INTRODUCTION

A vehicle registration plate, also known as a number plate (British English), license plate (American English), or licence plate (Canadian English), is a metal or plastic plate attached to a motor vehicle or trailer for official identification purposes. All countries require registration plates for road vehicles such as cars, trucks, and motorcycles. Whether they are required for other vehicles, such as bicycles, boats, or tractors, may vary by jurisdiction. The registration identifier is a numeric or alphanumeric ID that uniquely identifies the vehicle or vehicle owner within the issuing region's vehicle register. In some countries, the identifier is unique within the entire country, while in others it is unique within a state or province. Whether the identifier is associated with a vehicle or a person also varies by issuing agency. There are also electronic license plates.

As per The Motor Vehicles Act, 1988, all motorized vehicles plying on Indian roads must be registered with the RTO and bear a license plate (number plate). There are various types of number plates in India. An unregistered vehicle falls in direct violation of the act which can attract a heavy penalty. A license plate is a combination of alphabets and digits that form a registration number. The license plate is issued by the district RTO (Regional Transport Office) and should be placed in the front and the back of the vehicle with provision for illumination. The international registration code for India is IND**.**

2. LITERATURE SURVEY

[1] Akshat Ajeya: As per The Motor Vehicles Act, 1988, all motorized vehicles plying on Indian roads must be registered with the RTO and bear a license plate (number plate). There are various types of number plates in India. An unregistered vehicle falls in direct violation of the act which can attract a heavy penalty. A license plate is a combination of alphabets and digits that form a registration number. The license plate is issued by the district RTO (Regional Transport Office) and should be placed in the front and the back of the vehicle with provision for illumination. The international registration code for India is IND**.**

Summary: We will get some information about Types of Number Plates in India & High Security Registration Plate (HSRP).

[2] Mehul Gupta: Vehicle Number Plate Detection aims at detection of the License Plate present on a vehicle and then extracting the contents of that License Plate. A vehicle's license plate is commonly known as 'a number plate'. It is a metal plate that is attached to a vehicle and has the official registration number of a vehicle embossed on it. Number plates are placed at the front and back of the vehicle and help anyone to identify a vehicle.

Summary: Here, we will get the authors approach for **Vehicle Number Plate Detection & Recognition.**

[3] K. Yamaguchi, Y. Nagaya, K. Ueda, H. Nemoto, and M. Nakagawa: A countermeasure for relieving traffic congestion is to employ a priority signal control system at the intersection, and in order to affect this signal control, it is essential to identifying public transport

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vehicles. As for the methods for identifying vehicles, while an image processing method for recognizing vehicles by reading the license plate numbers has already been put into practical use, there is no precedence of its application to priority signal control. Therefore, focusing on priority signal control of route buses, we proposed a method for identifying the individual route numbers of the route buses. Considering the ease of processing, we based this method on a template matching process that targets route numbers. However, with this method, the correlation values fluctuate greatly due to the changes in the external environment, which poses the problem of greatly reducing the judgment precision if simple threshold values are used. This paper describes the identification method using the above-mentioned template matching process and its problems, and proposes an identification method that uses a new recognition algorithm for solving those problems.

Summary: Here is the approach of recognizing the route numbers that are displayed at the front top area of the route buses, based on the signal control of the destination of the route buses. Author introduced a template matching method in which template images of the route numbers are compared to the images sampled by the television camera, as a method for identifying the route numbers of the buses.

[4] Q. Zuo and Z. Shi: Aiming at plate texture and plate shape of vehicle image, an algorithm applied to license plate extraction of vehicle image based on mathematical morphology is introduced. It adapts to the complicated background of vehicle image and the variety of illuminating conditions by adjusting threshold, while two-dimensional morphological filtering method. Moreover, point operation of mathematical morphology is inverted into line operation of mathematical morphology, the binarization method is based on one-dimensional edge detection to effectively utilize the plate shape and plate texture feature of vehicle images. It is much more robust and faster than the traditional thresholding methods and edge detecting operator methods. We have completed a series of experiments under different conditions. The experiment results show that the segmentation effects and its orientation accuracy

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are improved significantly, so the proposed method is very effective for segmenting and locating noisy vehicle license plates.

Summary: An algorithm applied to licence plate extraction of vehicle image based on mathematical morphology is implemented with the goal of plate texture and plate structure from the vehicle image

3. EXISTING SYSTEM:

The license plate detection and recognition has received greater attention of several industries nowadays because it plays vital role in several real time applications, such as toll fee, parking fee payment, tracking vehicle when the vehicle violates rules. It also assists police to find vehicle theft, controlling traffic during emergency/accident/peak hours etc. At the same time, the images or video captured by camera suffers largely from plate variations and environment variations where we can see multi-size texts/number, fonts, occlusion due to dirt, vehicles movements, illumination effect due to lighting and vehicle headlights. In addition, illumination and headlight effect may results in poor quality, blur and touching adjacent characters, and text may camouflage with the background.
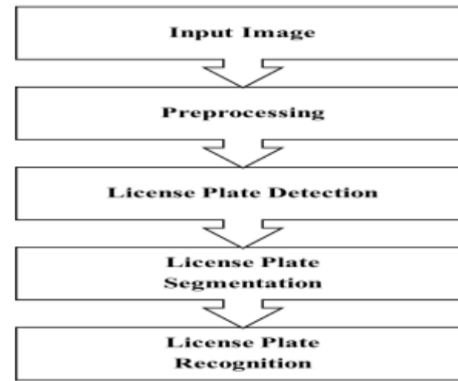

Fig 2: Block Diagram of Existing Method

DISADVANTAGES OF EXISTING SYSTEM:

- Segmentation/detection of license plate is not up to level best
- There is no feature of character segmentation
- There is no feature of character recognition
- Not fit for all conditions (depends on environment light)

4. PROPOSED SYSTEM:

Here, we are going to discuss the Yolo network. Below figure shows the model diagram of our proposed method.
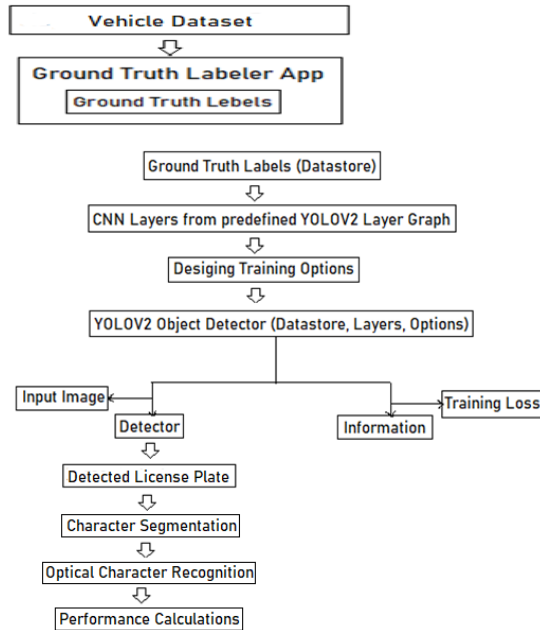
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Fig 3: Block Diagram of Proposed Method

In YOLOv2 the details of each block in the visualization can be seen by hovering over the block. Each Convolution block has the Batch Norm normalization and then Leaky ReLU activation except for the last Convolution block. YOLO divides the input image into an $S \times S$ grid. Each grid cell predicts only **one** object. For example, the yellow grid cell below tries to predict the "license plate" object whose center falls inside the grid cell. Each grid cell predicts a fixed number of boundary boxes. In this example, the yellow grid cell makes

boundary box predictions to locate where the license plate is. However, the one-object rule limits how close detected objects can be.

ADVANTAGES OF PROPOSED SYSTEM:

- Fast. Good for real-time processing.
- Predictions (object locations and classes) are made from one single network. Can be trained end-to-end to improve accuracy.
- YOLO is more generalized. It outperforms other methods when generalizing from natural images to other domains like artwork.

5. SOFTWARE REQUIREMENTS

INTRODUCTION TO MATLAB

After logging into your account, you can enter MATLAB by double-clicking on the MATLAB shortcut icon (MATLAB 7.0.4) on your Windows desktop. When you start MATLAB, a special window called the MATLAB desktop appears. The desktop is a

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window that contains other windows. The major tools within or accessible from the desktop are:

- The Command Window
- The Command History
- The Workspace
- The Current Directory
- The Help Browser

Features of MATLAB:

Following are the basic features of MATLAB.

- It is a high-level language for numerical computation, visualization and application development.
- It also provides an interactive environment for iterative exploration, design and problem solving.
- It provides vast library of mathematical functions for linear algebra, statistics, Fourier analysis, filtering, optimization, numerical integration and solving ordinary differential equations.

6. DIGITAL IMAGE PROCESSING

Digital image processing:

Digital Image Processing means processing digital image by means of a digital computer. We can also say that it is a use of computer algorithms, in order to get enhanced image either to extract some useful information.
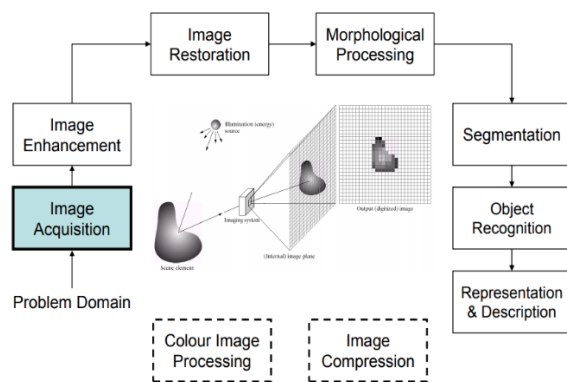
Image:

An image is defined as a two-dimensional function, F(x, y), where x and y are spatial coordinates, and the amplitude of F at any pair of coordinates (x, y) is called the intensity of that image at that point. When x, y, and amplitude values of F are finite, we call it a digital image. In other words, an image can be defined by a two-dimensional array specifically arranged in rows and columns. Image is composed of a finite number of elements, each of which elements have a particular value at a particular location. These elements are referred to as picture elements, image elements, and pixels.

Image processing mainly include the following steps:

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- Importing the image via image acquisition tools.

- Analyzing and manipulating the image.

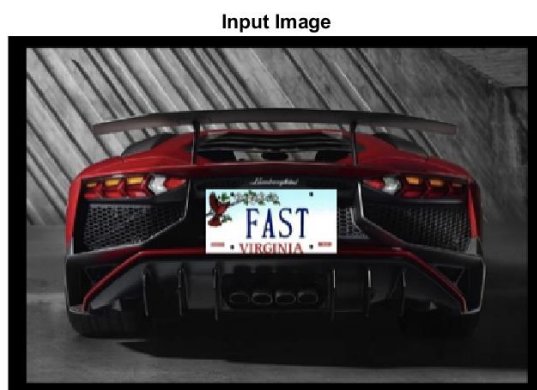Output in which result can be altered image or a report which is based on analyzing that image.

Detected Image

Fig 6: Detection of Licence Plate

7. RESULTS AND DISCUSSION

Input Image

Fig 5: Input Vehicle Image
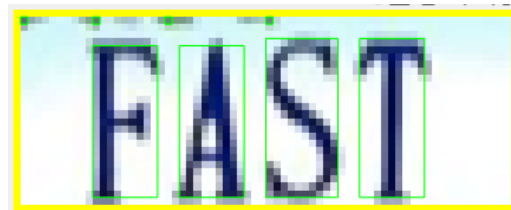

Fig 7: Detected License Plate
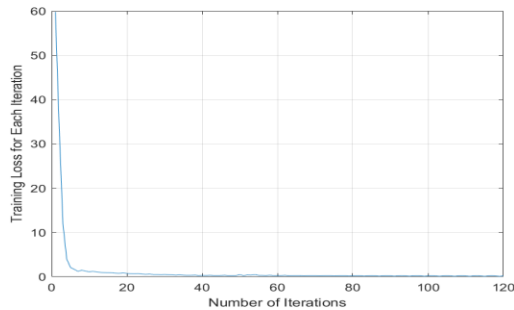

Fig 8: Characters Segmentation
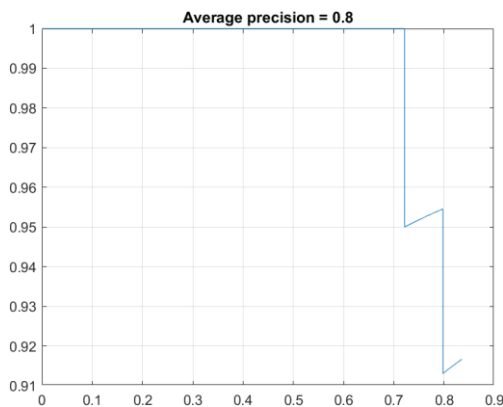
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Fig 9: Training Loss

Fig 10: Precision Graph

8. CONCLUSION

This paper has presented a deep learning technique for effective detection and recognition of LPs (License Plates). For this model, we have used YOLO (You Only Live Once) for detection process of license plate and OCR (Optical Character Recognition) for the process of characters recognition in license plate. For the enhancement of license plate, some Image Processing Techniques are utilized. Experimental results shown that our proposed model provides better results when compared to existing works.

9. FUTURE SCOPE

In future, we can improve results of OCR phase (improving character recognition). And also we can extend this concept to classifying whether the vehicle is stolen or not/authorized or not using deep learning techniques.

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