Number Plate Detection System Using Machine Learning

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ABSTRACT: Number Plate Detection System (ANPR) is a picture processing technology which uses number (license) plate to spot the vehicle. the target is to style an efficient automatic authorized vehicle identification system by using the vehicle number plate. The system is implemented on the doorway for security control of a highly restricted area like military zones or area around top government offices e.g. Parliament, Supreme Court etc. The developed system first detects the vehicle then captures the vehicle image. Vehicle number plate region is extracted using the image segmentation during an image . Optical character recognition technique (OCR) is employed for the character recognition. The resulting data is then wont to compare with the records on a database so on come up with the precise information just like the vehicle silas owner, place of registration, address, etc. The system is implemented and simulated in Matlab, and it performance is tested on real image. it's observed from the experiment that the developed system successfully detects and recognize the vehicle number plate on real images.

Keywords: Automatic Number Plate Recognition (ANPR), Optical character recognition technique (OCR), Vehicle surveillance, Vehicle Parking

I. INTRODUCTION

The growing affluence of urban India has made the ownership of vehicles a necessity. This has resulted in an unexpected civic problem - that of control and vehicle identification. Parking areas became overstressed because of the growing numbers of vehicles on the roads today. the automated Number Plate Recognition System (ANPR) plays a crucial role in addressing these issues as its application ranges from parking admission to monitoring urban traffic and to tracking automobile thefts.

This project aims to acknowledge registration number plates, the project might be useful for security, monitoring, etc. so on detect registration number plates, use OpenCV to spot number plates and python pytesseract to extract characters and digits from the number plates. OpenCV is an open-source machine learning library and provides a typical infrastructure for computer vision. Whereas Pytesseract could also be a Tesseract-OCR Engine to read image types and extract the knowledge present within the image.

As [4] state,ANPR systems generally comprises of a camera, processor and application capable of performing sophisticated optical character recognition (OCR), to transform the image of the plate into alphanumeric characters. Application software to match the transformed license plate characters to databases of license plates of interest to law enforcement; and a interface to display the photographs captured, the results of the OCR transformation, and an alert capability to notify operators when a plate matching an agency's wanted list is observed.

II. LITERATURE REVIEW

With the growing number of vehicles, finding a parking zone could also be a significant issue today for an outsized number of students and faculty at Educational Institutions. Most of the car parks are managed manually by security guards who don't keep a track of the quantity of vehicles entering and exiting the premises. Hence, the vehicle driver got to keep circling the parking zone so on hunt down a vacant slot leading to a wastage of some time , to not mention the anxiety and frustration of the driving force . Automatic Number Plate Recognition is a process where vehicles are identified or recognized using their number plate or license plate. ANPR uses image processing techniques so as to extract the vehicle number plate from digital images [3]. ANPR systems normally comprises of two components: A camera that used in capturing of vehicle number plate images, and software that extracts the number plates from the captured images by using a character recognition

tool that allows for pixels to be translated into numerical readable characters [6]. A license plate recognition system generally works in four main parts namely image acquisition, license plate detection, characters segmentation, and lastly character recognition [7].

Automatic Number Plate Recognition (ANPR) Techniques by categorizing them according to the features utilized in each stage. Comparisons of them within the terms of Pros, Cons, Recognition results, & Processing speeds were addressed. A future forecast for ANPR was also given at the top . the longer term research of ANPR should consider multi-style plate recognition, video-based ANPR using temporal information, multi-plates processing, high - definition plate image processing, ambiguous - character recognition. this technique is developed supported digital images and should be easily applied to commercial parking zone systems for the use of documenting access of parking services, secure usage of parking houses and also to stop car theft issues. The proposed algorithm is based on a mix of morphological operation with area criteria tests for number plate localization. Those are plate localization, character segmentation and character recognition. First, the quantity of plate is extracted from the primary image, then the characters from it

are isolated, and eventually each character is recognized. The algorithms were developed employing a group of coaching images. the ultimate program is capable of extracting the required information during a high percentage of the test images.

III. PROPOSED METHOD

As this technique completely works on Image Processing to detect the vehicles and there numbers, the camera used for the footage got to be of high resolution. The camera must be fitted at an angle directly facing the vehicle. Cameras also needed to be fitted with night-sight to figure in night properly. Stylish Number Plates are difficult to be read by computers. The Project is majorly software based including footage processing and management, but it also requires a hardware camera which can provide the footage, but the hardware isn't in current scope.

3.1 Project Development Plan
1. Detect License Plate
2. Perform segmentation of characters
3. Train a ML model to predict characters
4. Prediction of characters in License Plate

The approach want to segment the pictures is Connected Component Analysis. Connected regions will imply that each one the connected pixels belong to an equivalent object. A pixel is claimed to be connected to a different if they both have an equivalent value and are adjacent to every other.
Car Image -> Grayscale Image -> Binary Image -> Applying CCA to get connected regions -> Detect license plate out of all connected regions

(Assumptions made : width of the car place region to the complete image ranges between 15% and 40% and height of the car place region to the complete image is between 8% & 20%).
Output of initiative may be a car place image detected during a car image. This is provided as input to step2 and CCA is applied on this image to bound the characters in plate. Each character identified is appended into a list.
Model is trained using SVC (4 cross fold validation) with dataset present in directory

train20X20. The model is saved as finalized_model.saw which is then loaded to predict each character. Once the characters of plate is obtained and model is trained, the model is loaded so as to predict each character.
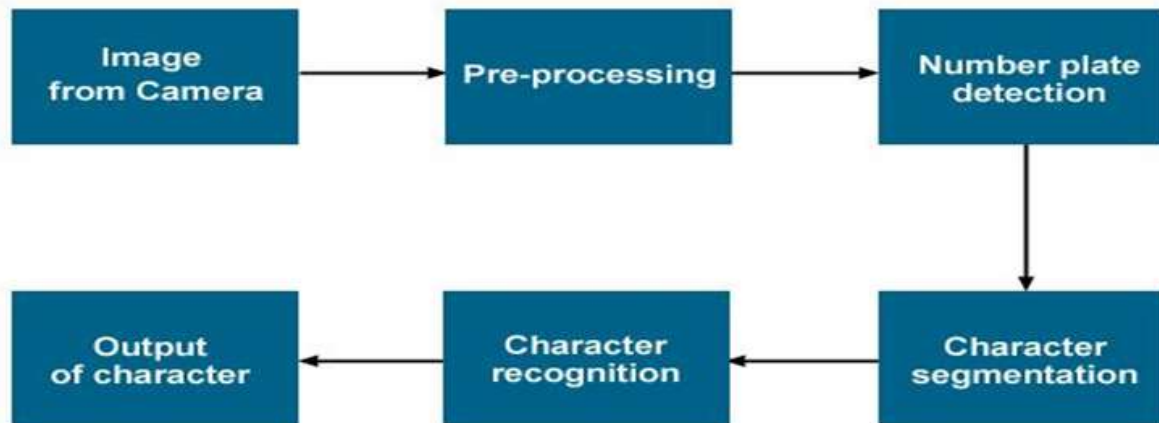

Fig.1: Work Flow of system[8]

1. Image Processing

Image processing can be taken as the first step of the entire license plate recognition process. This feature allows the system to take the input image and turn it into binary format which contain only white and black pixel. Not only that, as the colour of the license plate (black) has the high contrast with the colour of the character (white) on it, therefore the binarization process will separate and redefine them. However, only the possible car place region are going to be binarized thanks to the performance concern about the unnecessary or unwanted region, which is about at the third quadrant of the image.

2. Number Plate Detection

The system is able to detect license plate by searching through the white area from the binarized image. To detect the Region of Interest (ROI), the system will try to find a rectangle which has the four edges connected with only white pixel and contain some black pixel in the middle. This match the characteristic of a license plate. A predefined size of 267 in width and 61 in height is used to form the rectangle to detect the license plate. This is the size of the smallest license plate can be after some observation. On the opposite hand, not every vehicle has an equivalent car place size all the time, therefore the system will increase the estimated width and height accordingly if the system cannot find the ROI license plate at first. After the system has increased the dimensions maximum 3 times, the system will assume the car place is in square and redefine the width and height so as to find out the ROI which might be the license plate.

3. Character Segmentation

The system uses Connected Component Analysis (CCA) to differentiate the character because every character is made up by a group of connected pixels. As the cropped license plate is white colour in background and black colour in character, so the system will focus on finding only the black pixel in the image. Once the system found black pixel, it first looks to the four neighbours around covering four directions, east, south, west, north and see whether or not they're labelled. In this case, the current pixel will follow the smallest label number while all of the pixels with the larger label number will be updated to the smallest label number as well. Hence, they all become an object as one.

4. Character Recognition

The last feature of this solution is character recognition. The system uses template matching as the technique to recognize character. The character template including number 0-9 and alphabet A-Z are stored into an image folder in the system. The size of the character template is fixed, 30px of width and 40px of height. The segmented character is also resized to the same so that it can be matched with the character template. The system will turn both the segmented character and the character template into an array. By using array, the pixel is compared with the colour. As the image contain only black and white pixel, there is a difference if the colour of pixel from both arrays is not same. If the pixel from array1 is black and therefore the pixel from array2 is black also , the system will consider it as a match and add a score thereto . This process will be continued until every

pixel in the array is scanned. At the end, the template obtains the very best match area is that the

recognize character.

Fig.2: Vehicle Scan

3.2 UML Diagrams

Image Processing: It would get data of particular vehicle number or license plate number of a vehicle while capturing try to add datetime of capturing image. Vehicle data would include all the values are in string dataType. This would include Vehicle number, data time etc. Successful implementations of ANPR systems have resulted in faster and easier vehicle identification. This has also resulted in faster and easier search and retrieval of auto information mostly done by law enforcers in identifying vehicles that are uninsured, stolen, or driven by someone without a license or prohibited from driving.
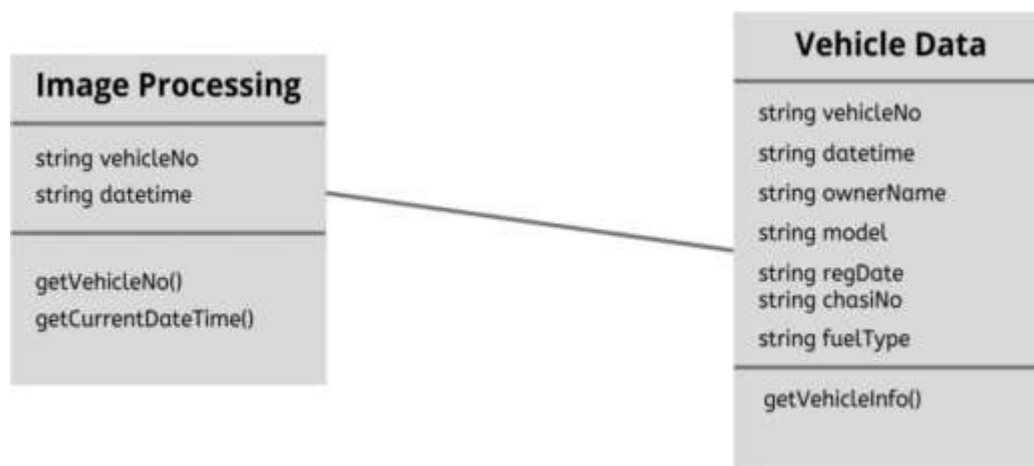

Fig. 3: UML of Image Processing and Vehicle Data

IV. TESTING AND RESULT

The proposed solution involved the use of Optical Character Recognition in order to automatically capture, scan and display a vehicle's number plate in a timely and user-friendly manner.

This test was performed in order to check whether the application was able to meet the user's expectation in a real world with regards to the vehicle entry registration process.
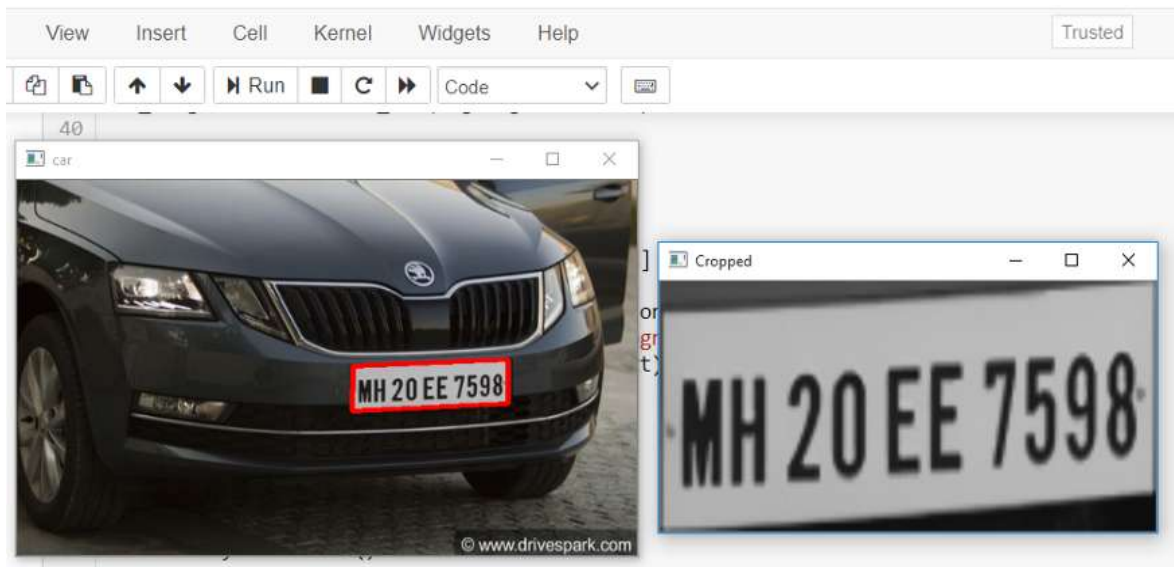
programming_fever's License Plate Recognition

Detected license plate Number is: MH 20 EE 7598

V. CONCUSION

The Research based on the recognition method in which the vehicle plate image is obtained by the digital cameras and the image is processed to get the number plate information. A rear image of a vehicle is captured and processed using various algorithms. Further we are getting to study about the characteristics involved the automated number plate system for better performance. The Automatic Number Plate Recognition system using vehicle car place is presented. This system use image processing techniques for recognition of the vehicle from the database stored in the computer. The system works satisfactorily for wide variation of conditions and differing kinds of number plates. The system is implemented and executed in Matlab and performance is tested on genuine images. Obviously, the accuracy of the popularity is that the most vital during this system. Therefore, this application should be optimized and modified for overcoming the accuracy limitations.

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