International Journal of Research in Engineering, Science and Management
Volume 4, Issue 7, July 2021
https://www.ijresm.com | ISSN (Online): 2581-5792

Automatic Number Plate Detection using Deep Learning

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***Abstract*: Vehicle Number plate detection is a technology which uses Convolutional Neural Network to detect and recognize the number plate data. The objective is to design an efficient automatic number plate detector using the vehicle images. The system can be implemented for security purposes in the restricted areas like military zones, government offices, parking management and toll management. The developed system first applies various image pre-processing techniques using OpenCV. Vehicle number region is extracted using the image segmentation. The trained neural network detects and recognizes the characters in the number plate. The resulting data can be stored in the database and can compare with the record on a database. The system performance is tested on real image. It is noticed from the testing that the established system effectively detects and recognize the vehicle number plate on factual images.**

***Keywords*: Image Pre-processing, OpenCV, Convolutional neural network, Keras, Deep learning.**

1. Introduction

Vehicle number-plate recognition is a technology used to identify number plates of the vehicles. The automatic number plate recognition popularly known as ANPR was invented in 1976 at the Police Scientific Development Branch in the UK. It gained much attention during the last decade along with improvement of digital camera and the increase in computational capacity. The purpose was to build a system capable of detecting number plate and recognize the characters from an image. The vehicle number detector can be used in many areas from speed enforcement and toll collection to management of parking lots. It can also be used to sense and prevent a wide range of criminal activities and for security control of a highly restricted areas like military zones or area around top government offices.

The system is implemented to detect and recognize the images of the Indian vehicles aimed to be light weighted so that it can be run real time and recognizes Indian standard number plate under normal conditions. The system is implemented using the Convolutional neural network. CNN has achieved large successfulness in the recognition of characters and objects hence machine learning become popular in the field of security also.

A. CNN (Convolutional Neural Network)

The name "convolutional neural network" specifies that the network employs a mathematical (convolution) operation. Convolutional is specialized kindly of linear activity. Convolutional networks are only system networks that usage convolution in place of general-purpose matrix multiplication in at least one of their layers. A convolutional network consists of an input and an output part, as well as multiple hidden layers. The hidden layers of CNN typically consist of a series of convolutional layers that convolve with a multiplication or other dot product. The stimulation part is normally a RELU layer, and is later followed aside additional convolutions such as pooling layers, to the full connected layers and normalization layers, relate to as hidden layers because their input and output are masked aside the stimulation function and last convolution. The terminal convolutional in activity, oftentimes relate back propagation in state to more accurately weight the last product.

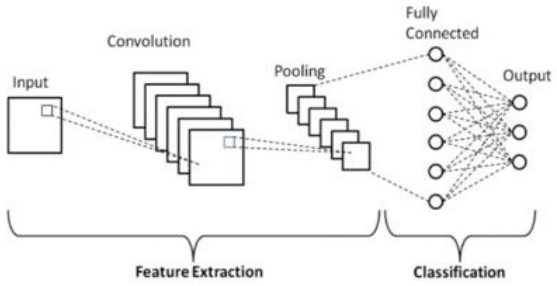

Fig. 1. Basic CNN architecture

2. Literature Survey

The paper proposed by Anish Lazrus et al came up with a proposal of system that recognizes license plates under poor environmental conditions like blur due to poor lighting, rain, weak tenacity and haze, by the use of neural network. This paper concentrates on location of license plate, segmentation and character reorganization from acquired plate. The image of vehicles was captured manually and the license plate part was cropped followed by segmenting the grey scale image applying Sobel filter for smoothing thus reducing the number of connected components. The system uses the various image

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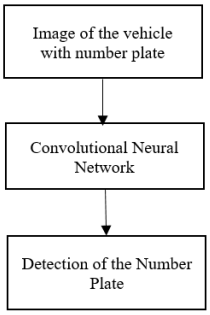
processing techniques such as edge detection, histogram equalization and also image threshold. Last but not least, each character and number are been recognize using neural network. The writer used Otsu Thresholding method. The Otsu technique selects the threshold that reduces the intra class variance of black and white pixels. It functions directly on the grey 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 disadvantage of this method 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% [1].

A license plate recognition system uses image processing tactics, to help to identify the vehicles through their plates.

In this paper, a system is implemented that can recognize plates using the images taken at various angles, various distances and different times of the day, thus under various illumination conditions. The plate is confined using Otsu's thresholding method and the plate features. Vertical and horizontal histograms are defined for character segmentation. Finally, characters recognize by Probabilistic Neural Networks. Simulation outcomes are included and performance analyses are tabulated. MATLAB program is used in the simulations. Reduction to grey levels, filtering and thresholding are done as the pre-processing. Reduction to grey levels is done for the removal of the unnecessary information in the colour image. This way, the speed of the processing rises tremendously. Finally, the attained characters are recognized using a Probabilistic Neural Network. The characters attained from the images in the dataset 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 drawback of this method is the plate is not recognized correctly even if the single character is in error [2].

3. Methodology

The effort 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 procedure initiates by accepting the user input. Finally, the image of the number plate and recognized characters will be displayed.



A. Dataset Collection

A huge set of vehicle images needs to be trained in order to detect and recognize the characters in the number plate. It is difficult to collect such huge dataset therefore the images of number plate are generated in the following ways. At first the characters 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 image generated are rescaled to essential dimension. There are 80000 images generated and kept in a folder to train the neural network.

B. Framework

Tensor flow is an open source and end-to-end platform used for numeric cunning 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 where Keras provide only high-level APIs. Keras built in python so it's much user comprehensible than Tensor flow. Tensor Flow authorize for training on both a CPU and GPU. Our model is implemented using GPU.

C. Pre-Processing

Initially the images in the dataset are rescaled to 224x224 pixels then pre-processing techniques are applied using OpenCV that is converting the image into a greyscale image. Then the greyscale image experiences 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

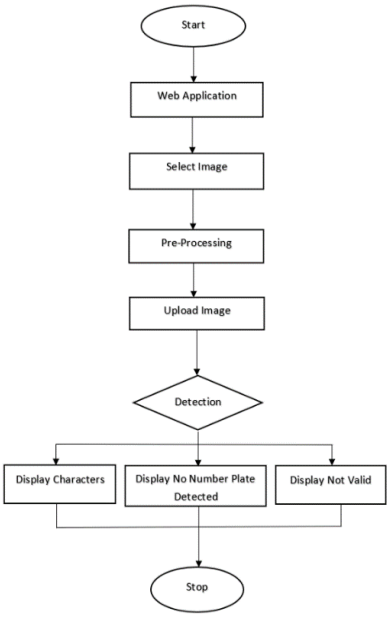


Fig. 2. Flow chart for vehicle number plate detection using CNN model

Figure illustrates the flowchart of Vehicle Number plate detection. Flowchart shows how the system works when input is given considering different environments. 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.

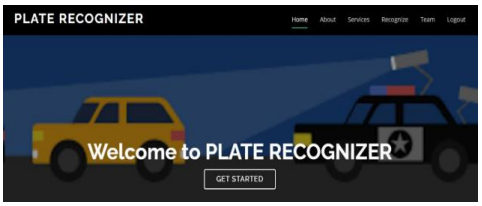


Fig. 3. Home page of the web page

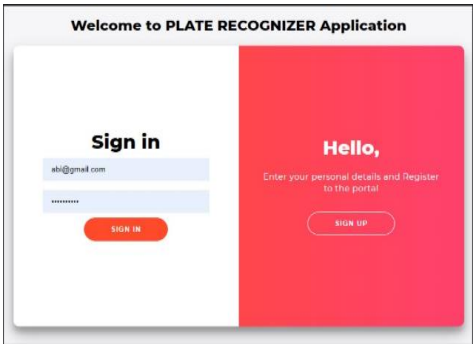


Fig. 4. Sign-in page of the web application

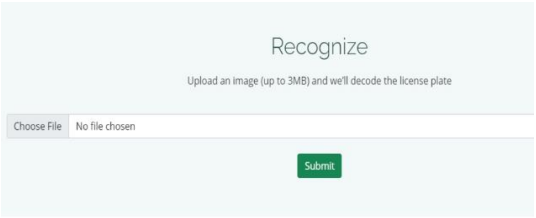
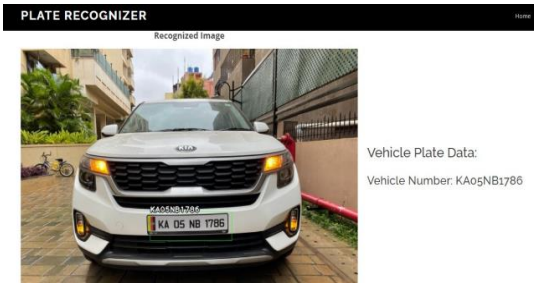


Fig. 5. Page where you upload the image of the vehicle



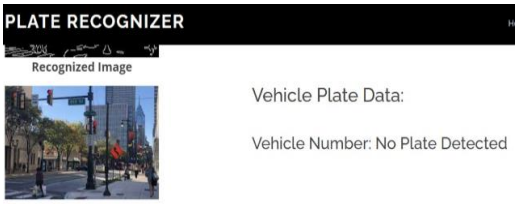


Fig. 6. Result screen of detected number plate and no plate detected

4. Conclusion

Vehicle Number Plate Detection is an emerging wide field which can be implemented using many different approaches and algorithms. Every approach has its own rewards and drawbacks.

Our proposed methodology initially undergoes 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 fed as input to the CNN in directive to recognize the character correctly. Training our system with the huge dataset of 80000 images made our system more reliable and efficient in order to recognize the characters which has delivered the accuracy of 72%.

5. Future Scope

For future work we are focusing 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.

References

[1] S. Zhang, M. Zhang, and X. Ye, "Car plate character extraction under complicated environment," in Proc. IEEE Int. Conf. Syst. Man Cybern., vol. 5. Oct. 2004, pp. 4722–4726.

[2] Anand Sumatilal Jain, Jayshree M. Kundargi; Automatic License plate Recognition Using Artificial Neural Network; IRJET, vol. 2, no. 4, July 2015.

[3] Kumar Parasuraman, and P. Vasanth Kumar, "An Efficient Method for Indian Vehicle License Plate Extraction and Character Segmentation," IEEE International Conference on Computational Intelligence and Computing Research, 2010.

[4] Rajesh Kannan Megalingam, Prasanth Krishna, Pratheesh Somarajan, "Extraction of License Plate Region in Automatic License Plate Recognition," International Conference on Mechanical and Electrical Technology (ICMET), 2010.

[5] https://www.javatpoint.com/training-of-cnn-in-tensorflow