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License Number Plate Recognition(LNPR)

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***Abstract*—License number plate recognition is a technology which is used to detect the number of vehicles; it can be achieved by the OCR (optical character recognition) and OpenCV which is a computer vision technology. Most of the time the accuracy depends on hardware which is used to collect the data and the environment also like whether, Lighting. LNPR can be used in for traffic system where police can easily identify the vehicle number with the help of LNPR and it can be used in toll-tax areas where road authority can used it to get the tax from the public. It can also be used in the parking areas to get the data which vehicle is present at which time.. ANPR is a fascinating subject for academics because of its unreliability, tough surroundings, and other complications.**

Keywords: Artificial Intelligence, Security, camera quality, Easy-OCR, Tesseract, OpenCV, LNPR, licence plate segmentation, OCR.

I. INTRODUCTION

LNPR has become an important part of human lives and will continue to do in the future as well. In recent time licence number plate recognition has proven to be one of the best methods for vehicle surveillance. It can be used in a variety of public locations for a variety of reasons, automatic toll tax car park systems, and automatic vehicle parking systems. We will create software for a LNPR in this project. Using Open CV and Optical Character Recognition this system recognizes and reads car license plates automatically. It detects the license plate using OpenCV contour function. Finally, the license plate numbers are first caught by cameras and then we use OCR on it to fetch out the data. Connected Component Analysis was also utilized to segment the images. Connected regions mean that the object at that pixel region are equal. If two pixels have the same value and are adjacent to each other, they are said to be linked. The first result generated after running the application is a license plate image recognized in an automobile image.

This image is used as input for the following phase, and CCA is used to bind the characters in the plate. A list is created for each character found. After the plate's characters have been obtained and the model has been trained, the model is loaded to forecast each character.

By removing the need for human interaction LNPR technology is already contributing in the development of intelligent transportation systems. It's just not the camera on the road or car parks entrance that's being used. Over time with the arrival of smart phones LNPR devices also become handheld. Because of the cheaper provisioning costs LNPR is commonly employed in the toll and parking lot businesses. The primary reason is that, unlike UHF-RFID systems, the LNPR technology identifies the registration number plate without the use of a transponder.

In today's world, rapid country urbanization is a key advancement. The rural areas people are moving towards the urban area for getting a better opportunity in career due to which the urban areas are becoming more population dense area and everyone needs a vehicle for transport, which is increasing traffic on the roads and police has to do extra work in order to make discipline on the road. This also needs to increase the manpower of the police on the road in order to protect the law and order on the road. Here LNPR comes handy and can also provide the data which police may not able to find.

A prototype based on Digital Image Processing is created in this project processing improvement, licence plate segmentation and OCR are all used to store the number in text form. Using the OCR principle and the pytesseract and Tesseract engines, the plate number is displayed as text on the terminal. When security forces pursue a car or are unable to apprehend a vehicle that has broken traffic laws, it is common for them to encounter difficulties.

On a busy day, authorities find manually logging numbers of vehicles inconvenient we may install this system that will a detect vehicles that violate traffic regulations, snap a photo of them, and save their licence plate numbers in a database so that the owner can be fined later. The technology can be used in parking lots to capture pictures of cars and record their licence plates in

a database. The technology removes the need for unwanted arduous manual power on a busy day it saves money on labour, and is significantly more efficient than people.

Once the no. of any car has been received as a text, they can be displayed, saved in the database, or searched for details across the full database. This project is so versatile that it may be used as a standalone application or as part of a larger project after being converted to software.

A prototype based on DIP is created in this project. Using the OCR principle and the pytesseract and Tesseract engines, the plate number is displayed as text on the terminal. When security forces pursue a car or are unable to apprehend a vehicle that has broken traffic laws, it is common for them to encounter difficulties6. On a busy day, authorities find manually logging vehicles extremely inconvenient. we may install this system that will automatically detect vehicles that violate traffic regulations, snap a photo of them, and save their licence plate numbers in a database so that the owner can be fined later. The technology can be used in parking lots to capture pictures of cars and record their licence plates in a database (or the cloud, if connected to the internet).

The technology removes the requirement of tedious physical power on everyday saves money on labour power and is significantly efficient than people. Once the no. of any car has been received as text it can be displayed, saved in the dB searched for details across full DB. This project is so versatile that it may be used as a standalone application or as part of a larger project after being converted to software.

Fig.1. LNPR identifying plates of running vehicles in real time.

A. Motivation

India, unlike other countries, has a unique set of ANPR requirements because to its population of one billion people. Highway surveillance, parking management, and neighbourhood law enforcement security are the most common uses of ANPR. In India, one person dies every four minutes, with the majority of these deaths resulting from excessive speeding. ANPR is used to track the average speed of cars and can detect those that exceed the speed limit. A fine ticket can be created automatically in this situation by estimating the distance between two cameras. This aids in the maintenance of law and order, which can help to reduce the number of road fatalities. ANPR is the most effective method for parking management. Vehicles with registered plates can enter parking areas automatically, however non-registered vehicles will be charged at the time of check in and check out. Every year, 200,000 cars are stolen in India. This number can be reduced if appropriate measures are taken and the ANPR system is utilized to track automobiles so that if vehicles are stolen, law enforcement can determine when, where, and how a stolen vehicle travelled

B. Scope of the project

This project is designed to recognize a vehicle's license plate and record the number plate's extracted characters in a database together with their timestamp. The purpose of this project is to develop a real-time number plate recognition system for vehicle in order to control the increasing crime. LNPR systems be utilized in a very variety of applications, including automatic toll collection, border crossings, parking systems, traffic control, tracking stolen vehicles, and law enforcement.

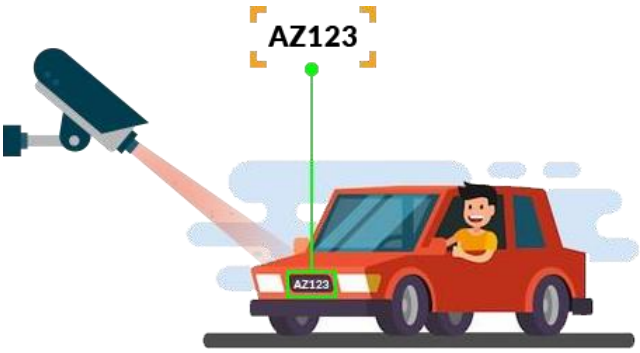


Fig 2. Illustration Representing Automatic Toll Collection Implementing ANPR

C. Objective

- To create an LNPR application that is efficient, quick, and dependable, and that can compete with other recently produced LNPR systems with similar features.
- To evaluate the various Machine Learning algorithms and select the most appropriate for LNPR. To have a better understanding of how

they work and adapt them to the LNPR application.

- To examine the many Computer Vision techniques currently in use in LNPR in order to choose the most effective and relevant ones. To learn how to apply these strategies and maximise their potential.

II. Related Previous Work

A Review Paper on Enhanced Image Processing Techniques for Criminal Surveillance Using LNPR

An LNPR system's goal is to extract the no. plate of a vehicle and use it for numerous purposes. In this paper, we look at existing LNPR systems, the basic used, and adjustments to the existing technique to improve the entire system. We then go over a list of prospective uses for this technology, including criminal monitoring, which is one of them. The system we're working on detects a six-digit license plate, but it could be tweaked to detect a variety of other registration plates.

Using image processing and deep learning approaches, this study shows how to build and construct a new efficient LNPR. This technology is used at the entrances to residential parking lots. The number plate sensor will detect the presence of a vehicle, and then the camera will capture the vehicle frames. This data is given to the Raspberry Pi, which uses it to process the image. We detect the vehicle's number plate using deep learning SSDMobile.Net model.

III. Literature Review

A. Previous Work

In previous work many developments have been done, many character reading technology has been formed. In recent years, a number of ways for using digital image processing have been created advancement in Optical Character Recognition Technology several improvements in Digital Image Processing. There was web service and application present which can translate the foreign languages many other languages like Hindi, English, French, Chinese, Punjabi, Japanese, Korean are there in use

For OCR a technology developed in 2006 when it was released. Between 1985 and 1994, In England developed the Tesseract engine as proprietary software, with minor adjustments made in 1996 to transfer to Windows; a partial switching happens they want to transfer it from C language to its advance language C plus in 1998. A large portion of the code was written in the language of C, followed by C++. Since then, all of the code has been rewritten to work with a C++ compiler at the very least. In the ensuing decade, little nothing was accomplished., Las Vegas released it as an open-source project in 2005. (UNLV). Since 2006 Google has been funding the development of Tesseract. In 1995 It works on Windows, Linux and Mac OS X. However, due to a lack of resources, developers have only thoroughly tested it on Linux and Windows.

B. HISTORY

For character categorization and recognition, Artificial Neural Networks are used. In his third article, Hamed Sanghei proposes an automatic and mechanized license and number plate identification system that uses image processing techniques to derive the license plate number of a vehicle travelling through a particular area. The generated information is used to compare records in a database. The described method correctly identifies and recognizes the car number plate on real photos, according to experimental results.

This system can also be utilized for traffic management and security A ring of detectors encircles a patient in computerized axial tomography, while an X-Ray source revolves around the patient, concentric with the detector ring. The object has to be passed from a ray known as x-ray and is captured by the appropriate detectors in the ring at the opposite end. This step is repeated as the source rotates.

Image processing techniques have successfully repaired hazy photographs that were once the only documentation of rare antiques that had been lost or damaged after being photographed. Image processing techniques have successfully repaired hazy photographs that were once the only documentation of rare antiques that had been lost or damaged after being photographed. The origins of early OCR can be traced back to telegraphy and the development of reading aids for the person who are not physical see things. Mr. Goldberg invented a mechanism that reads text and converts them to telegraph code in 1914.

In 1951, David Sheppard, a young Department of Defence engineer, invented a scanning apparatus at home that he dubbed 'Gismo.' This apparatus was capable of reading twenty-three letters of the alphabet, deciphering Morse Code, and reading aloud letter by letter. While primitive by today's standards, its promise as a useful business tool in the data entry industry piqued the interest of scientists and businessmen alike. 'Gismo' attracted a lot of attention, which sped up the development of OCR tools.

IV. Proposed Method

A. Functional Requirement

The functionalities that are applicable to a system are referred to as functional requirements. The following are the functional requirements for an automatic license plate recognition system. The system must be able to do the following: 1. Take videos from the system and load them. 2. Take frames out of the video. 3. Use the frames to locate the license plate region. 4. Separate the characters on the localized plate into segments. 5. Recognize and display the segmented characters on the terminal.

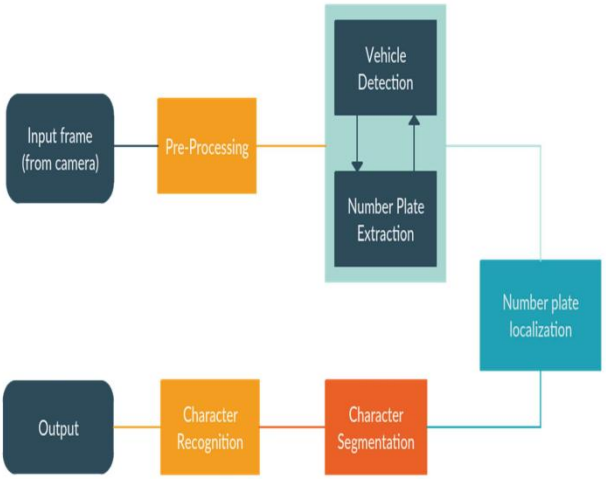
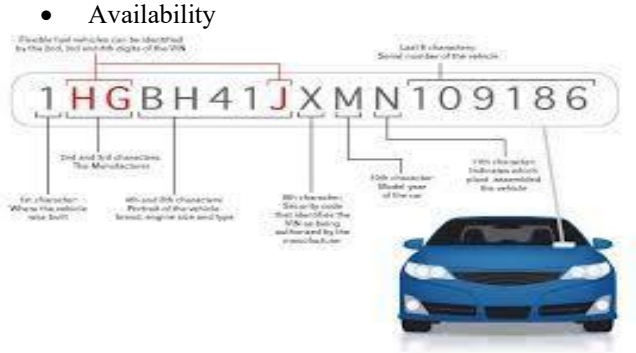


Fig 3. The proposed system flow chart how the system works.

B. Non-Functional Requirements

A non-functional requirement is how a system must act or should behave. This also explains how the system's quality qualities or characteristics are defined. The qualitative goals of the developed system should go in these places in order to impose this constraint on the specific system behaviour Execution characteristics:

- Functionality
- Security
- Usability
- Effectiveness & Efficiency Evolution qualities:
- Availability



- Reliability
- Manageability

Fig.4. Character recognition and various registration plate identification techniques both help to improve registration plate image analysis.

C. USER REQUIREMENTS

1. In both day and night-time settings, the LNPR system should take films of moving vehicles' license plates.

2. Detection of vehicle license plates in a timely manner.

3. Online optical character recognition of the number plates of the captured automobiles.

4. LNPR system-observed object, including overseeing the LNPR live video-stream of the controlled road, lane, etc. and visualization of the discovered number plates.

D. Implementation

Read Image: First we read the image with the help of the computer vision, we can use many computers vision present in the machine learning for example OpenCV. Then we apply gray scale on it and blur the Image for better readability of the text. The gray scale helps to make the image colour grey which increase the readability of it.

Localization: In this step we apply filters and localized the edges. When we apply filters in the it reduces the noise from the image, we use bilateral filter function for it and we detect edges which help us to detect a rectangle shape plate from the vehicle.

Fig.5

Character Segmentation: It creates a sub sided image from the original image that is the same size and position as the shrunk number plate region, then

convert it to count the amount of white pixels by column using vertical projection on the binary sub-image. Character Segmentation: uses vertical projection information to divide a binary sub-image into many parts, each of which is meant to contain one character, and all of these parts are displayed in the segmentation panel.

Identifying of Characters: Identifying of Characters To recognise the character included in the segrated parts of the sub-image, apply the char recognition algorithm to them and convert the char to ASCII format.

Contours and masking: In this step we find the four point which can make a rectangle where possibly a plate is located in it. And apply masking in it which can fetch the number plate from it.

OCR: In this step we read the text with the help of existing technology. The OCR which is known as optical character recognition will help to read the text for example easy OCR. In this step we will able to detect the license number from the number plate. After this we will render the result and we will able to find the number. We will use this number to store in the database or find the vehicle previous record which will help us to find the record of the particular vehicle.

V. CONCLUSION

A. Performance Evaluation

This effort basically achieves four objectives. For the prototype, the first task is to input an image of the car, by computer's camera. The quality of image is improved when it is fed. Both the resolution and the thresholding have been enhanced. The image can only fit within a certain image frame size. Following the augmentation, the image is processed using a mathematical rectangle model to isolate the number plate from the rest of the image. The segmented plate is displayed in a separate window. The goal of the project is for us to gain a better understanding of today's technologies.

ALPR applications such as automatic toll collection, automatic charging systems in parking spaces, vehicle management in parking spaces, and traffic monitoring, among others, have created new research challenges in ALPR. Using data from a live video feed, we built software for automatic licence plate recognition. On the number plates that were extracted, character segmentation was used. Finally, the mean squared error approach is used to distinguish segmented characters.

B. LIMITATIONS

Major drawbacks of the current system are as follows.

1. Poor file resolution, mainly due to the plate having large distance, and also occasionally due to the using low-quality black-and-white camera.
2. Images that are smeared, especially if they are moving.
3. Overexposure and shadow reflection result in poor lighting and low contrast.
4. A tow bar on the plate, or an object concealing (part of) the plate.
5. Check for number plates that are different in the front and back due to pulled trailers, campers, and other vehicles.
6. During number plate reading, the camera's angle of view changes due to vehicle lane changes.
7. Two cars with the same number but different pate designs can be from separate countries or states.

C. FUTURE DIRECTIONS

In future more advance technology will be coming where more advanced cameras also helps in getting more wider and clearer images on the streets It can be assessed using a variety of other picture databases and classifiers. For traffic surveillance management systems, user-friendly Android applications can be designed. Character recognition can also be done with the help of various deep learning algorithms, which are more accurate. In terms of computational time, GPUs can be employed to produces a better result.Vehicle owner identification, vehicle model identification, traffic management, vehicle speed regulation, and vehicle position monitoring can all be done with ANPR. It may also be used as a multilingual ANPR to automatically detect the language of characters based on the training data. It can give a variety of benefits, including traffic safety enforcement, security-in the event of suspicious vehicle behavior, ease of use, immediate information availability-in comparison to manually checking car

owner registration records, and cost effectiveness for any country. Some image enhancement methods, such as super resolution, should be focused on low-resolution photos. The majority of ANPR systems are designed to process a single vehicle number plate, but in real-time, many vehicle numbers plates may be present while the images are being taken. Multiple vehicle number plate photos are considered for ANPR, however in most other systems, offline images of vehicles, such as are given as input to ANPR, therefore the precise results may deviate from the results. A coarse to-fine technique could be useful for segmenting multiple vehicle number plates.

Fig.6. OCR at pictures to identify vehicle registration plate.

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