ISSN: 2348 - 2117

International Journal of Engineering Technology and Computer Research (IJETCR)

Available Online at www.ijetcr.org

Volume 10; Issue 2; March-April; 2022; Page No. 01-06

Real Time Number Plate Recognition System

Rishabh Mishra[1], Atul Bajpai[1], Addhayayan Pandey[1], Shivank Vishwakarma[1]

[1]Student, Pranveer Singh Institute of Technology, Kanpur, U.P, India

Conflicts of interest: Nil

Corresponding author: Rishabh Mishra

Abstract

In this era of the world the technology is growing fast, there is a highly demand through people for a easily lifestyle and travelling. In these years, the number of vehicles on road is grown as fast as much. With these increases in the traffic sector every day,so the tracking of the vehicle. This proposal of the project giving an idea of an automated way of tracking the fast moving vehicles at real time with the help of the surveillance cameras on the road. To overcome on this idea, we can use an deep learning framework particularly meant that we can extract the licence plate from an surveillance video image using some computer vision technique and then we can use OCR (Optical Character Recognition) to detect licence plate number. This proposal having four steps of process. Firstly, convert the video into images and identify the the car from each of the frames. The second step is to detect the license number plate from the detected frames. Now final step is that Reading and extracting the number plate characters from the detected number plates. To make the process of training the deep learning model easier, this system uses some use full modules and library and CNN algorithm. It provides very easy way to use module's methods to perform image recognition tasks. These images are taken under different conditions and angles. The given proposal method is tested in real time situation and achieved 97% accuracy for car detection, 98% accuracy for number plate detection and 90% accuracy for character recognition.

Keywords: cctv footage, veichle localization, image recognition, ocr (optical character recognition), CNN, grey scale, edge detection, Thresholding.

1. Introduction

The objective is to design an efficient real time number plate of vehicle identification system by using the CNN algorithm and some usefull modules. Real Time Number plate recognition (RTNPR) can be used in various fields such as vehicle tracking, traffic management, automated payment on tolls of highways or bridges, and parking management softwares.

In this project, two Convolutional-Neural network (CNN) models are used. There are two datasets or modal consisting of car images and number plate images are required. For training the car images, cars dataset from the internet is used [1]. For number plate images, efficient dataset was created with the help of online sources. Once the data is obtained, it divided into train and test and converted to the machine readable form. In this the live CCTV footage is converted into frames. The frames are passed through CNN algorithm to detect the cars images in it and then from these images are checked for number plate. The detected number plate will be extracted and Then characters

in these number plates are recognized using OCR (Optical Character Recognition). The extracted text is then copied to an excel sheet with the time, date ,state , city and vehicle number. This software tends to give a higher accuracy than the existing software and has an additional benifits to implemented in real time.

2. Literature Survey-

In the existing systems, the detection algorithms have some drawbacks in number plate detection. They need large computational working and the results are extremely dependent on the image quality and the accuracy degrades with the high noisy pictures. So to remove the noise complete this process it takes huge power and time.

Edge detection is the process where histograms of the edges are plotted. These edges are applied as both horizontal and vertical directions, and the main disadvantage is the boundary extraction and it reduces the proficiency level. To overcome the processing time inefficiency and also to upgrade the efficiency, neural networks are used. CNN rise the efficiency and by rising the hidden layers the system learns effectively the relation of input and output layers.[2]

In [3], Optical Character Recognition (OCR) technique was used, which is generally used technology which accomodate scanned images of printed text into machine encoded text. Here, an OCR algorithm based on neural network is being proposed where two uncorrelated real character image data sets are used for training and testing the proposed model of neural network. The two uncorrelated image data sets were used to identify real-world structure where the neural network will be subjected to. Artificial Neural Networks (ANN) are generally used intelligent computing structure for pattern recognition. The most common used ANN is the multilayer feed-forward neural network which has a simple structure that can identify inputs into a set of target categories. Typically, the works done in [6] and [7] use features extraction and binary pixels value to recognize the inputs of neural network respectively, the former one is the most common used method for neural network, which can achieve good performance even under difficult environment.

In [8], Soble filter was used to identify thie issue to find the edges of the vehicle which are applied to recognize the type of vehicle. The Contour method and SVM (Support Vector Machine) were used in [9] to find out the model of the vehicle. They showed numerical results on data set of about 70 images. But, they didn't use the method to detect real-time video stream.

In [10], Maximum Average Correlation Height (MACH) filter and Log r-theta Mapping techniques were used to

recognize the vehicle disregarding of scale and rotation varies of vehicles. The MACH filter was used for detection of detect in cluttered environment. In [11], MACH was used to filter the pattern to orientation eveness and they used log r-theta mapping to create in plane rotation and scale invariance while recognition.

In [5], MATLAB has been used for the performance of the algorithm on a PC fit out with a Dual Core 2.4GHz and 3G RAM. It has also been used to generate the weights of neural network. 6436 binary images with different resolutions from the character segmentation were used.

Each system proposed for vehicle identification and number plate recognition in the literature survey has its own pros and cons.

3. Proposed Methodology-

There are various Number Plate recognition (NPR) techniques carried out in India and their efficiency is very less. The proposed methodology focuses to optimize and enhance the efficiency of NPR. Initially the model was trained with convolutional Neural Network (CNN) algorithm, object detection algorithm. An ImageAI architecture is used which worked efficiently for detection and recognition for NPR. The software is built using python.

3.1 Localisation of Number Plate and character segmentation-

In this part of following steps has been done-

- Blur the Image.
- Convert to grayscale.
- Find vertical edges.
- Threshold the vertical edged image.
- Closed morph the threshold image.

The captured digital image is pre-processed by passing it through gray scale filter and edge detection is applied to spot the region of interest, which is the number plate of vehicle itself. In this the digital image is estimate the shape of neutral grey oscillating according to its intensity for weak intensity it is black and for strongest intensity it is white .

Then it is converted to binary form and make a logical matrix of pixcel value 1 for white and 0 for black shades. Probable number plate regions in images are recognize by observing some changes in contrast. others regions are filtered out. The best achievable number plate location is carried out by comparing width by area factor of actual Indian number plates to the same of plate like regions getting by this method. The gray level plate images are enhanced by using threshold techniques [2]. So, the contrast differences between images and the noises such as dirty regions in white background of the plate can be eliminated.

3.1.1 Threshold the vertical edged image

To detect the the plate we have to binarize the image. For this apply thresholding on the vertical edge image and get the binarize image in white and black shades.

3.1.2 Closed morph the threshold image

Apply closing morphological transformation on threshold image. Closing is important to fill small black shades between the white shades. It identified the rectangular white box area of number plate.

Now to find the plate we need to get countours in the image. And after draw all the extracted counters it look like this:

And then find the minimum area rectangle of each of countours and validate its side ratio and area. Fixed minimum and maximum area decided as 4700 and 35000 respectively. After validate and compare we get perfect contour of number plate image

3.1.3 Character Segmentation

To recognize the character on extracted number plate apply segmentation.

The characters of the extracted number plate area are segmented using Regionprops function of MATLAB to obtain bounding boxes for each characters. It returns the smallest bounding box that contains a character. This method is used to obtain the bounding boxes of all characters of the number plate.[4]

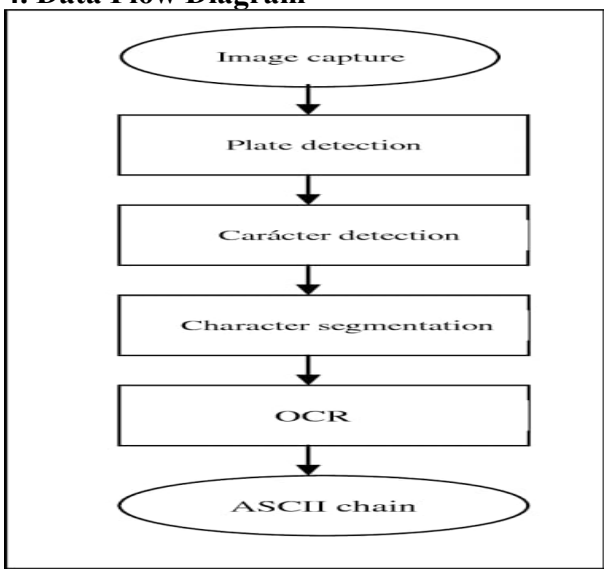
3.2 OCR by template match

Template matching is one of the Character Recognition techniques. It is the technique of finding the location of a sub-image called a template, inside an image. It give

similarity between template and image of same size and identify highest similarity measure. This process involves the database of characters or templates. It exists a template for all possible input characters. Templates are created for each of the alphanumeric characters (from A-Z and 0-9) using 'Regular' font style.[4]

For recognition to occur, the given input character is compared to each template to find an exact match, or the template with the nearest charcterization of the input character. The outputs of template matching for character recognition on the number plates taken from static images are shown below.

4. Data Flow Diagram-



5. Result Analysis-

After the completion of project, our software is able to localize the number plate and extract the value from the plate at real time. The accuracy of result taken out by observing the result on various models testing shown below –

Models	Accuracy
Car Detections	90.6%
Number plate Detection	89.6%
Character Recognition	95.8%

Now Result analysis comparison with respect other resources-

In [5],[7],[12],[13] combination results the models accuracy rate are shown below-

Models	Accuracy
Car Detection	89%
Number Plate Detection	90.89%
Character Recognition	94.5%

On seeing the analysis it identified that some point of the models accuracy is approximately same , and some modules used for the detection is consuming a spaces as compared to the our related models. Which turns efficient way of recognize for the system.

6. Conclusion-

In this work, existing methodologies and algorithms proposed in literature for Vehicle and Number Plate recognition were reviewed. In this the parameters of neural network were optimized to enhance the performance of neural network and using this framework the code complexity is also reduced. The system was tested in a dynamic environment where it automatically detected the vehicles. The plate localization and character recognition was performed successfully than existing systems.Template matching was applied on number plates obtained from digital images and an avg. accuracy of 96% was obtained. This accuracy can be inhanced greatly by adjusting the camera suitably to recognize the best frame and using two layers of neural networks. This proposed system can be upgrade for the recognition of number plates of more vehicles in a single image frame by using multi-level genetic algorithms.

Also, a more advanced version of this system can be implemented by taking inputs from live footage and selecting the vehicles frame for classification of vehicle types and recognizing the number plates using neural networks.

References

1. P. Harini1, K. Harish1, V. Gnanaprakash, "Real Time Number Plate Recognition", IJTSRD, Volume 4 Issue 5, July-August 2020.
2. Genyun Suna, Qinhuo Liua,∗, Qiang Liua, Changyuan Jib, Xiaowen Lia "A novel approach for edge detection based on the theory of universal gravity", the journal of pattern recognization society.
3. H. Erdinc Kocer and K. Kursat Cevik, "Artificial neural networks based vehicle license plate recognition," Procedia Computer Science, vol. 3, pp. 1033-1037, 2011 .
4. Aniruddh Puranic, Deepak K. T. and Umadevi V. " Vehicle Number Plate Recognition System: A Literature Review and Implementation using Template Matching", International Journal of Computer Applications (0975 – 8887) Volume 134 – No.1, January 2016.
5. Xiaojun Zhai, Faycal Bensaali and Reza Sotudeh, "OCRBased Neural Network for ANPR" in IEEE, 2012. Pp1.
6. Y. Amit, D. Geman, and X. Fan, "A coarse-to-fine strategy formulticlass shape detection," IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 26, pp. 1606-1621, 2004.
7. C. Oz, and F. Ercal, "A Practical License Plate Recognition System for Real-Time Environments. Computational Intelligence and Bio-inspired System," Lecture Notes in Computer Science, vol. 3512/2005, pp.497-538, 2005.
8. Weihua Wang, "Reach on Sobel Operator for Vehicle Recognition, "International Joint Conference on Artificial Intelligence, pp.448-451, 2009.
9. Saeid Rahati, Reihaneh Morvejian, Ehsan M. Kazemi and Farhad M. Kazem "Vehicle Recognition Using Contourlet Transform and SVM," Proceedings of the Fifth International Conference on Information Technology, 2008.
10. SaimaRafique, Mahboob Iqbal and Hafiz Adnan Habib, "Space Invariant Vehicle Recognition for Toll Plaza Monitoring and Auditing System", Multitopic Conference, 2009. INMIC 2009,IEEE 13th International, pp. 1-6.
11. Bone P, Young R, Chatwin C. "Position, rotation, scale, and orientation-invariant multiple object recognition from cluttered scenes," Opt Eng2006; 45:077203.
12. C. Oz, and F. Ercal, "A Practical License Plate Recognition System for Real-Time Environments. Computational Intelligence and Bio-inspired System," Lecture Notes in Computer Science, vol. 3512/2005, pp.497-538, 2005.
13. Seemal Asif. A Basic Introduction to neural networks, Cranfield University, 2018.