

Automatic License Plate Recognition using OpenCV

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Abstract-Traffic control and vehicle proprietor distinguishing proof has become serious issue in each nation. Every so often it gets hard to perceive vehicle which wishes to enter a specific leaving office. In this way, it is hard for the standing gatekeeper to recover vehicle number from the moving vehicle in light of the speed of the vehicle. Along these lines, there is a need to create Automatic License Plate Recognition (ALPR) framework as a one of the answers for this issue. There are various ALPR frameworks accessible today. These frameworks depend on various philosophies yet at the same time it is truly testing task as a portion of the elements like rapid of vehicle, non-uniform vehicle number plate, language of vehicle number and distinctive lighting conditions can influence a great deal in the general acknowledgment rate. The enormous larger part of the structures work under those limitations. In this paper, various methodologies of ALPR are talked about by considering picture size, achievement rate and preparing time as parameters.

Keywords: License Plate, Open-CV, Detection, Machine Learning, k-NN.

1. INTRODUCTION

Character Recognition is the process of identifying characters from a given input, be it an image, a video or a text. The character recognition method can be very helpful in automating the task thus reducing the manual labour and efforts.

Extracting data with the help of character recognition and OpenCV is the next big step-in automation. It can help authorities to put a more reliable and safe method to help out the public in terms of their safety.

The automated character recognition is helpful in reducing the number of crimes, imposing stricter safety rules and guidelines, to tract movements with the help of extending character recognition feature.

The License Plate Recognition is a system designed to help in recognition of number plates of vehicle. The main purpose of this project is to detect a number plate from an image provided by the camera and detect the number plate of the vehicle and compare it with already registered number to grant access to the user.

The basic function of License Plate detection is to capture an imagery. Then optimize the image of the plate. Process the optimized image to segregate & read the license plate. Store the recognized image in the data base. From the database the info can later be used to access user information and provide access to the parking facility.

1.1 Need for ALPR in India

Unlike other countries, India, with its one billion people population, has a unique set of needs for ALPR. The main use of ALPR is in highway monitoring, parking management, and neighborhood law enforcement security.

In India there is one death in every four minutes with most of them occurring due to over speeding. ALPR is used to monitor the vehicles' average speed and can identify the vehicles that exceed the speed limit. In this case, a fine ticket can be automatically generated by calculating the distance between two cameras. This helps to maintain law and order which, in turn, can minimize the number of road casualties.

ALPR provides the best solution for providing parking management. Vehicles with registered plates can automatically enter into parking areas while non-registered vehicles will be charged by time of check in and check out. Number plates of the car can be directly linked with owner mobile phone and parking tickets could be paid without any extra effort directly from the user's account against the ticket number generated. ALPR can support a cloud-based system pre-book and pre-pay platform for parking.

In India 200,000 cars are stolen per year. This number can lessen if proper steps are taken and ALPR system is used to track cars so that if vehicles are stolen, law enforcement will be able to identify when, where and the route taken by a stolen vehicle. This can help bring justice swiftly to such a vast nation.

- ALPR Challenges in India

The need for ALPR in India is strong. However, the solution may not be as clear.

ALPR in countries such as Vietnam, Australia and Italy, which have fairly standardized license plates, have accuracy levels often exceeding 90%.

India, however, is quite different. The variations of Indian license plates makes it difficult for an ALPR system to accurately identify and decode the license plate. In India, there are 210 million vehicles with over 50 different license plate types. The plates vary in style, color, fonts, sizes and even location in the vehicle. For example, certain regions of India would have certain plate formats and certain generations of vehicles have their unique peculiarities.

Moreover, cameras deployed in India tend to be of lower quality, thereby compounding the ability for ALPR engines to accurately decode the license plate. The low-cost cameras have limited visual coverage, are equipped with less acute motion and object detection sensors, and contain limited night vision capabilities. These three factors increase the number of blind spots and occurrence of blurry images. This situation is made worse during nighttime and inclement weather when visibility is lower.

As such, ALPR for India is particularly difficult and accuracy rates seldom exceed 70% from our internal analysis of our and competitive ALPR providers.

2. RELATED WORK

Researchers have conducted lot of work in character recognition, including character tracing, capturing, classifying. Number plate recognition is a system to identify the number plate of a vehicle based on the details already available at the admin end.

Researchers present a few problem statements where concept of character recognition and number plate detection can be used. These are as follows:

In e-challan concept of road transport ministry, the cameras on the road can detect high speed cars exceeding the speed limit and their details based on the image captured can be extracted using the number plate. The number plate helps in identifying the vehicle and to produce an e-challan thus reducing the patrolling of police officers.

In accident detection system, the OpenCV can be used to read the data of accident prone areas based on machine learning concepts and can notify the authority if any miss-happening took place

3. LITERATURE SURVEY

The immense lion's share of the in most recent couple of years, ALPR has been one of the helpful methodologies for vehicle observation. It tends to be applied at number of open spots for satisfying a portion of the reasons like traffic wellbeing authorization, programmed cost content assortment, vehicle leave framework and Automatic vehicle leaving framework which is our principle center. ALPR calculations are commonly separated in four stages: Vehicle picture catch, Number plate discovery Character division and, Character acknowledgment. The initial step for example to catch picture of vehicle looks simple however it is very urgent assignment as it is hard to catch picture of moving vehicle continuously in such a way, that none of the segment of vehicle particularly the vehicle number plate ought to be missed. Directly number plate discovery and acknowledgment preparing time is under 50ms in numerous frameworks. These frameworks follow various ways to deal with find vehicle number plate from vehicle and afterward to separate vehicle number from that picture. A large portion of the number plate limitation calculations combine a few strategies, bringing about long computational (and in like manner significant execution) time (this might be decreased by applying less and easier calculations). The outcomes are profoundly subject to the picture quality, since the unwavering quality of the methods seriously debases on account of intricate, uproarious pictures that contain a ton of subtleties. It can likewise be utilized to distinguish and forestall a wide scope of crimes and for security control of profoundly limited zones like military zones or territory around top government workplaces. The framework is computationally economical contrast with the other ANPR systems.

The precision and accuracy of the framework/setup depends on the technology and computational calculations used. From the other works based on image recognition and shape recognition and from researchers data it can be inferred that the lightweight calculation is the more fast the outcome will be, and the more accurate the calculations and datasets learning is, the more accurate the output will be.

4. METHODOLOGY

In this section, we tend to shall study the methods and ways of implementing the framework. We tend to study the technologies and algorithms used in achieving the objective. In section A we tend to shall provide information regarding the used algorithms and technologies. In section B we can justify our projected system.

- **OpenCV:** OpenCV can also be known as Open Computer Vision. It helps in detecting and capturing of data with the help of a camera. OpenCV-Python is a library of Python bindings designed to solve computer vision problems. OpenCV-Python makes use of Numpy,

which is a highly optimized library for numerical operations with a MATLAB-style syntax. All the OpenCV array structures are converted to and from Numpy arrays. OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code.

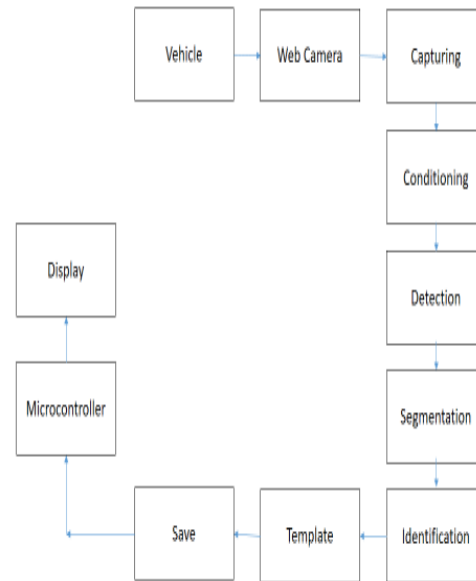
- k-NN:** In pattern recognition, the k -nearest neighbours algorithm (k -NN) is a non-parametric method used for classification and regression.^[1] In both cases, the input consists of the k closest training examples in the feature space. The output depends on whether k -NN is used for classification or regression. KNN is a non-parametric, lazy learning algorithm. Its purpose is to use a database in which the data points are separated into several classes to predict the classification of a new sample point. K-nearest neighbours (k -NN) algorithm uses 'feature similarity' to predict the values of new data points which further means that the new data point will be assigned a value based on how closely it matches the points in the training set.

4.2 Proposed System

A first time user of the software must register himself through a registration page, where he is required to enter his details such as his username and unique password. An already registered user can login directly from login page using his credentials. Every user is provided with his personal profile page where all the information about the user is present in a tabular format. User can logout from his profile at any time or can update his profile through update information page.

All the details of the user and his vehicle are saved in the database which is managed by the admin. Only the admin can change the data in the database except for the password. Only on successfully comparing the vehicle number with the number registered in the database the user can access the parking facility.

The figure below shows the flow of working which is carried out during the extraction process of number plate.



5. IMPLEMENTATION AND TESTING

This segment gives data about the execution condition and illuminates the real strides for the usage of the dataset to show signs of improvement exactness to anticipate number plate.

5.1 Hardware requirements

The following hardware was used for the implementation of the system:

- 4 GB RAM
- 10GB HDD
- Intel 1.66 GHz Processor Pentium 4
- Webcam

5.2 Software requirements

The following software was used for the implementation of the system:

- Windows 10
- Python 3.6.0
- Pycharm

5.3 Implementation steps

In this section, we will talk about the means which were actualized while doing the examination. We will be performing testing on different number plates to get the accuracy of the system.

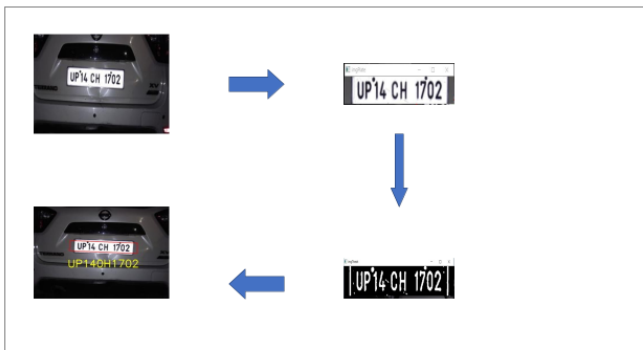
1. We have collected various number plate data in our database.
2. The first step of scanning includes the capturing of number plate and its data.
3. For refining of number plate and its data we have used the implemented feature of OpenCV.

4. The data of number plate is extracted in multiple steps before it reaches the final result. It have different steps including converting image in greyscale and then converting it to negative and then process of removing of noise is done to get the clear data at the end.
5. After the number plate data is extracted, the resultant data is compared with the data stored in the database.
6. The comparison takes place character-wise.
7. At the last stage, if the extracted data is matched with any instance of database, then it's a success in granting certain permission.
8. The extracted data stored in temporary is removed and a system log file is updated based on the current event.

6. RESULTS

We have effectively managed to get the result and accuracy based on the certain factors such as stability of number plate, lighting conditions, distance at which the capturing process takes place, the font which is used for the number plate.

The various factors worked in optimal conditions provided good accuracy and results. The k-NN algorithm helped in identifying of characters and noise and separating them into different classes.



7. CONCLUSION

It is found that automation in the field of character recognition is of high importance so as to automate further tasks. The task carried out by personal can be reduced significantly by adoption such methods and the data is kept secured and handled correctly if subjected to proper security measures. The vehicle permit number can

be utilized for future references when required. The execution works very well notwithstanding, there is still opportunity to get better. The camera utilized in this undertaking is delicate to vibration and quick changing focuses because of the long shade time. The framework strength and speed can be increment if high goals camera is utilized. The OCR strategies utilized in this undertaking for the acknowledgment is delicate to misalignment and to various sizes, the relative change can be utilized to improve the OCR acknowledgment from various size and edges

REFERENCES

- [1]International Journal of Engineering Research & Technology (IJERT) IJERT ISSN: 2278- 0181 www.ijert.org Vol. 3 Issue 7, July - 2014 Automatic Number Plate Recognition System (ANPR System)
- [2] International Journal of Computer Applications (0975 – 8887) Volume 69– No.9, May 2013 21 Automatic Number Plate Recognition Systems (ANPR): A Survey.
- [3] <https://opencv.org/>
- [4] <https://numpy.org/doc/>
- [5]<https://scikitlearn.org/stable/modules/generated/sklearn.neighbors.KNeighborsClassifier.html>