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Vehicle Number Plate Detection Using CNN

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ABSTRACT

Vehicle number plate detection plays an important role in this busy world, due to the heavy rise in vehicles day by day. Passing the tollgates without paying the money, stealing of vehicles, breaking traffic rules, coming into restricted space also are increasing linearly, thus to block this situations vehicle number plate detection is proposed. Among the important process steps such as detection of number plate, segmentation of characters and recognition of each characters, segmentation plays an important role. To avoid problems like unwanted brightness, tilt that degrades the segmentation which in turn affects the recognition accuracy, numerous algorithms are developed for this work. We proposed an approach Vehicle Number Plate Detection using CNN model which is a part of Deep Learning. Our model is pre-trained by feeding 80000 of images also including images which are not Indian vehicles and also which do not have number plate in it. Our approach is simple, fast and inexpensive and does not require huge equipment.

Keywords : Vehicle Number Plate, Machine Learning, Convolutional Neural Networks (CNN)

I. INTRODUCTION

Vehicle number plate detection is a technology used to identify number plates for their vehicles. The purpose of vehicle number plate detection was to build a system capable of detecting number plate and recognize it using a convolutional neural network.

Vehicle number plate detection using CNN is an expected part of making the traffic system more composed and efficient. The purpose of the system is to detect the license plate and recognize different Characters and Numbers.

Vehicle number plate detection using CNN is a combination of some components like object detection, image processing, and pattern recognition. It is used for toll collection on pay- per-use roads and as a method of categorising the movements of traffic, for example by

highways agencies. Number plate detection is immediately needed in countries where the security issues are very life-threatening.

II. Literature Survey

Automatic vehicle number plate detection is an essential stage in smart traffic systems. Nowadays vehicles play a mass role in transportation. Also the usage of vehicles has been increasing because of population growth and human requirements in recent years. Therefore, control of vehicles is becoming a big problem and much more tough to solve. Automatic vehicle number plate detection are used for the purpose of effective control. License plate recognition is a form of automatic vehicle detection. It is a technology used to identify vehicles by only their license plates. Real time Licence plate detection plays a major role in automatic nursing of traffic rules and maintaining law application on public roads. This research will present an approach to get structure that can identify license plate in more accurate and effective manner. The proposed system has three main modules Pre-Processing of Image, License Plate Extraction and Segmentation of Character. In first module, after the vehicle image is captured by the camera, it will be passed to pre-processing which prepares the image for further processing by the system. Its main operations are to eliminate noises caused by the image acquisition subsystem and image enhancement. In second module, license plate is extracted. In the third module, the elements (characters and numbers) in the extracted license plate are segmented by connected component and bounding box method. This method is based on the morphological algorithms and connected components analysis. To measure the efficiency, method has been tested over a large number of images captured at day time and achieved a satisfactory results. The main advantage of this method is the extraction and segmentation of the characters is easy. Finally, it is proved to be 91.02% correct in the extraction of plate region and 88.46% correct in the segmentation of the characters. So, the overall accuracy of the system is 89.74%.[1]

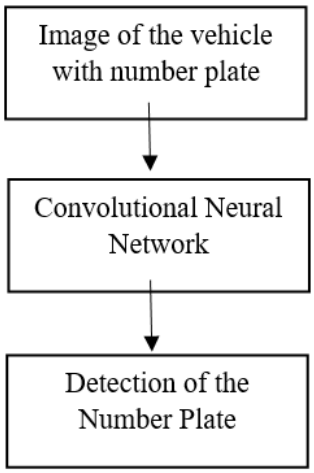
The paper proposed by Anish Lazrus et al came up with a design of system that recognizes license plates under poor environmental conditions like blur due to poor lighting, rain, weak resolution and haze, by the use of neural network. This paper focuses on location of license plate, segmentation and character reorganization from acquired plate. The image of vehicles were captured manually and the license plate part was cropped followed by segmenting the gray scale image applying Sobel filter for smoothing thus reducing the number of connected components. The system uses the sequence of image processing techniques such as edge detection, histogram equalization and also image threshold. Last but not least, each character and number is been recognize using neural network. The writer had decided to use Otsu Thresholding method. The Otsu method chooses the threshold that minimizes the intra class variance of black and white pixels. It operates directly on the gray level histogram. Finally character by character is detected. A result of 98% accuracy was achieved. The main advantage is that it has better recognition rates. The main drawback of this approach was its time taken for training the neural network and at the same time the size of characters also plays an important role in recognition. Only when the characters were large enough the neural network predicted it 100% .[2]

This paper deals with the Automatic detection of license plate (LP) is to localize a license plate region from an image without human involvement. This paper, presents a new ALPD method consisting of six processing stages. At each stage, it develops a new techniques and approaches capable of handling different hazardous conditions. The proposed ALPD

is implemented and tested on 850 car images having different hazardous conditions, such as night, indoor, day, blurry, foggy, rainy and tilted LP. The overall detection probability is 91%. It also compares the experimental results against the ALPD methods that are present. It finds that the proposed ALPD method outperforms two existing ALPD methods in terms of detection probability and running time. However, the proposed system has few limitations. In the proposed ALPD, it applies the rain removal approach only on the rain affected car images. There is no such step to determine which input image is rain affected and which one is not and it is focused on the automatic detection of plate area from a car image but not considering the image acquisition and the recognition steps of an ALPR system. The center of attention is different hazardous image conditions. Image classification for rain and non-rain image can be applied for triggering the rain removal function. In the future work, can intend to improve the proposed ALPD to solve these problems. In addition, the ALPD method can be improved by introducing more filtering criteria, also can associate more issues like snowy weather condition and vertically tilted LP to make the ALPD method more robust.[3]

A license plate recognition system employs image processing techniques, to help to identify the vehicles through their plates. License plate recognition is a process, where first the license plate region is localized in a car image supplied by one camera or by multiple cameras, and then the characters on the plate are identified by a character recognition system. In this paper, an algorithm is designed that can recognize plates using the pictures taken at various angles, various distances and different times of the day, thus under various illumination conditions. The plate is localized using Otsu's thresholding method and the plate features. Vertical and horizontal histograms are used for character segmentation. Finally, character recognition is done by Probabilistic Neural Networks. Simulation results are included and performance analyses are tabulated. MATLAB program is used in the simulations. Reduction to gray levels, filtering and thresholding are done as the preprocessing. Reduction to gray levels is done for the elimination of the unnecessary information in the color image. This way, the speed of the processing increases tremendously. Finally the obtained characters are recognized using a Probabilistic Neural Network. The characters obtained from the

III. Methodology



The focus of the project is to detect and recognize the characters in the number plate. Then the images are divided into train, test and valid for further classification. The images are trained in the ratio of 80:20, where 80% of the images are used for training the model and 20% for testing the accuracy. The process initiates by accepting the user input. At last image of the number plate and recognized characters will be displayed.

A. Dataset Collection

A total of 80000 pictures of number plate are generated as a dataset. At first, the characters images in the database are used as a training set and this set is used to train the Neural Network. The program needs an average of 0.1 seconds on Intel® Core™2 Duo Processor CPU P8400 (2.26GHz, 2267 MHz)

computer to recognize each plate with at most 96% accuracy. The simulation results are evaluated on the basis of both plate and character recognition. The drawback of this method is the plate is not recognized correctly even if the single character is in error.[4] and digits are initialized in the required standard and the number plates are generated using the different font style files and extracting background from other images. The dimension of picture generated are rescaled to required dimension. There are 80000 images generated and saved in a folder to train the neural network.

Fig: The images shows a vehicle with Indian Number Plate, an image with no vehicle and an image with foreign number plate respectively.

B. Framework

Tensor flow open source and end-to-end platform. Used for numeric computation and has libraries, flexible ecosystem of tools. Construct and train model easily using high- level APIs. Keras is one library among multiple TensorFlow libraries. Tensor flow has both high and low APIs wherein Keras provide only high-level APIs. Keras built in python so it's much user-friendly than Tensor flow. Tensor Flow permit for training on both a CPU and GPU. Our model is implemented using GPU.

C. Pre-processing

Initially the images in the dataset is rescaled to 224x224 pixels then converting the image into a greyscale image. Then the greyscale image undergoes edge detection process. The image is converted into an array. We will feed the images to the CNN model. Output will be given, the characters in the number plate are considered as the final output.

D. Flow Diagram

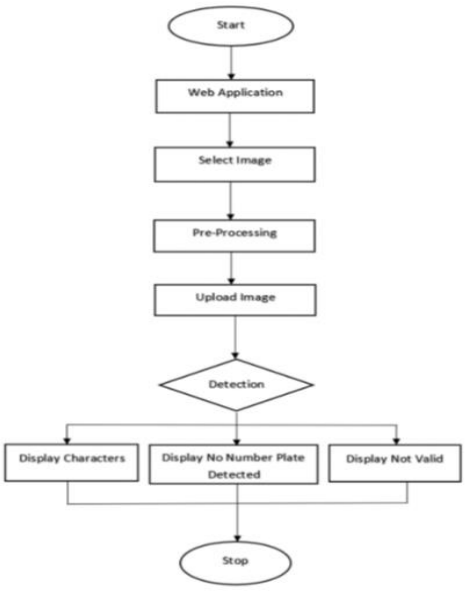


Fig shows the flowchart for Vehicle Number Plate detection using CNN Model

Figure shows the flowchart of Vehicle Number plate detection. Flowchart shows how the system works when input is given considering different scenarios. Initially the image is taken as input through web application, and the pre- processing of the input image takes place followed by detecting the number plate if present. If the image does not have any number plate then display it as no number plate detected, and not valid if the image is not the Indian number plate.

E. Web Application

The development of web application that can be useful in identifying the number plate of the vehicle using Convolutional Neural Networks. The user has to go through few authentication steps in order to access the webpage.

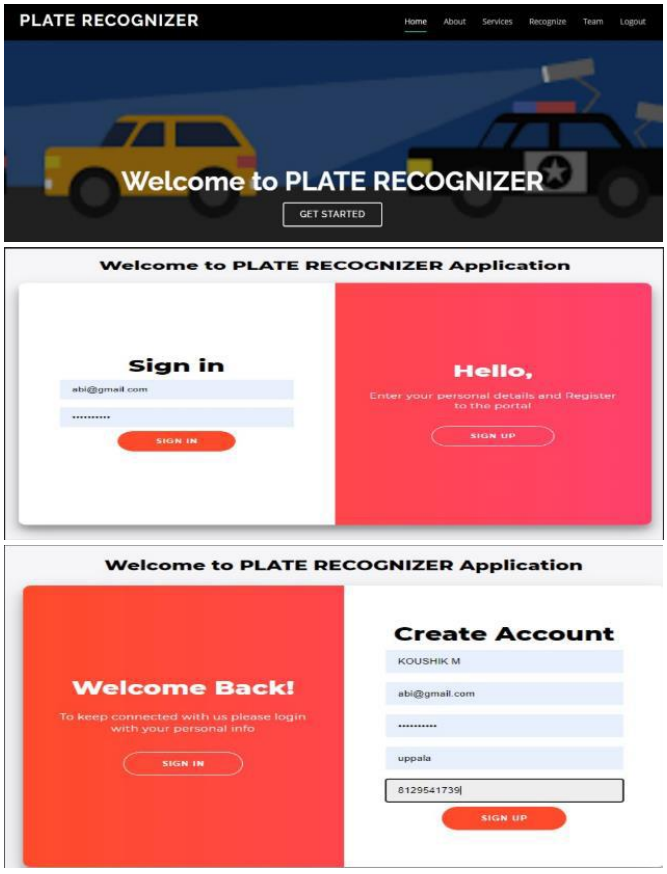


Fig shows the Home Page of the web page

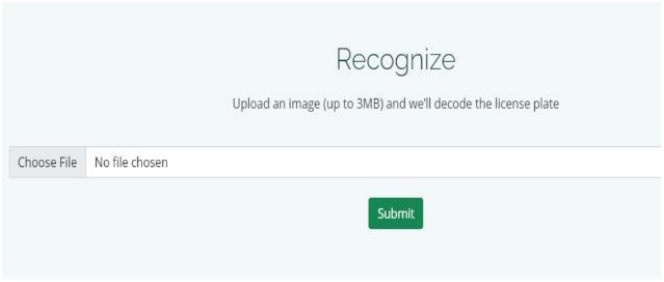


Fig shows the sign up and sign-in page of the web application respectively

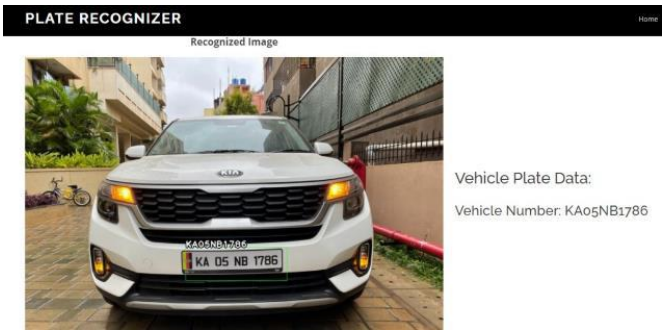


Fig shows the page where you upload the image of the vehicle

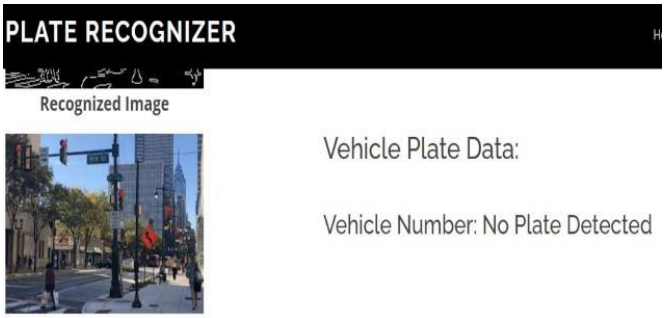


Fig shows the result screen of detected number plate and no plate detected

IV. Conclusion

Vehicle Number Plate Detection is a wide field which can be implemented using many different algorithms and techniques.

Our proposed methodology initially does the pre-processing steps which includes RGB to grayscale conversion, and binarization of the image. After which the license plate is extracted. Then the characters are segmented which is given as input to the CNN in order to recognize the character correctly. Training our system with the help of 80000 images made our system more reliable and efficient in order

to recognize the characters which has delivered the accuracy of 72%.

V. Future Work

For future work we are focussing on developing our web more interactive for the users. Our project however works on the simple font styles which is being used normally on license plates of the cars as per the rules made by the governing bodies of traffic department. But in order to handle the cases where people don't follow these rules, it can be handled in future projects being implemented in this field of license plate detection.

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