Automatic Number Plate Recognition System

Lavalesh Yadav

Galgotias University, Greater Noida, Uttar Pradesh

Abstract

Automatic Number Plate Recognition System (ANPRS) is a System that Automatically Recognizes the Number plate of any vehicle and gives the information about the owner of the vehicle. A number plate is a metal plate that is attached to every vehicle to uniquely identify any vehicle. Each Number plate contains a unique Alphanumeric number to identify any vehicle. Automatic Number Plate Recognition System uses Optical Character Recognition to read Alphanumeric numbers from the number plate using high-quality CCTV cameras. Number Plate Recognition System can be used for various security purposes such as it can be used in highly restricted areas like military zone or government places like parliament, Supreme court, Bank, Hospitals, School, colleges, Airport, etc. Automatic Number Plate Recognition System helps police to reduce accidental crime, if some has done a crime, it can be easily captured using automatic number plate recognition system their vehicle can be easily detected at Automatic number plate recognition system enabled Road. It also helps police to find stolen vehicles in an efficient manner. Previously developed Automatic number plate recognition system suffers from many problems such they are unable to detect the correct position of the plate, unable to detect correct information about owner when number plate is written in different font styles also it fails to detect number plate information when low-quality cameras are used for the detection of the number plate. Our Automatic number plate detection system is free from all these shortcomings because it uses optical character recognition and uses high-quality CCTV cameras. Automatic Number Plate Recognition system generally works in five steps as it will capture image using CCTV cameras after that it will detect license plate then character segmentation is done finally character recognition is done. Automatic Number Plate Recognition System is fully automated to operate 24/7.

Keywords: Optical Character Recognition, ANPRS, CCTV, Automatic Number Plate Recognition System.

1. Introduction

(i) Overall Description

Automatic Number Plate Recognition System is a technology that automatically recognizes the Number plate of any vehicle and gives the information about the owner of the vehicle. In simple terms, ANPR takes a photo using CCTV cameras of the number plates of the vehicles and pass to the System. This 'photo' is then fed in an ANPR System to find out details about vehicle. It gives information related to owner and driver. ANPR consists of cameras linked to a computer. As a vehicle passes, ANPR

'reads' Vehicle Registration Marks - more commonly known as number plates - from digital images, captured through Closed Circuit Television (CCTV). The photo fed in the APNR System is converted into data, after processing through the Automatic Number Plate Recognition system. In this System, we have used a method mainly based on edge detection, optical character recognition (OCR)

operation and finding rectangles in a vehicle image. The method used by the APNR system is optical character recognition (OCR) that recognize number plates in photos of vehicles. Previously APNR System can be used for security Systems to control accesses of vehicles and car parks. The ANPR System are more reliable, some APNR systems can offer recognition rates between 60 and 80%. Also, some ANPR equipment can recognize the number plate of vehicles that drive up to 120km/h. Generally, the ANPR technology have 3 major Stages:

- License Plate Detection: This step is the first and most important step of the ANPR system. In this step, we determine the position of the license plate. In this step, we provide an image of the vehicle as input and we get a license plate as output.
- Character Segmentation: It's at this stage the characters on the license plate are mapped out and segmented into individual images.
- Character Recognition: In this step we wrap everything. The characters which are segmented in

the previous step are identified here. We will use machine learning concept for this.

1.1 Purpose

The main purpose of the Automatic Number Plate Recognition system is:

- To enhance the ability of police to detect criminal activity that involves the use of motor vehicles.
- This System can be used for security purposes at various places like an entrance for security control of a highly restricted area like military zones or areas around top government offices e.g. Parliament, Supreme Court, etc.
- The APNR system can be used for traffic control as it can recognize the number plate of vehicles that circulate up to 200 km/h with a reliability of 95%.
- APNR system can be used to control red light control- To jump a red light is a dangerous infraction with consequences for other drivers and pedestrians. But today it is possible to control the vehicle when they cross a red light. APNR system combines image capturing tools such as cameras or video recorders and sensors.

1.2 Motivation and Scope

- ANPR system can be used to automatically open a gate or barrier in a secured area for authorized members. This system can replace or assist security guards at the gates or barriers of premises.
- If any vehicle is stolen, then it can be marked in the Automatic Number Plate Recognition System. If a stolen vehicle passes through the road then the camera set on the roadside that belongs to the Number plate recognition system set an alarm to alert a guard.
- To control traffic flow management.
- Nowadays advance technology took Automatic Number Plate Recognition systems from hard to set up, limited expensive, fixed based applications to simple mobile ones in which the "point to shoot" method can be used. This happens because of the creation of software that ran on cheaper PC based and also no specialist hardware in which there no need to give pre-defined speed, size, direction and angels in which the plate would be passing the camera field of view. Besides, Smaller cameras which can read license plates at high speed, along

with smaller, more durable processors that can fit in police vehicles.

2. Literature Review

Muhammad Tahir Qadri In this anticipate [2] OCR technology is used for recognition is susceptible to misalignment and different sizes. The affine transformation can be used to advance OCR recognition from various size and angles. A vehicle identification system programmed using a vehicle license plate is displayed. A series of image processing techniques of the system to identify the vehicle from a database stored in a PC.

S.Kranthi, K.Pranathi In this paper they [3] proposed that Automatic Number Plate Recognition (ANPR) is a method that captures the image of the vehicle and verifies their license number. ANPR can be used in the presentation of stolen vehicles. ANPR can be used to identify stolen vehicle on the highway in various manner.

Abd KadirMahamad. In this paper they explained [8] an automated number plate inspection of the letter sets of plate using image processing and optical character recognition. A mandatory system has been created for the training interface using LABVIEW software.

Kuldeepak et al. In this paper [1] they introduced that high degree of accuracy is required by the number plate recognition when roads are occupied and number of vehicles are passing by. In this paper, they have achieved an accuracy of 98% by optimizing various parameters, it is essential that bargaining cannot be done with tracking of stolen vehicles and monitoring of vehicles with 100% accuracy. Therefore, to accomplish better precision streamlining is required. Additionally, issues such as stains, blur areas, blurring with different text styles and sizes should be remembered. This work can be further boundless to minimize the errors because of them.

AmrBadr et al. In this paper [8] Automatic recognition of car license plate number became an indispensable part in our life day by day. For the plate localization and characters segmentation, Automated Number Plate Recognition System uses morphological operations, histogram manipulation and edge search techniques. Artificial Neural Networks are used for Character classification and recognition.

3. **Problem statement**

This project is mainly focused on finding alternative solutions to the image segmentation and character recognition problems by doing experiments deeply, within the Number Plate Recognition System framework. Three main stages are identified in such applications.

   I.   It is necessary to locate and extract the license plate region from a larger scene image.
   II. Having a license plate region to work with, the alphanumeric characters in the plate need to be extracted from the background.
   III. Deliver them to an optical character recognition system for recognition.

By locating the number plate in the image provided by CCTV cameras we can identify the vehicle by reading its license plate successfully. Finding the location of Locating of interest helps in dramatically reducing both the computational expense and algorithm complexity. Even, the input to the segmentation and recognition stages is simplified, resulting in easier algorithm design and shorter computation times. The techniques, algorithms, and parameters that are used in the Automatic Number Plate Recognition system can be adjusted easily for identifying various alpha-numeric, various sizes number plate sets.

4. **Proposed Model**

The number plate is a pattern with many high variations in contrast. If the number plate is the same as the background. It's difficult to identify the location. Brightness and contrast changes as light fall changes to it. In this Model, the morphological operations are used to extract the contrast feature within the plate. The work is divided into several parts:

A. Input car image

B. License Plate Detection

C. Character segmentation

D. Character Recognition.

A.   **Input vehicle image**

Input the image that is taken from the CCTV Cameras.

Input vehicle image

B.   **License Plate Detection**

This is the first stage and at the end of this stage, we should be able to identify the license plate's position in the car. To do this, we need to read the image and convert it to grayscale. In a grayscale image, each pixel is between 0 and 255.

We now need to blur unwanted portion of the vehicle.

We now need to convert it to a binary image in which a pixel is either full black or white.
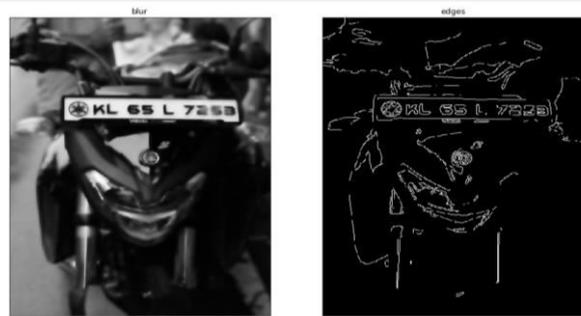
The output will show two images, one in grayscale and the other in binary.

The concept of connected component analysis is used to identify all the connected regions in the image.

The concept of connected component analysis helps us to group and label connected regions on the foreground. A pixel is said to be connected if they both have the same value and are adjacent to each other.
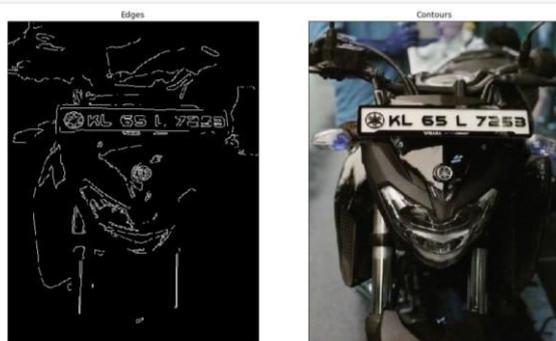
From the resulting image, we can see that other regions that do not have a license plate are also mapped. To eliminate these, we will use some features of a specific license plate to remove them.

a) They are rectangular.

b) The width is more than the height.

c) e proportion of the width of the license plate region to the full image ranges between 15% and 40%.

d) The proportion of the height of the license plate region to the full image is between 8% &

20%.

By the modified version of the Connected Component Analysis py script concept, other fields that may not be license plates have been exhausted. Finally, we get number plate.

C.   Segmentation of characters

It's at this stage the characters on the license plate are mapped out and segmented into individual images.

D.   Character Recognition

This is going to be the last stage, it's at this stage we introduce the concept of machine learning. Machine learning can only be defined as a branch of AI that deals with data and processes it to discover pattern used for future forecasts. We use optical character recognition system is based on convolutional neural network a specific type of deep neural network based on the part of the brain dealing with sight in animals.

5. Observation

- Detection works for complex environments such as low light, many background objects, texture and brand name images.
- Accuracy of Automatic Number Plate Recognition System is 100% for country wise parameters and 95% for global case.

- Automatic Number Plate Recognition System accuracy on average from test sets is 88.54%.
- Features like character height, spacing, License Plate height and width are used for License Plate detection.

6. Conclusion

In this paper, an automated number plate recognition system using vehicle license plate has been introduced. The system utilizes image processing techniques for recognizing the vehicle from the database stored in the computer by user. The system works agreeably for wide variation of conditions and distinctive sorts of number plates. The system is actualized and executed in jupyter and performance is tried on genuine images. In the existing work, work has been done on contorted number plates. Next, we plan to study the features involved with the automated number plate system for better performance.

7. References

- Ganesh R. Jadhav, Kailash J. Karande, "Automatic Vehicle Number Plate Recognition for Vehicle Parking Management System" Computer Engineering and Intelligent Systems, ISSN 2222-1719 (Paper) ISSN 2222-2863 (Online) Vol.5, No.11, 2014.
- Amr Badr, Mohamed M. Abdelwahab, Ahmed M. Thabet, and Ahmed M. Abdelsadek, "Automatic Number Plate Recognition System", Annals of the University of Craiova, Mathematics and Computer Science Series Volume 38(1), 2011, Pages 62–71 ISSN: 1223-6934 Special Conference Issue: National Conference on Cloud Computing & Big Data
- Sourav Roy, Amitava Choudhury, Joydeep Mukherjee, "An Approach towards Detection of Indian Number Plate from Vehicle", International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-2, Issue-4, March 2013.
- J.-W. Hsieh, S.-H. Yu and S.-H. Yu, Morphology-based License Plate Detection from Complex Scenes, IEEE Proceedings of the 16th International Conference on Pattern Recognition, Quebec City, Canada, August 1115, 2002, Vol. 3 (2002), 176-179.