International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 02 | Feb 2020 www.irjet.net p-ISSN: 2395-0072

# COMPUTERIZED VEHICLE FOYER AND OUTLET MONITORING SYSTEM USING DEEP LEARNING APPROACH

**VishnuVarthan S [1], Ramya V [1], Vengateshwaran M [2]**

*[1]UG Student, Departmen of CSE, Agni College of Technology, Chennai, Tamil Nadu, India*
*[2]Assistant Professor, Department of CSE, Agni College of Technology, Chennai, Tamil Nadu, India*

---

**Abstract -** *Automatic License Plate Recognition System may seems to be easy to implement, but many factory like illumination variation, occlusion, change in viewpoint, background clutter and many factor make its challenging task. So we have proposed a novel end-to-end ALPR system with the two custom YOLO object detector and also LeNet architecture based CNN. Due to the unavailability of the Indian vehicle dataset and different fonts used in vehicles we have collected the datasets manually along roadsides and also in various building, parking lots, schools and college busses and these data has been manually annotated with better care. After training the YOLO model which can be able to successfully locate the license plate in the given frame. The captured license plate has been preprocessed with image processing techniques like binarization. To segment the character we have built another YOLO model which can be able to detect the character in license plate but not able recognize it. Finally LeNet architecture has been trained with custom segmented characters from license plate and MNIST datasets with data augmentation*

***Key Words***: **ALPR, License Plate, LeNet, YOLOv3, Keras.**

## 1. INTRODUCTION

Automatic License Plate Recognition plays a vital role in many areas such as detection in stolen vehicles, vehicle monitoring system, tollgates, detection and intimation of specific vehicles' arrival and so on. As the number of vehicles is increasing, we may need to process multiple vehicles in a single frame. Traditional computer vision techniques may detect the play, but not accurately. Robustness is one of the major characteristics that ALPR must have which lacks in the traditional system. So, we have developed a novel end-to-end approach for the ALPR system. Here each network has been trained separately and at last, joined together. The subtask in these modules is (i) license plate detection, (ii) Preprocessing, (iii) Character detection and segmentation and (iv) Character recognition. Published research work also provides a big weight-age to get admissions in the reputed squad. Now, here we use the proven steps to publish the research paper in a journal.

In this first module, we have skipped the vehicle detection part because YOLO can detect the license plate in the fly Because of the nature and robustness of the YOLO multiple license plates in the image will be able to detect. We have chosen YOLO in spite of many object detection algorithms because its shows a better result compare to other algorithms, its robustness, and also with its good accuracy made a perfect model for the ALPR system. In the second module preprocessing, the first module output segmented license plate will be fed into this model.

Here the Otsu's binarization and Gaussian blur have been applied to remove the unwanted noise in the image. Then the preprocessed image will be returned to the next module.

In the third module, the preprocessed image will be fed into another custom YOLOv3 based object detector which will detect the character in the license plate and using the bounding box it will be segmented. We train a YOLO based object recognition model which may classify the character while detection but because of the change in font of many Indian vehicles and lack of datasets which lead us to poor accuracy. So, we have trained the YOLO model to only detect the character in the license plate and return the bounding box. Here another problem rose since there is no order in returning of the segmented character in the license plate segmented character has been returning with no order. But with the help of the returning bounding box, we have arranged the bounding box based on the x-axis coordinate.

In the final model, the segmented characters will be passed to the character classification model in here the LeNet Architecture based CNN has been trained here. Because of the different fonts, manual segmentation of digits and letters, and also the MNIST dataset have been mixed here. Due to the small amount of the dataset the data augmentations have been used which gives blur, change in contrast or slightly rotated images. Then, by using these data the LeNet architecture has been trained to classify the character which has been segmented in the license plate.

## 2. RELATED WORK

In this Section, we have studied a few papers which show that deep learning has a strong connection with the ALPR system.

A. Yovan Felix and A. Jesudoss and J. Albert Mayan proposed, "Entry and Exit Monitoring using License Plate Recognition" here triggering the camera to capture the license plate needs a manual operation. And also, he has used DNN to perform the character classification.

B. Shan Du, Mahmoud Ibrahim, Mohamed Shehata, and Wael Badawy proposed, "Automatic license

plate recognition: A-State-of-the-Art Review" here edge detection has been used for license plate localization which leads to the false positive in few cases.

C. Muhammad Tahir Qadri and Muhammad Asif proposed the "Automatic license plate recognition system for vehicle identification using Optical Character Recognition" which uses OCR based character recognition which may not be suitable for noisy images

D. Anuja P. Niagara proposed the "License Plate Character Recognition System using the Neural Network "which uses the back propagation method in Neural Network

## 3. PROPOSED SYSTEM

The proposed ALPR system consists of three main modules: a license plate localization module, character detection, and segmentation module and character recognition module which have been shown in Fig-1. In the experiment of locating license plate, 2040 images were taken from various scenes under different conditions were employed. In which 2031 images have been successfully located license plate and segmented from the image which is 99.1% of accuracy. As for the character detection and segmentation which has been tested for 400 plates, in 359 plates all character has been detected and segmented which is 89.7% of accuracy. And for the character recognition model which provides 92% accuracy in map training.

## 4. DATASET

The dataset for the Indian license plate is not available. So the datasets are collected manually at various places. The images of the vehicles with their number plates are captured and stored for the dataset. We have captured 2,040 images of different types of vehicles which are found commonly in the Indian streets. The dataset not only has the images of the car but also bike, auto, bus, lorry, etc., the variety of number plate designs are found and captured. When the data are collected the different lighting conditions observed and collected, such as images of vehicles at the daytime, at night light, also during the bright noontime.

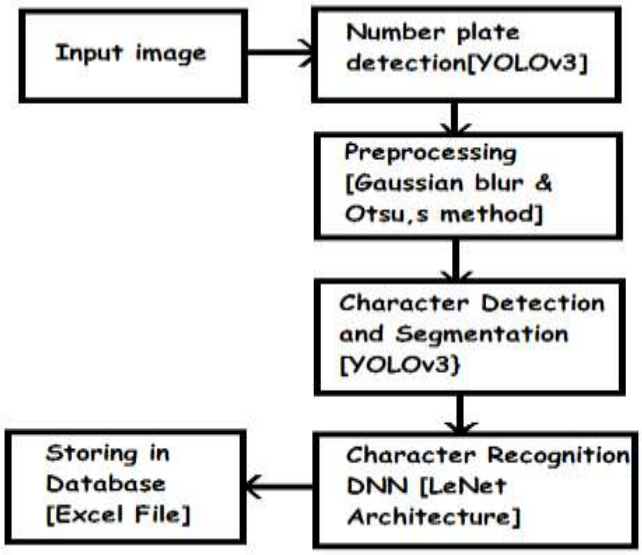


**Fig -1**: Block Diagram of the Proposed System

## 5. MODULES

a. Input module

b. License plate localization module

c. Preprocessing module

d. Character detection module

e. Character segmentation module

f. Character recognition module

g. Output

### 5.1 INPUT MODULE

The input is taken from one of the frames of the live stream video captured by the camera placed at the vehicle appearing places. It is important to place the camera covering the vehicle's entire image that consists of the license plate like image in Fig-2.

### 5.2 LICENSE PLATE LOCALIZATION MODULE

An image or sequence of the image will be fed in this module in which the custom based trained YOLO will detect the license plate from the image example shown in Fig-3. In this custom trained YOLO model, the input size has been changed into 416x416. At the end of the model, the license plate will be segmented and forwarded to the next module.


**Fig -2**: Input Image


**Fig -3**: License plate Localization

### 5.3 PREPROCESSING MODULE

After obtaining the segmented license plate, it needed to be preprocessed to increase its size and remove the noise. Here the license plate will be converted into grayscale for better processing. Then the contrast of the image will be saturated using the Morphological processing methods such as a Black hat, Top Hat, etc. Then the Gaussian blur is applied for smoothing the image and the Otsu's threshold has been applied for binarization of image. Again morphological filter will be applied for removing the small noise to smooth the image. The preprocessed images is shown in Fig-4.


**Fig -4**: Preprocessing

### 5.4 CHARACTER DETECTION MODULE

Here another YOLO model has been trained to detect the character in the given plate. The model will process the given image and detect the character and return the bounding box, and its coordinates shown in fig-5.


**Fig -5**: Character Detection

### 5.5 CHARACER SEGMENTATION MODULE

After the characters are detected the returning bounding box will not be in the sequential order. So, we have used bounding box coordinates to arrange them. After that, the characters will be segmented using bounding box coordinates. The segmented image will be appended in sequential order and forwarded to the next module as shown in fig-6.


**Fig -6**: Segmented Characters

### 5.6 CHARACTER RECOGNIZATION MODULE

We have developed the LeNet based CNN model in Keras with Tensorflow as backend. It has been trained with MNIST and segmented datasets and also with the data augmentation. Here the input characters will be recognized refer Fig-7 and converted into text.


**Fig -7**: Recognized Plate

### 5.7 OUTPUT

The text from the previous module is stored in an excel file with respective date and time of the vehicle appeared. Which have shown in the Fig-8.

| | Date | Time | License Plate |
|---|---|---|---|
| 0 | 19-01-2020 | 16:08:28 | TN01BH5371 |
| 1 | 19-01-2020 | 16:14:15 | TN06K4243 |
| 2 | 19-01-2020 | 18:28:01 | TN07BF3132 |
| 3 | 19-01-2020 | 18:29:44 | TN07BS0918 |
| 4 | 19-01-2020 | 18:30:55 | TN01BH5371 |
| 5 | 19-01-2020 | 18:35:14 | TN07BS0918 |
| 6 | 20-01-2020 | 08:10:07 | TN06K4243 |
| 7 | 20-01-2020 | 08:12:43 | TN01BH5371 |
| 8 | 20-01-2020 | 08:38:11 | TN06K4243 |
| 9 | 20-01-2020 | 08:40:32 | TN01BH5371 |

**Fig -8**: Output

### 6. CONCLUSIONS AND FUTURE WORKS

In this paper, we proposed an automated vehicle monitoring system that will be useful in many places, the important part in our system is that we have the YOLOv3 model, which not only used for the detection process also for the segmentation process. The efficient part is that the neural network used. LeNet in Deep Neural Network plays a vital role in our system. The future work could be that is can be used in various places and it will be cost-effective and time-efficient process.

### REFERENCES

[1]. Yovan Felix, A. Jesudoss and J. Albert Mayan's "Entry and Exit Monitoring using License Plate Recognition" 2017 IEEE International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy And Materials (ICSTM).

[2] Shan Du, Mahmoud Ibrahim, Mohamed Shehata and Wael Badawy "Automatic license plate recognition: A State of the Art Review" IEEE Transactions on Circuits and Systems for VideoTechnology, Feb. 2013 INSPEC Accession Number: 13270696 DOI: 10.1109/TCSVT.2012.2203741.

[3] Anuja P. Nagare "License Plate Character Recognition System using Neural Network" International Journal of Computer Applications (0975 – 8887) July 2011. DOI: 10.5120/3147-4345.

[4] Nauman Salim, Hassam Muazzam, H.M Tahir "Automatic License Plate Recognition Using Extracted Features" computational and Business Intelligence (ISCBI), 2016 4th international symposium on 5-7 September 2016 INSPEC Accession Number: 16466966DOI:0.1109ISCBI.2016.7743288.

[5] Pooja Sharma, Shannu Sharma "Image Processing Based degraded Camera Captured Document for Improved OCR accuracy" Cloud System and Big Data Engineering (Confluence), 2016 6th International Conference on 2016 INSPEC Accession Number:16140689

[6] Albert Mayan J, Kumar Akash Deep, Mukesh Kumar, Livingston Alvin, Siva Prasad Reddy, "Number plate recognition using template comparison for various fonts in MATLAB ", IEEE International Conference on Computational Intelligence and Computing Research, ICCIC 2016, PP: 1-6, DOI: 10.1109/ICCIC.2016.7919542

[7] S. Kranthi et al, "Automatic number plate recognition," Int. J. of Adv. in Tech., vol. 2, no. 3, pp. 408-422,2011.

[8] S. Wang and H. Lee, "Detection and recognition of license plate characters with different appearances," Int. Conf. Intell. Transp. Syst., vol. 2, pp. 979984, 2003.

### Author's Profile:

S.VishnuVarthan B.E.,

Final year CSE

Agni College of Technology, Chennai

V.Ramya B.E.,

Final year CSE

Agni College of Technology, Chennai

Mr. M. Vengateshwaran M.E.,

Assistant Professor in CSE

Agni College of Technology, Chennai

Area: Machine Learning, Big Data, Data mining, IR