A Review on Automatic License Plate Recognition

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Abstract: A vital stage in smart traffic systems is automated vehicle identification. Vehicles now play an extremely important part in transport. Vehicle uses have also increased in recent years due to development in population and human requirements. Different types of license plates are utilized; for every country the necessity for an automatic registration system differs. Infringements of traffic law have been acknowledged as a leading source of traffic accidents in much of the world. Infringers are still increasing, despite the presence of the rules and regulations stated against it. ANPR is the technique used to derive the information of the number plate from the car image Plate Number. Composite method for plate number recognition Image capture, Pre-processing where many disruptions and noise in the image have been cleaned, Plate area extracts usable data from the filtered input patterns from the study and extraction process. Character segmentation in the number plate retrieved and recognition of character where segmented characters are recognized. This review article examined the numerous designs applied for license plate recognition.

Keywords: APNR, Number Plate Recognition, Character recognition

I. INTRODUCTION

In numerous applications, vehicle platform detection and recognition is employed, including trip time estimates, road counts, detection of infringements and surveillance applications. The growing population is also significantly increasing the number of automobiles. In recent days a big number of students and teachers in educational institutions find it difficult to find a vehicle park. The safety guards who cannot maintain a vehicle record in the car park manually operate most car parks. The driver of the vehicle must therefore continue to walk through the parking lot to find a parking place. The lack of security officers can also result in vehicle thefts and can lead to conflicts between drivers to park. ANPR is also known as the Automated License Plate Recognition (ALPR). ANPR is an innovation in image processing utilized for the perception by their tags of cars. The knowledge in security and traffic installation is ahead of time. Tag Reconnaissance System is a PC Vision application. PC vision is a technique to use a PC to collect anomalous data from a digital image. For example, its size and the outline of the license plates provide unnecessary homogeneity among numerous tags.

The ANPR system consists of following steps:-
i. Vehicle image capture.
ii. Preprocessing.
iii. Number plate extraction.
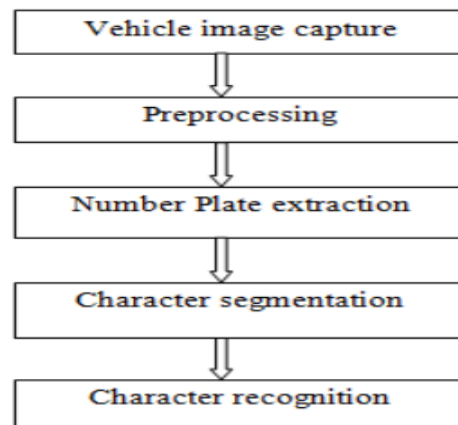iv. Character segmentation.
v. Character recognition.

Figure: 1 Block diagram of ANPR system

In order to use the ANPR system, you must position your car and take a front or rear image of it. The next step is to find the vehicle's licence plate number and then remove the licence plate. The pictures segmentation approach is used for the final segmentation stage of the neural network, mathematical morphology, colour analysis, and histogram analysis. A character recognition technique known as segmentation is employed for each recognized character. OCR is one of the methods used to recognize each

character, and it makes use of a database for each alphanumeric character [8] that is preserved.

With the VLPR framework, traffic applications and safety may be ensured from parking lot monitoring to automatic collection to road traffic monitoring to vehicle enforcement to traffic volume computing to analysis of vehicle activity to criminal acts. Traffic and travel control measures can be implemented with the help of the VLPR framework. Using frame sequences (from video) or silent images, this algorithm deduces the exact licence plate number. When it comes to automatic automobile plate recognition (APR), it refers to the methods of detecting a vehicle's licence plate through image processing, object ID, and pattern recognition combined with optical character recognition (OCR). Recognition of Vehicle Number Plate by Optical Character (OCR) Android Usage The plate number recognition is meant to determine the plate number and to recognize the plate automatically from a moving vehicle. Automatic recognition of the number plate comprises two main parts: Vehicle platform mining, Optical character recognition (OCR). The extraction of the plate number is that phase in which the plate number of vehicles is found and the plate text is removed. The segments are standardized and submitted to an OCR algorithm. Finally, the information on the optical character will be translated into encoded text. The Template matching characters are recognized. In a string [11], the ultimate output must be given. The processing of photos also helps to improve and restore existing photographs. The essential ideas employed include filtering, transforming, morphologic operations, clustering, segmentation, edge detection, characteristic extraction, etc. Videos can be divided into frames and processed in the same way as photos via image processing. The availability of computing power, storage etc.. for video monitoring has also increased[13]. IP algorithms have been used to monitor videos.

II. LITERATURE REVIEW

Sheetal Mithun Kawade et. all (2014) Generally, four processing phases include an ALPR system. Some points must be seen at the pictures acquisition stage, for example camera resolution and shutter speed, when the ALPR system camera is selected. The license plate is extracted based on a number of factors like colour, border or the presence of characters during the license plate extraction phase. During the segmentation phase of the license plate characters are extracted by projection, labelling or adaptation of their colour data to the template information.

Finally, the characters are recognized by templates or by classifiers such neural networks and floating classificators in the character recognition stage. Due to the diverse license plate formats and the different ambient circumstances, the automatic licence plate identification is very difficult. [1]

Ravi Kiran Varma et. all (2019) This work addresses the identification of plates of numbers and plates, concerning Indian plates or licence plates of vehicles. The main contributions of this study include considering difficult scenarios such as different lighting, hazy, skewed pictures, noisy pictures, standard and partially worn-out numeric plates. In these works, numerous image processing techniques are applied in the pre-processing phase, including as morphological transformations, gaussian limping and gaussian thresholds. [2]

Ayush Mor et. all (2019) There are different license plate detection systems and many factors depend on how well it may be identified. Essentially, we use three aspects, namely image location, segmentation and then recognition, for detection. The present research demonstrates a comprehensive examination based on the different comparison of recognition plate. This study provides critical assessments in five dimensions of experimental validation, i.e. techniques, data bases, accuracy, processing time and real-time relevance. [3]

Olamilekan Shobayo et. all (2020) The system used a smart IR sensor to detect moving objects, camera for capturing the picture, extracted text from the image and saved text on a Web page.) This work established a highly efficient, economical and VRPN system.) The Raspberry Pi is the main component chosen for main system work. Open CV has been used for character segmentation and recognition in conjunction with python programming. [4]

Hana Demma et. all (2019) ANPR is the technique used to derive the information of the number plate from the car image Plate Number. Composite method for plate number recognition Image capture, Pre-processing where many disruptions and noise in the image have been cleaned, Platter region extraction of usable information, segmentation of the character in the recovered number plate, and recognized character, when separated characters are recognized, from the filtered input patterns. This report focuses on recent studies connected to the technicality and the accuracy of the platform identification systems for various countries with a distinct environment and licence plate format for proposed algorithms and their limitations. [5]

Shally Gupta et. all (2020) This article offers an examination of the identification of a vehicle number plate

in traffic control. For efficient traffic monitoring ANPR is very beneficial and trustworthy. Device using a powerful picture processing technology can detect automobiles from different angles quickly and view ownership information as output. In developing the smart transport network, the ANPR systems play a vital role. [6]

P.Meghana et. all (2019) Automatic identification of numerical plates is a famous concept today due to the fast expansion of cars, motorcycles and other vehicles. This automatic number plate recognition system incorporates vehicle identification image processing technologies. This document outlines the numerous methods, benefits and inconveniences of recognition and allows everyone the best to choose a user-friendly, effective and un-impacted approach. Factors such as speed, light, text size and styles should not affect this system. [7]

Anisha goyal et. all (2016) The automatic recognition system employing the license plate for the vehicle is introduced in this paper. In order to identify the car from the data base stored on the computer by user the system applies image processing algorithms. The technique works conveniently for a wide variety of situations and distinctive numerical plates. In Matlab, the system is updated and run and real photos are proven to be performing. Work on countervailed number plates was done in the current work. This procedure has a problem with turmoil and is separated from images. A new technique for de-noising and reorganizing better character through conventional classifiers of neural networks has been proposed in the proposed work to deliver better body detection. [8]

Md Yeasir Arafat et. all (2019) The Vehicle License Platform Recognition (VLPR) framework has become one of the most important challenges in Smart Transport Systems in recent years. Recently the issue of the examinations of the obstacles and diversities of license plates (LPs), including diverse lighting and dangerous settings, has become a significant and complicated topic for research. An in-depth study was made of existing VLPR approaches in which an analytical review based on the qualities used and methodologies was carried out throughout this document. An analytical comparison of conveniences, discomfort and results has also been offered according to each categorized attribute. [9]

Mr A. N. Shah et. all (2016) The proposed work shows the automated identification number plate system employing the number plate for the vehicle. The technique has been implemented in Matlab and has been tested on actual pictures. One type of intelligent transport system is a

number plate recognition system. In order to retrieve a car numbers plate, the template matching technique is also used. The automatic identification number plate system plays a key role in identifying safety threats. Segmentation of character for the separation of each character here. [10]

Ruchita V. Patel et. all (2020) The major goal of this research project is to study the picture segmentation and the recognition issues in the License Plate Recognition Framework closely and find alternate solutions. In such applications, three main phases are identified. First, the area on a license plate from a bigger scene image must be located and extracted. Second, the alphanumeric characters on the plate must be removed from the background using a license plate region to work with. Thirdly, provide them for recognition in an OCR system. To identify a vehicle by successful reading of the license plate, the plate must obviously be found in the image produced by an acquisition system (e.g., video or still camera). [11]

Aniruddh Puranic et. all (2016) The model matching was performed using numerical plates obtained from static pictures and 80.8 percent average accuracy was achieved. By setting the camera appropriately to catch the best frame and by using two neural network layers, this accuracy may be considerably enhanced. Using multi-leveled evolutionary algorithms, the implementation of the suggested system can be extended to include numerous car plates in a single frame. [12]

S. Sanjana et. all (2020) The need to construct a better city is traffic monitoring. Motorcycle and helmet detection together with number plate recognition can be performed to penalize motorcycle riders who do not wear caskets. The rapid rise of the number of online tools and numerous integrated models which can be utilized for a wide range of applications has resulted in machine learning and image processing technology. [13]

Sweta Singh et. all (2021) The automated license detection system for today's hectic traffic system is an essential system. It helps to monitor traffic regulations and other enforcement activities automatically. In India, rash driving occurs with many situations in cars that violate several traffic rules. Traffic police officers find the details of the car quite challenging. In order to facilitate and quickly monitor the traffic regulations on cars, the automated license detection system was therefore devised and implemented over the years. This article gives a concise examination of different methodologies for automatic license detection. [14]

Ashwin Jaware et. all (2020) The automatic recognition system employing the license plate for the vehicle is introduced in this paper. In order to identify the

car from the data base stored on the computer by user the system applies image processing algorithms. The technique works conveniently for a wide variety of situations and distinctive numerical plates. In python/java, the system is updated and performed and real photos are tried. Work on countervailed number plates was done in the current work. This procedure has a problem with turmoil and is separated from images. A new technique for de-noising and reorganizing better character through conventional classifiers of neural networks has been proposed in the proposed work to deliver better body detection. [15]

III. NEED OF AUTOMATIC PLATE RECOGNITION

The fast technical development and the increased use of automobiles have led to several applications for license plate recognition systems. Crimes are growing day after day with a rapid rate in today's society and criminals use vehicles for crimes. If we go to a crowded location, we can notice, as many road accidents occur, that people do not follow traffic regulations. To overcome these challenges, it is necessary to have a license plate recognition system. The identification of a vehicle in criminal offences may assist criminals in their identification and also be utilized for Flexible and Automated Systems, Effective Enforcement and Effective Enforcement of Transport Regulations .The algorithms utilized for recognition play an important role, besides these conditions. If the algorithm quality is good, then the system input may be given to more types of pictures, which will also minimize process calculation speed. Precision and recognition speed are the most important challenges for the vehicle license plate recognition system.

IV. IMPOTENT THING FOR APNR AND ITS APPLICATIONS

4.1 Image Acquisition

The first step is to get an image, i.e. to get an image using the PC-related digital camera. These captured photos are in RGB format so that the platform extraction can be continued. The database system includes the vehicle's personal data and a few of graphics, abbreviations and acronyms of vehicles.

4.2 Image Processing

The acquired image is influenced by several aspects, for example: the degradation of the camera's captured car image and the unfavorable impact on further image treatment is the optical system distortion, system confusion, lack of the highest relative movability of a camera or vehicle.

4.3 Image binarization

Image binarization is a black-and-white procedure for converting a picture. In this process, certain thresholds are established to categorize certain pixels as black and some as white. The key challenge is to collect the image thresholds. Sometimes the selection of the optimum threshold value becomes exceedingly difficult or impossible. The approach called adaptive thresholding can address this difficulty. You can set a threshold manually or an algorithm, which is known as an automatic threshold, can be selected automatically.

4.4 Edge Detection

The edge location is the main detection or extraction approach. This is particularly difficult for complicated images to apply since with unconnected curves the question limit may arise. Distinctive edge identification is used for edge recognition such as canny, sobel, prewitt & Roberts cross. Many of the edges can be divided into two primary stages. The first is to find pixels in the picture, where edges are likely to occur by looking for angular discontinuities.

4.5 OCR using Template Matching

Matching the template is one of the greatest strategies of character recognition because it is easy to execute. In the template matching, the first thing is to provide a template that is to match the image. This technique is called as template matching for the location of the sub-image (template image). The picture is located within an image. The template correspondence displays commonalities between a particular template and the image to match.

4.6 Character Recognition

This is the most important and fundamental part of ANPR. It shows the strategies needed to organize the individual characters and then perceive them. The ranking is based on the features gathered. These characteristics are then grouped using statistical, syntactical, or neurological methods.

4.7 Applications of APNR

a) For Security Purpose
b) As Border crossing vehicle
c) For Toll ways d) Finding stolen cars
e) Parking area management
f) Traffic signal violation
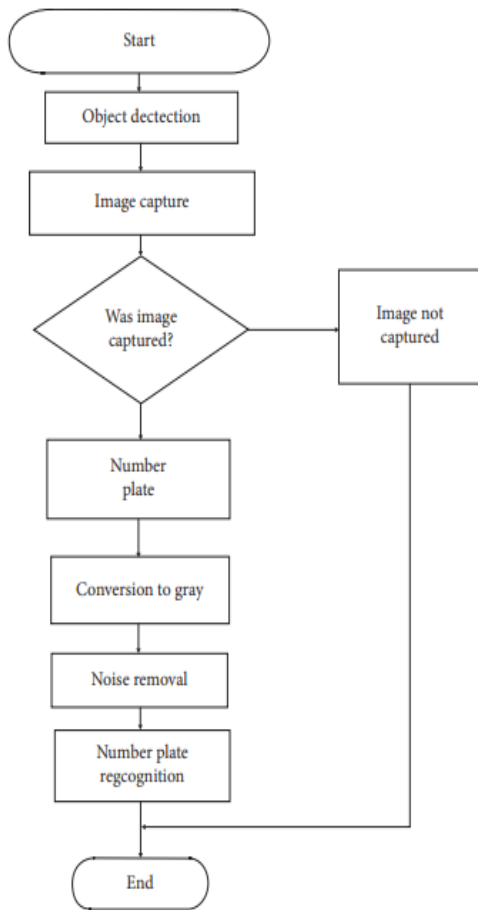
V. BASIC SYSTEM DESIGN FLOWCHART

Figure: 2.Basic APNR Flow Chart

In this flow chart we can see 1st algorithm is starts then object detection is done, then image capture and this image used as input image after that all the processing will done like conversion to gray scale image, noise removal then number plate will be recognize and after that algorithm will be stop.

VI. REVIEW STUDY TABLE OF DIFFERENT AUTHORS

Table: 1 Different Techniques Review

S. No.	Author Name	Title	Description
1	M. M. Shidore, and S. P. Narote	Number Plate Recognition for Indian Vehicles	Profound shadows and reflections influence the extraction of numerical plates. Due to uneven lighting, discoloured numerical plate, and the real numerical plate cannot be properly extracted.
2	Deepti sagar and maitreye e dutta	Block based neural network Automatic number plate recognition	Further improvement such as a square-shaped, coloured, shadow-plate number should be needed.
3	Reshu kumara and surya Prakash shrama	A Machine Learning Algorithm for Automatic Number Plate Recognition	SVM does not need large amount parameters to give good result
4	p.surekh a et.al	Automatic license plate recognition using image processing and neural network	In order for a DL to predict the vehicles' presence, ALPR should be able to predict multiple license plates when numerous cars are seen

			in one frame.
5	Hanit Karwal et al.	Vehicle Number Plate Detection System for Indian Vehicles	The technology offered demonstrates the need to retain information about vehicles by using automated methods. An effective recognition mechanism for Indian number plate vehicles has been designed in the proposed algorithm.
6	Mr.G.T.Sutar et al.	Number Plate Recognition Using an Improved Segmentation	Authors are using number plate number recognition (NPR). For security reasons that could replace the present human input system, this system has been developed to take into consideration the automation of number

			plate detection.
7	Kuldeepak et al.	License Plate Recognition System based on Image Processing Using Lab VIEW	The segmentation of each image is used to separate the backdrop from each image. The system was implemented utilizing the 8.2.1 & lab view 11.0 vision assistance.

VII. CONCLUSION

The need to construct a better city is traffic monitoring. There are different license plate detection systems and many factors depend on how well it may be identified. This article offers an examination of the identification of a vehicle number plate in traffic control. For efficient traffic monitoring ANPR is very beneficial and trustworthy. The current strategies for number plate detection and recognition systems are analyzed here. Different strategies of the identification of car numbers are examined in this article. The model can be built on neural networks to identify characters from the number plate of the car. From the review of numerous papers we infer that the identification of the number plate is subject to diverse methodologies. In reviewing all the research material and articles concerned, it can therefore be determined that the gadget can quickly detect and identify the number plates of the interested vehicle using advanced image processing techniques.

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