**AUTOMATIC NUMBER PLATE RECOGNITION USING PYTHON-OPENCV AND TENSORFLOW**

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**ABSTRACT**

Automatic number plate recognition is a type of image processing that uses the OpenCV programming language. The major goal is to create a system that can identify approved number plates automatically. This system is installed at the entrance to various locations for security control, such as mall parking, shopping districts, college campuses, and so on. The designed system first detects a moving vehicle approaching the entrance, then records an image of the car number plate. The image and video segmentation in an image are used to extract the vehicle number plate region. Character recognition is done using the optical character recognition technique. The resulting data is then stored in a database to produce precise information such as the vehicle's number plate, time taken, and frequency of data collection. This system is developed and simulated using OpenCV, Tensorflow, and MongoDB, and its performance is evaluated using real-world photos and videos. The developed technology successfully identifies and recognises the car number plate on genuine photos and videos, according to the testing . After noting down the vehicle number by number, the information will be entered into an excel spreadsheet with a time stamp so that the monitoring device can determine when and where that particular vehicle was identified.

**Keywords:** ANPR , Character Recognition , Number Plate Recognition , Vehicle Detection.

1. **INTRODUCTION**

Every country has its own system for creating and assigning number plates to its cars. Various government departments then use this licence number plate for their routine administrative tasks, such as traffic police tracking those who break traffic regulations, identifying stolen automobiles, toll collecting, and parking allotment management, and so on. In India, each motor vehicle is given a unique number. The Regional Transport Office at the district level assigns these numbers to the vehicles (RTO). License plates must be shown on both the front and back of the vehicle in India. On the other hand, given to their high level of intelligence, these plates are generally easy to read for humans. It becomes exceedingly difficult for computers to perform the same activity. Many characteristics, such as illumination, blur, background colour, foreground colour, and so on, will cause issues. In addition, License Plate Recognition (LPR) in India is challenging due to a lack of adherence to traffic rules and a lack of adherence to number plate standards. Each adopts a different style, resulting in variations in parameters such as number plate size and characters, number plate location, type of font used, background (white background with black letters for non-commercial vehicles and white background with yellow letters for commercial vehicles), unwanted pictures, and so on, making number plate localization extremely difficult.

The primary goal of this system is to build an effective approach for recognising licence plates and extracting text from them in Indian settings. This operation is carried out on both vehicle and two-wheeler number plates.

To recognise a licence plate, the software required to use five different algorithms:

1. License plate location, which is in charge of locating and isolating the plate in the image. It should be found and retrieved from the image so that it can be processed further.

2. After locating and extracting the number plate from the photograph, it can be converted to a standard format for brightness and contrast.

3. Plate size and orientation, including offset angles that make the plate appear "crooked" and adjusting the size.

4. Individual character segmentation is seen in the plate.

1. **LITERATURE REVIEW**

This section will go over some of the protocols that have been designed earlier. Over the last few years, a large amount of work has been done on image processing techniques and deep learning for object detection. In this arena, several alternative vehicle reconnaissance recognition and detection methods have evolved. From a literature review, we may see a variety of current strategies.

Nazmus Saif et. al (2019) : Using convolutional neural networks, a system was presented to detect and recognise the Bangla licence plate from a car image. Because of its configuration for the end-to-end pipeline, the main focus of this work is to choose convolution neural network in the designed system. In this case, CNN clearly outperformed traditional image processing algorithms, and generalised CNN models performed better in numerous circumstances when compared. YOLOv3, which has 53 convolutional model layers, was used in the detection study. After identification, image segmentation and character recognition are the next steps. The device rips out the number plate regionand sends it to the second YOLO model for segmentation and platform image identification during this step. As a result of these tests, the model was tested with 200 photos and accurately recognised the licence plate number in 199 of them, resulting in a 99.5 percent accuracy rate[1].

S.Roy, A. Choudhury, J. Mukherjee : [2] The proposed a method for number plate localization, primarily for automobiles in West Bengal (India), and split the numbers so that each number could be identified separately. This work proposes a method based on morphological operations that are simple and efficient, as well as the Sobel edge detection method. He also demonstrates a straightforward method for segmenting all of the letters and numerals on the number plate. After removing noise from the input image, we use histogram equalisation to try to improve the contrast of the binarized image. We primarily focus on two steps: locating the number plate and segmenting all of the numbers and letters to identify each number independently.

Singh, A. K. , & Roy, S. (2015) : A considerable number of issues are raised in this paper[1], Number plate identification in India, due to differences in font sizes, colours, and double line number plates, among other things. As a result, the final outcome has a high level of inaccuracy. All of these issues are addressed in this study, which is based on real-world Indian road conditions. Character recognition is done with ANN, and plate contour detection is done with SVM. Various algorithms for removing noise and improving plate recognition, as well as the use of a neural network for the best results while removing a variety of camera limitations.[3]

Kuldeepak et al.(2012): They said in this research [4] that when streets are crowded and a large number of vehicles pass through, a high level of precision is required for number plate recognition. They achieved a precision of 98 percent in this paper by tweaking several parameters. It is critical that for the tracking of stolen automobiles and vehicle monitoring, 100 percent accuracy cannot be compromised. As a result, improved precision streamlining is necessary. Additionally, stains, hazy areas, and smudges with varying font styles and sizes should be remembered. This work can be expanded in order to reduce errors caused by them.

Madhusree Mondal et. al (2017): She created an ANPR framework that focuses on convolutional neural networks' learning capabilities. CNN's self-synthesized function was chosen in this case since it distinguishes between vehicle states and number plates. In this study, the system was arranged as an echelon network of feature detectors that processed visual data in a sequential manner related to the visual cortex's dominant visual processing experience, which informed the CNN's computational model. The results of this study were observed with less training samples, and the precision rate was shown to be 90% higher [5].

Subhadhira,S et. al (2014): The training approach in this paper[6] is done using the deep learning method. Extreme machine learning accurately classifies the plates. The first component of the system uses HOG to preprocess and extract features, while the second part classifies each number and alphabet to analyse and separate each number and letter on the car's number plate. Extreme learning machine (ELM) is a quick supervisor learning technique that operates on single hidden layer feed forward networks and has classification performance similar to SVM. To recognise Thai letters on number plates, ELM is utilised as a classifier, while HOG is used to extract essential features from the plate. Because of its quick speed and appropriate testing and training tenets, the ELM system is deployed.

In this paper [7], Recognition of UK number plates has been implemented in ANPR using machine learning techniques such as SVM, ANN, and KNN. The massive automotive picture dataset, which is required to train the machine learning algorithms, is developed from scratch in order to construct an efficient application. To produce fast and reliable applications, number plates were collected from high resolution digital photos and coupled with modern computer vision techniques and armed with the most powerful machine learning algorithms. The subject of computational sciences has made incredible progress in recent years. The system takes in the image of the car, processes it, and analyses it using KNN, SVM, and other computer vision algorithms. The final result identifies the car's licence plate in the photograph.

1. **CONCLUSION**

Based on an examination of several papers, we have concluded that different strategies for recognising car number plates are available. Sobel edge detection method,Automatic licence plate identification, is a novel approach for detecting edges and filling gaps fewer than 8 pixels, categorising features at each stage, and identifying and recognising car licence plates.

As a result, at present time, an improved character segmentation method is being used to lower the amount of work necessary to recognise a car licence number plate. Calculate a better result than the usual method in terms of the time required for convergence.

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