

A Review on Automatic vehicle license plate recognition system

Hana Demma¹, Mandeep Kaur²

^{1,2}School of Engineering and Technology, Department of Computer Science and Engineering, Sharda University

Abstract—Automatic number plate recognition (ANPR) is the technique of extracting the number plate information from an image of the vehicle Number plate. Number plate recognition system is composed Capturing image, Pre-processing where a lot of disturbances and noises present in the image cleared, Plate region extraction the process of studying and extracting useful information from the filtered input patterns, Segmentation of character in the extracted number plate, and Character recognition where segmented characters are recognized. This review focus on the recent studies related to number plate recognition system technique and accuracy of proposed algorithms and their limitations, for different country with a different environment and format of license plate.

Keywords— Automatic number plate recognition, Extraction, segmentation, Character recognition

I. INTRODUCTION

A number plate is the unique identification of vehicle used to identify vehicles by their own number plates. Automatic number plate recognition (ANPR) is the ability to automatically extraction and recognition of a vehicle number plate's characters from an image. it consists of a camera or frame grabber that has the potential to grab an image, find the location of the number in the image and then extract the characters for character recognition tool to translate the pixels into numerically readable character [1]Automatic vehicle license Plate Recognition (ANPR) was invented in 1976 at the Police Scientific Development Branching the UK.[2] Recently this license plate recognition system gets much interest from different researchers and became a hot issue. With the rapid increase in the number of vehicles, there is a need to improve the existing systems for identification of vehicles. An automated system became a promising in order to reduce the dependency on labor. These days, the number of vehicles is growing day to day, which leads to increases the new challenges for traffic police such as red light violations, parking problems, wrong lane violations & toll booth violations. There is a need to automate various processes in addition to increasing traffic police force. To resolve this issue traffic police installed many surveillance devices like Traffic light cameras, parking Booth cameras or toll booth cameras. It requires man-power to Check these images, note down the vehicle's number plate and forward it to the appropriate department to take an action on rule violators[3]Since the topic literature review will provide The aim of this paper is to provide researchers a systematic survey of existing LPR research by categorizing existing algorithms according to the features they used, by analyzing the pros/cons of these features, comparing them in terms of recognition performance and to find scope for the future research.

II. REVIEW OF PREVIOUS WORKS

In the literature, many algorithms for Automatic number plate recognition have been proposed. Although license plate recognition has been studied for many years, it is still a challenging task to detect and recognize license plates numbers. This review will cover different related work and investigate to explore different algorithms which are suitable to be used in a different country.

YassenM.Alginahi presents automatic Arabic license plate recognition using a neural network, Horizontal projection, and zoning, 470 image samples are used for feature extraction got around 97 % accuracy.[4] M. M. Shidore and S. P. Narote presents Number Plate Recognition for Indian Vehicles using SVM, Vertical edge detection and connected component analysis got accuracy around 78.84%.[5] Deepti sagar and maitreyee dutta proposed automatic number plate recognition by using block-based neural network the work is implemented on Indian number plate get accuracy around 98.2%.[6] Seble Nigussie and Yaregal Assabie presents Automatic Recognition of Ethiopian License Plates using Correlation based template matching and use Gabor filter for plate detection and CCA for feature extraction get an accuracy of 71.06%.[7] İbrahim Türkyılmaz and Kirami Kaçan present License Plate Recognition System Using Artificial Neural Networks, divide the recognition process into three stages, plate region determination, character segmentation, and character recognition.

Edge-based image processing Techniques for LP region determination, vertical projections in Binarized images for character segmentation, and ANNs for Character recognition got success rate around 97%. [8] Reshu kumara and surya Prakash Sharma presents automatic number plate recognition by using machine learning techniques and divided the process into three capturing the image, plate localization and recognition of digits on the plate and also use HOG features for training and SVM for classification, they obtained is 99% accuracy. [9] P.surekcha et.al presents automatic license plate recognition using image processing and neural network and obtained 97% accuracy. [10] .fei Xie el.al proposed robust license plate detection and character recognition algorithm based on a combined feature extraction model and BPNN, they used feature combination, training the feature vectors through BPNN to get the best result, and they get recognition accuracy of 97.7%. [11] Inga astawa et.al presents Detection of License Plate using Sliding Window, Histogram of Oriented Gradient, and Support Vector Machines also Identify the location of a vehicle license plate using a mobile Phone, and is expected to contribute to future recognize the identity of the vehicle and the owner of the Vehicle based on license plate recognition in real-time get recognition accuracy of 96%. [12]. Gajendra Sharma presents Performance Analysis of Vehicle Number Plate Recognition System Using Template Matching Techniques and also connected component analysis used for feature extraction on 90 sample images get 67.98% cross correlation and 63.46% phase correlation. [13] The literature review is presented in the tabular form.

S.No	Author	Year	Title	Aim	Feature extraction method/ sample	Methodology	Result Accuracy	Remark
1	YasserM . Alginahi	2011	Automatic Arabic License Plate Recognition	Recognition of Saudi Arabian license plate	Horizontal projection profiles as well as zoning are used /470 image	Artificial Neural network	94.9%	The proposed system is tested over a large image dataset captured in various illumination conditions and is verified to generate high recognition rate.
2	M. M. Shidore, and S. P. Narote	2011	Number Plate Recognition for Indian Vehicles	Automatic Number Plate extraction, character segmentation and recognition for Indian vehicles.	Vertical edge detection and connected component analysis /250 images	SVM	79.84%	Deep shadows and reflections have an impact on number plate extraction work. Because of uneven illumination, stained number plates, true number plates could not get correctly extracted.
3	Deepti sagar and maitreye e dutta	2014	Block based neural network Automatic number plate recognition	Develop a Block Based ANPR system for recognition of Indian car license number plates by resolving issues with non-standard number plates, to provide high recognition rate	Block based feature extraction using edge density calculation and edge detection methods /3399 images	Block based neural network	98.2%	More improvement should be needed like recognizing square shape, colored, shadow image plate number

4	Seble Nigussie and Yaregal Assabie	2015	Automatic Recognition of Ethiopian License Plates	Recognizing Ethiopian number plate	Gabor filter for plate detection and CCA /350 images	Correlation based template matching	71.06%.	Character recognition module misclassifies numbers like 0 for 8, characters 4 for 8, and 8 for 4. In addition, characters and numbers affected by the rivets of plates have gotten a higher percentage of misclassification.
5	İbrahim Türkyılmaz and Kirami Kaçan	2017	License Plate Recognition System Using Artificial Neural Networks	Develop LPRS that takes less processing time ,less computing power and better recognition rate under fewer restriction	NWG thinning algorithm/ 357 images	ANN	97%	To get LPRS with higher performance advanced image processing technique is recommended
6	Reshu kumara and surya Prakash shrama	2017	A Machine Learning Algorithm for Automatic Number Plate Recognition	Recognizing vehicle number plate	Use connected component analysis /100 images	HOG is calculated for all images SVM used for classification	99%	SVM does not need large amount parameters to give good result
7	p.surekha et.al	2018	Automatic license plate recognition using image processing and neural network	Implementing ALPR for parking lot	Use connected component analysis for character extraction /105 Images	Image processing Neural network trained with feed forward back propagation algorithm	97%	ALPR should have the ability to predict multiple license plate when multiple car are present on a single frame so DL are enforced to predict presence of vehicles.
8	fei xie et.al.	2018	Robust license plate detection and character recognition based on combined feature extortion model and BPNN	Detection of license plate by using combined algorithm	Use vertical traverse density (VTD) and horizontal traverse density (HTD) and/ 100 images	Combined feature extraction model BPNN.	97.7%	Give better result under weaker illumination and complex background

9	Inga astawa et.al	2018	Detection of License Plate using Sliding Window, Histogram of Oriented Gradient, and Support Vector Machines	Identify the location of a vehicle license plate using a mobilePhone, and is expected to contribute to future recognize the identity of the vehicle and the owner of the Vehicle based on license plate recognition in real-time.	Use HOG and SVM/350 images	using sliding window method, HOG and SVM	96%	
10	Gajendra Sharma	2018	Performance Analysis of Vehicle Number Plate Recognition System Using Template Matching Techniques	measure the performance of system by comparing the result of accuracy of the system	Connected component analysis /90 sample	Template matching	67.98% cross correlation and 63.46% phase correlation	To improve the accuracy of phase correlation and normalized correlation by taking inputs from live video feed and selecting the best vehicle frame for classification of vehicle types and recognize the number plates

TABLE I Reviewed Papers

III. NEED OF AUTOMATIC PLATE RECOGNITION

Due to rapid development of technology and increasing use of vehicles License plate recognition system has numerous applications. In present world, crimes are increasing day by day with a rapid speed and criminals use vehicles in crimes. When we go at a crowded place, we see that people does not follow traffic rules during driving due to which many road accidents occur. So there is a need for license plate recognition system to overcome these problems. Identifying the license plate of a vehicle involved in crimes can help to nab the criminals and also it will be used for Flexible and automatic highway toll collection systems, Effective law enforcement and Effective enforcement of traffic rules Apart from these conditions, the algorithms applied for the recognition also plays a vital role. If the quality of the algorithm is good, then more varieties of images can be given as input to the system, and this will also reduce the computation speed of the process. The most basic issues in the vehicle license plate recognition system is the accuracy and the recognition speed.

IV. CHALLENGES IN EXISTING SYSTEM

The literatures have laid the groundwork to address several challenges in developing a scalable and effective system for vehicle number recognition these challenges include:

- Data extraction from the a vehicle number
- Difficulty in recognition of different shape and color
- Weaker result under illumination and complex background
- Difficulty in predicting when multiple cars are present on single frame.
- Misplaced character recognition

V. CONCLUSION

From review we conclude that the proposed automatic vehicle license plate recognition most of the recognition techniques have high accuracy detected efficiently hence Ethiopian License Plates and Indian license plates detection techniques have low accuracy Because of uneven illumination parameters influences the vehicle number plate recognition like camera type, an expected disturbance in the image, detection of vehicle within the obscurity, seeing point, Deep shadows and reflections have an impact on number plate extraction work and so forth in future work researchers should take a shot at conquer these parameters.

REFERENCES

- [1] Vijay Laxmi *License Plate Recognition System Using Haar* International Journal of Scientific & Engineering Research, Volume 5, Issue 9, pp. 635,2014
- [2] AmrBadr *Automatic Number Plate Recognition System* ,Annals of the University of Craiova, Mathematics and Computer Science Series Volume 38(1), Pp62,71,2011
- [3] Harjinder Singh *Car registration License plate detection and recognition system* ,Msc.Thesis sandiego state university,2015
- [4] Y. M. Alginahi, *Automatic Arabic License Plate Recognition*, Int. J. Comput. Electr. Eng., vol. 3, no. 3, pp. 454–460, 2012.
- [5] P. R. Sanap and S. P. Narote, *License plate recognition system for Indian vehicles* AIP Conf. Proc., vol. 1324, no. 2, pp. 130–134, 2010.
- [6] D. Sagar and M. Dutta, *Block-Based Neural Network for Automatic Number Plate Recognition* vol. 4, no. 9, pp. 1–7, 2014.
- [7] S. Nigussie and Y. Assabie, *Automatic recognition of Ethiopian license plates*, IEEE AFRICON Conf., vol. 2015–Novem, pp. 1–5, 2015.
- [8] R. Kumari and S. Prakash, *A Machine Learning Algorithm for Automatic Number Plate Recognition* Int. J. Comput. Appl., vol. 174, no. 1, pp. 6–9, 2017.
- [9] H. M. Alyahya, M. K. Alharthi, A. M. Alattas, and V. Thayananthan, “*Saudi License Plate Recognition System Using Artificial Neural Network Classifier*, 2017 Int. Conf. Comput. Appl. ICCA 2017, vol. 39, no. 2, pp. 220–226, 2017.
- [10] p.surekha et.al *Automatic license plate recognition using image processing and neural network* ,ICTACT Journal on image and video processing, Vol-08, Issue-4, 2018
- [11] F. Xie, M. Zhang, J. Zhao, J. Yang, Y. Liu, and X. Yuan, *A Robust License Plate Detection and Character Recognition Algorithm Based on a Combined Feature Extraction Model and BPNN*, J. Adv. Transp., vol. 2018, 2018.
- [12] I. Astawa, I. G. N. Bagus Caturbawa, I. Made Sajayasa, and I. M. A. Dwi Suta Atmaja, *Detection of License Plate using Sliding Window, Histogram of Oriented Gradient, and Support Vector Machines Method*, J. Phys. Conf. Ser., vol. 953, no. 1, 2018.
- [13] G. Sharma, *Performance Analysis of Vehicle Number Plate Recognition System Using Template Matching Techniques*, J. Inf. Technol. Softw. Eng., vol. 08, no. 02, 2018.