Industrial Engineering Journal
ISSN: 0970-2555
Volume : 52, Issue 2, No. 1, February : 2023

# VEHICLE NUMBER PLATE & UNAUTHORIZED VEHICLE RECOGNITION SYSTEM

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## ABSTRACT

Automatic number plate recognition (ANPR) is an image processing technology which uses number (license) plate to identify the vehicle. The objective is to design an efficient automatic authorized vehicle identification system by using the vehicle number plate. The system is implemented on the entrance for security control of a highly restricted area like military zones or area around top government offices e.g. Parliament, Supreme Court etc. The resulting data is then used to compare with the database so as to come up with the specific information like the vehicle's owner, place of registration, address, etc. In the proposed method, Open CV library along with python language is used for image processing using pytesseract. Vehicle number plate recognition using optical character recognition has become an important area of research in computer vision and image processing. The input image or live stream is taken and converted into grayscale image and the processed image is filtered through bilateral filter to remove unwanted characters. In this project, Canny edge detection method is used to detect the edges of license plate. Tesseract is used as an Optical Character Recognition (OCR). The developed system first detects the vehicle and then captures the vehicle image. Vehicle number plate region is extracted using the image segmentation. Optical character recognition technique is used for the character recognition. The resulting data is then used to compare with the details of authorized people in the program so as to come up with the specific information like is he the owner or not etc.

***Keywords:*** *ANPR, OCR, Open CV, Tesseract*

## I. INTRODUCTION

Vehicle number plate recognition using Optical Character Recognition (OCR) has become an important area of research in computer vision and image processing. It has numerous applications, such as automatic toll collection, parking management, law enforcement, and traffic analysis. The aim of this document is to provide an overview of a system for vehicle number plate recognition using OCR implemented in python.

Over the last many times, the business on roads has increased by hops and bounds and so have the problems of auto theft, unregistered vehicles. Due to the below- mentioned problems, vehicle shadowing, recognition and unauthorized vehicle discovery have gained immense significance in ultramodern business control systems. The onerousness involved in number plate localization and recognition is veritably well known in the field of Digital Image Processing and the chain increases as further and further factors are taken into consideration. Each vehicle has a unique license plate number. License plate recognition system makes use of this unique number for variety of operations similar as border monitoring, risk operation, parking operation, auto power etc. With the perpetration of an effective security system we can put a check on the adding crime rate. But the difficulty in espousing a standard procedure, in working this problem, is substantially due to the characteristic features of the number plate, which vary extensively with the region/ area to which the vehicle detection.

Traffic flow prediction, vehicle re-identification, and vehicle tracking are basic components in traffic analysis. Among these applications, traffic flow prediction, or vehicle authorization, is one of the most important research topics of recent years. Good solutions to this problem could prevent traffic collisions and help improve road planning by better estimating transit demand we combine modern machine learning models with classic computer vision approaches to propose an efficient way to

predict vehicle number plate. In this paper, we introduce some state-of-the-art approaches in vehicle detection, and tracking of authorised or unauthorized vehicle.

Vehicle Number plate identification is an image processing approach that is used to detect the vehicles using the number plates. This technique is used mainly in security and traffic installations. This technique will help officials to provide security in authorized areas like the military.

## II. LITERATURE SURVEY

This section provides the essential contributions and techniques that are recently developed for accurately identification of vehicle number plate authorization of number plate.

Sandipan Chowdhury et al [1] proposes calculations to confine vehicle number plates from regular foundation pictures, to fragment the characters from the restricted number plates and to perceive the sectioned characters. The revealed framework is tried on a dataset of 560 specimen pictures caught with various foundations under different enlightenments. The execution exactness of the proposed framework has been computed at each stage, which is 97.1%, 95.4% and 95.72% for confinement and extraction, character division and character acknowledgment individually. The proposed strategy is likewise equipped for limiting and perceiving numerous number plates in pictures.

Sahar S. Tabrizi et al [2] presents another technique for Iranian License plate acknowledgment frameworks that will expand the exactness and lessening the expenses of the acknowledgment period of these frameworks. In such manner, a mixture of the k-Nearest Neighbours calculation and the Multi-Class Support Vector Machines (KNN-SVM) model was produced in the review. K-NN was utilized as the primary characterization display as it is basic, vigorous against uproarious informational collection and powerful for a substantial informational index. The perplexity among the tag comparative characters issue was overcome by utilizing the various SVMs characterization display. The SVMs show has enhanced the execution of the K-NN in the acknowledgment of comparative characters. The present review test comes about uncovered that there is a huge change in the character acknowledgment stage rate contrasted and a comparable review.

Tejendra Panchal et al [3] address License Plate limitation with the incorporated division approach. As the noteworthiness of open travel system constructs an Automatic License Plate Recognition has wound up being a basic investigation subject. ALPR outfitted with various sharp perception structures like, road movement organization, security organization, modified toll gathering system, et cetera. Different frameworks have been offered for tag acknowledgment, each bearing its own specific purposes of intrigue and blocks. The critical stride in ALPR framework is the exact repression of number plate, Segmentation, Recognition. Harris corner calculation is proposed in this paper which wind up being powerful in changing movement and enlightened lightning conditions. While the exactness of License Plate confinement is nourished forward to the Segmentation organize. The Segmentation is refined by a strategy for associated segment investigation solidified with Pixel check, Aspect proportion and Height of characters. At the end, the re-enacted results are appeared with conclusion and future work Pixel check, Aspect proportion and Height of characters. At the end, the re-enacted results are appeared with conclusion and future work.

## III. PROPOSED SYSTEM

Vehicle number plate recognition is an important task in the field of computer vision and image processing. In this project, we propose a system that uses Optical Character Recognition (OCR) techniques to recognize the characters present in a vehicle's number plate. The system is implemented using the Python programming language and various libraries such as OpenCV, Tesseract OCR, and NumPy.

The proposed system consists of four main stages: image acquisition, pre-processing, character segmentation, and character recognition. In the first stage, the vehicle's number plate image is acquired using a camera or from an image database. In the pre-processing stage, various image processing

techniques are applied to the image to enhance its quality and make it suitable for character segmentation.

In the character segmentation stage, the individual characters present in the number plate are segmented using techniques such as contour detection and morphological operations. Finally, in the character recognition stage, the segmented characters are passed through an OCR engine to recognize the characters present in the number plate. The system can be used in various applications such as automated toll collection, parking management, and law enforcement.

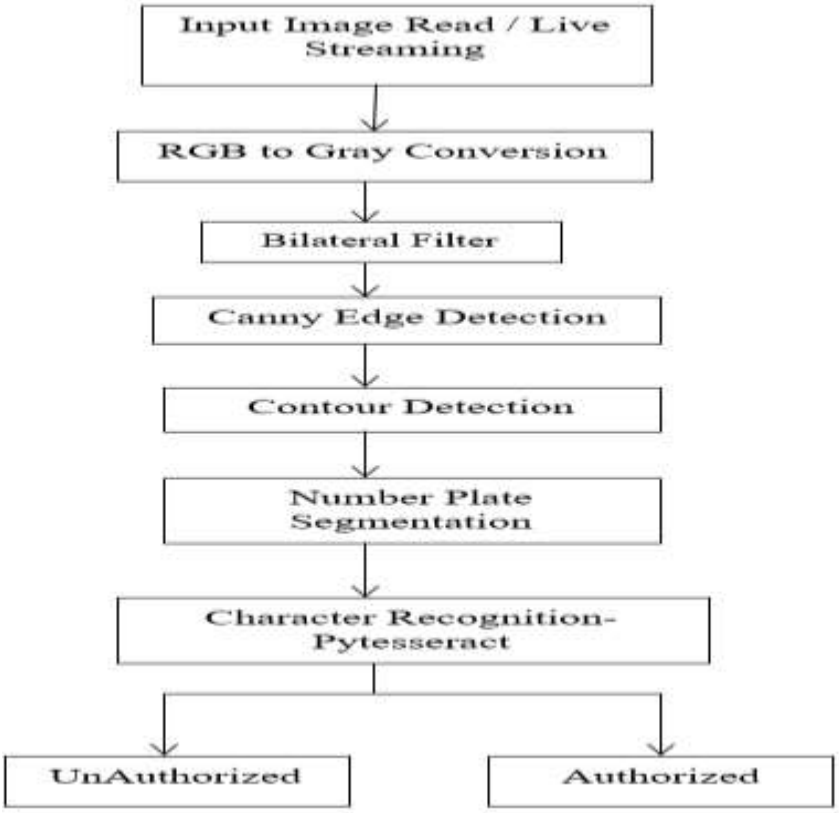


Figure 1: Block diagram

**RGB to Gray Conversion**:

RGB (Red Green Blue) to grayscale conversion is a common image processing operation that involves converting an RGB image to a grayscale image. In a grayscale image, each pixel is represented by a single value that corresponds to its brightness or intensity.

In Python, you can convert an RGB image to grayscale using various libraries like OpenCV, Pillow, and Scikit-image. Here we are using opencv for this processing.

**Image Resizing**:

Image resizing is a common image processing operation that involves changing the size or resolution of an image. In Python, you can perform image resizing using various libraries such as OpenCV, Pillow, and Scikit-image.

It's important to note that when resizing an image, you should be mindful of the aspect ratio and the potential loss of image quality that can occur if the image is resized too much. It's also important to choose an appropriate interpolation method when resizing an image to avoid artifacts and other image quality issues.

**Bilateral Filter:**

A bilateral filter is a type of non-linear filter used in image processing to smooth images while preserving edges. The bilateral filter works by applying a Gaussian filter to the image while also taking into account the difference in pixel values between neighbouring pixels.

The bilateral filter is often used to reduce noise in images while preserving edges, such as in medical imaging, where it can be used to remove noise from images while preserving the edges of organs and tissues. The bilateral filter can also be used in computer vision applications, such as object tracking, where it can be used to reduce noise in images and make them more suitable for feature extraction.

The bilateral filter takes two parameters: the spatial domain standard deviation and the range domain standard deviation. The spatial domain standard deviation determines the size of the filter window, while the range domain standard deviation determines the degree to which neighbouring pixels are considered for smoothing. It is important to note that the bilateral filter can be computationally expensive, especially for large images and large filter window sizes. It's also important to choose appropriate values for the spatial and range domain standard deviations based on the specific application and image characteristics.

**Canny Edge Detection**:

Canny edge detection is a popular edge detection algorithm in image processing that is used to detect the edges in an image while suppressing noise and other extraneous details. The algorithm is named after its inventor, John Canny. The Canny edge detection algorithm involves several steps, which are as follows:

1.Smoothing: The first step is to apply a Gaussian filter to the image to smooth out any noise and other irregularities in the image. This helps to reduce the number of false edges that are detected.

2.Gradient computation: The second step is to compute the gradient of the image to find the edges. The gradient represents the rate of change of pixel intensity in the image. The gradient is calculated using a Sobel filter or a similar filter.

3.non-maximum suppression: The third step is to apply non-maximum suppression to the gradient image. This involves thinning the edges to a single pixel thickness by suppressing all non-maximum values in the local neighbourhood of each pixel.

4.Double thresholding: The fourth step is to apply double thresholding to the gradient image. This involves applying two threshold values to the gradient image: a high threshold and a low threshold. Pixels with gradient values above the high threshold are considered strong edges, while pixels with gradient values between the low and high thresholds are considered weak edges.

5.Edge tracking: The final step is to perform edge tracking on the weak edges to determine if they are actually part of an edge. This involves connecting weak edges to strong edges and suppressing any remaining weak edges that are not connected to a strong edge.

It is important to note that the Canny edge detection algorithm can be sensitive to the choice of parameters, especially the thresholds. The choice of thresholds should be based on the specific application and image characteristics.

**Image Segmentation:**

In image processing, bitwise AND is a binary operation that is applied to two images or two portions of the same image. The operation is used to obtain the intersection of two binary images or to mask an image with a binary mask. The bitwise AND operation is a pixel-wise operation that takes the AND of the corresponding pixels in the input images. The output image has a value of 1 where the corresponding pixels in both input images are 1, and a value of 0 everywhere else. The operation is typically applied to binary images, where the pixels have a value of either 0 or 1. In Python, you can apply the bitwise AND operation to two images using various libraries such as OpenCV and NumPy. The bitwise AND operation is commonly used in image processing for tasks such as image segmentation, where a binary mask is used to isolate specific regions of an image.

**Python:**

Its language constructs and object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects. Python is dynamically typed, and garbage

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 52, Issue 2, No. 1, February : 2023

collected. It supports multiple programming paradigms, including procedural, object-oriented, and functional programming.

**Pytesseract**

Pytesseract is a Python library that provides an interface to the Tesseract OCR (Optical Character Recognition) engine. Tesseract is an open-source OCR engine developed by Google and is used to recognize text in images and documents. Pytesseract makes it easy to integrate Tesseract into Python applications, allowing developers to extract text from images and perform text recognition tasks programmatically. Pytesseract uses the Tesseract OCR engine to perform text recognition on images. The library provides a simple and intuitive API that makes it easy to extract text from images. The library can be used to extract text from various types of images, including scanned documents, photographs, and screenshots.

## IV. RESULTS



Figure 2: Input is given as image read


Figure 3: Output of Test image1

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 52, Issue 2, No. 1, February : 2023


Figure 4:Test image 2


Figure 5 : output for Test image 2


Figure 6: Input is given as Live Stream


Figure 7: Edge detection of test image


Figure 8: Blur detection of test image

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 52, Issue 2, No. 1, February : 2023


Figure 9. Contour detection of test image

## V. CONCLUSION AND FUTURE SCOPE

In this system, the vehicle plates are identified automatically for verification. This system uses a progression of various image processing standards for verifying every vehicle with the database stored in the PC. This system is implemented using python and performance is tested in real-time. The results show that the system detects the number of plates under normal conditions and can be implemented at the entrance of highly restricted areas. The further work in the future would be as a module of face recognition for the additional security for entering into the government or military secured areas. This is a robust real-time scenario system that can be developed and implemented at a low cost.

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