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Registration Plate Detection from Vehicle

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Abstract: ***Mining operations are generally spread over a vast area in remote locations and harsh environments. Coal extraction is a high - cost and increasingly high - technology venture that requires the utmost operational efficiency as well as uninterrupted workflow and delivery cycles. Operations cannot afford to be impacted due to a lack of visibility regarding the location and status of machinery, equipment, and vehicles. This causes delays, increased cost, and mounting losses and is also an open invitation to theft and misuse. Real - time location tracking and monitoring, especially of moveable assets such as the vehicle fleet transporting the coal, is thus of critical importance to the mining industry. Tracking pickups and deliveries of thousands of truck - loads moving daily to and from various locations inside mining areas to processing plants, rail wagons or jetties is a logistics nightmare.***

Keywords: Machine learning, number plate detection, OpenCV

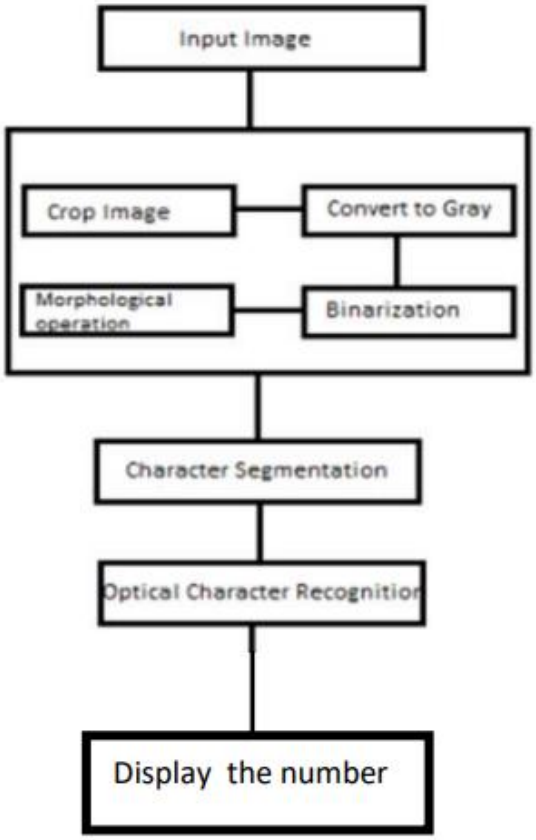
1. Introduction

The identification of license plates is a very good source of knowledge for record detection and recognition. But the conventional license plate recognition process is not reliable. The manual way of identifying the vehicle and its owner is not that applicable in detecting license plates to retrieve hidden treasures of information. Automatic recognition of license plates is an important stage in the intelligent traffic network, and several ways for the construction of ANPR, ANPR's basic work is reading and unfolding license plates. ANPR is also called by the name of ALPR (Automatic License Plate Recognition).

License Plate Recognition is an advanced machine vision technology used to identify vehicles by their number plates without direct human interruption. This development of the Intelligent Transportation System provides data on vehicle numbers which can be used in follow - up, analyses, and monitoring. Besides traffic monitoring, this technology is gaining popularity in various applications day by day, such as highway toll collection, border and customs checkpoints, and parking access control systems. Recently, with the increase in terrorism acts, it is strongly expected that LPR will gain great importance in security all over the world.

The various researchers have proposed various techniques for every step and an individual technique has its own pros and cons.

Here we going to a summarize the literature's showing the research conducted by other researchers in the field of license plate recognition.



2. Literature Review

K. K. Kim built a license plate recognition system by following a learning protocol. The camera captures an image inside the car detection module. Then, the picture of the candidate region is provided as output. The two TDNNs (Time Delay Neural Networks) were taken as the horizontal and vertical filters to find the license plate. The segmentation rate was 97.5 percent, and a recognition rate of 97.2 percent for the proposed system [1].

Chin - Chuan Han suggested a device that not only tracks several targets but also obtains high - quality images on plate numbers. A computer with a tuned dual - camera system has been built here by the author; a stationary camera and a pan - tilt - zoom camera are designed to monitor moving conveyance in an open field. The license plate for recognition has been sequentially identified by the CNN classifier. As 64 vehicles entered this region

illegally, data was composed manually of the science pictures and 59 IDs were accurately detected using this tool [2].

Madhusree Mondal 2017 developed an ANPR framework focused on the learning capabilities of convolutional neural networks. The self - synthesized function of CNN was used here, as it distinguishes the vehicle states from the number plate. The system was organized in this work in an echelon network of feature detectors that conducted consecutive processing of visual data pertaining to the dominant visual processing experience of the visual cortex, which influenced the computational model of CNN. The findings of this research were observed with fewer training samples and turned out to be a 90 percent higher precision rate [3].

Andrew S. Agbemenu in 2018 proposed an ANPR method based on the characteristics and variations of the plates therein. The author has proposed in this work an algorithm that is enhanced to perform with a Ghanaian license plate for conveyance. The designed model used two candidate detection algorithms as the detection of edges and the algorithms matching the template. The device then implemented the character segmentation technique particularly with square plates to prevent noise effects, arrangement of characters and skewing. At the final point, character recognition was rendered with the use of tesseract OCR engine. Feature detection was slightly low but had a good success rate, with an average speed of 0.185s detecting 454 plates with 90.8 percent accuracy. The optical character recognition provided an average of 0.031s for Automatic Number Plate Recognition (ANPR) is a fairly well - explored problem in the procedure and successfully identified approximately 60 percent of the detected plates [4].

An Automatic Number Plate Recognition System using OpenCV and Tesseract OCR Engine. The focus of this paper is a proposed algorithm that is optimized to work with Ghanaian vehicle number plates. The algorithm, written in C++ with the OpenCV library, uses edge detection and Feature Detection techniques combined with mathematical morphology for locating the plate. The Tesseract OCR engine was then used to identify the detected characters on the plate [5].

License Plate Recognition is an advanced machine vision technology used to identify vehicles by their number plates without direct human intervention. This development of the Intelligent Transportation System provides data on vehicle numbers which can be used in follow - up, analyses, and monitoring. Besides traffic monitoring, this technology is gaining popularity in various applications day by day, such as highway toll collection, border and customs checkpoints, and parking access control systems. Recently, with the increase in terrorism acts, it is strongly expected that LPR will gain great importance in security all over the world. LPR algorithm consists of the following three processing steps: 1) Number plate detection, 2) Character segmentation, and 3) Character recognition. The accuracy of plate extraction relies [6].

Rayson Laroca in 2018 proposed an ALPR system which discussed the robustness and effectiveness of a framework based on the state - of the - art YOLO artifact detector. The CNN are qualified and adapted for each ALPR stage to be resilient under different conditions. In this work, the author developed a two - stage attempt explicitly for the segmentation and identification of characters, using simple data augmentation artifice such as inverted number plates and character returns. The findings for the UFPR - ALPR dataset were found to be difficult as both commercial systems were below recognition levels of 70 percent. Yet the result was higher with a recognition rate of 78.33 percent for the proposed system [7].

Prashengit Dhar 2018 developed an automated LPR program to support it's the identification of Bangladeshi license plates. This work plate shows a clear white background with black fonts. Prewitt operators performed the detection of the number plate to segment the edges. Morphological dilation was performed to accentuate the points. Eventually, deep CNN was used to accomplish the reconnaissance job. In character classification, the protocol showed a strong precision rate of 99.6 percent [8].

Cheng - Hung Lin in 2019 proposed a three - stage license plate recognition system based on Mask - RCNN which was used for various shooting angles and numerous oblique images. The author used YOLOv2 for the associated conveyance in the preceding stage for vehicle detection. The next stage was the location of the license plate where YOLOv2 was again performed to detect the number plate. During this phase, YOLOv2 separates the images of phase I captured vehicles into 19 x 19 grids. In the final step, the author used Mask R - CNN for character recognition. The results in this work depict that the proposed model could classify vehicle number plates including bevel angles above 0 - 60 degrees and further accomplished the mAP rating of around 91 percent [9].

Nazmus Saif in 2019 proposed a system to detect and recognize the Bangla license plate from the vehicle picture by using convolutional neural networks. In this work, the main focus to choose a convolution neural network in the designed system is preferred because of its configuration for the end - to - end pipeline. CNN clearly outperformed conventional image processing algorithms for their case, and compared generalized CNN models better in different scenarios. The detection research was done using YOLOv3 which consists of 53 convolutional model layers. The second stage after identification is image segmentation and recognition of the characters it is. During this step, the device whips out the number plate region and then moves it to the second YOLO model for segmentation and platform image recognition. As a result, the model was checked with 200 images and correctly recognized the license plate number for 199 images, i. e.99.5 percent accuracy rate [10].

Rabbani et al. (2017) about the License Plate Detection and Recognition System for Bangladeshi License by utilizing Morphological operation and convolutional neural network. Their system is composed of four

modules: license plate area detection, license plate extraction, characters and words segmentation, and characters and words recognition. Image preprocessing works with image resizing, image enhancement by using haze removal techniques, and noise removal by applying a wiener 2 - D filter. The aspect ratio between 1.9 and 2.1 is used to detect the area of the license plate. After detection, horizontal line rescaling and vertical line rescaling are used in the corners of the license plate. The connected component analysis is used for character segmentation and a convolutional neural network is used to recognize the character over the license plate. The authors implemented the system on the customized dataset for digits and characters of Bangla. All accuracies of detecting license plates, segmenting, and recognizing the characters are over 90%. The accuracy will be lost when the license plate's characters are separate. This system used a small dataset and needs high - resolution images to detect broken characters for the characters segmentation [11].

Yuan et al. (2018) about the robust and efficient techniques for the real - time detection of license plates in complex scenes by applying a novel line density filter (LDF) for candidate extraction and cascaded license plate classifier (CLPC) for candidate verification. Downsampling and grayscale conversion of the image are used in the pre - processing step. Before Line Density Filter for Candidate Extraction, edge detection and binarization are processed by using the Sobel operator and adaptive thresholding (AT) respectively. After extracting the candidate region, finding the candidate with connected - component labeling (CCL) and removing the un - exhibited area of the license plate image is operating. Finally, the license plates are identified from among the candidate regions detected from the image by applying a cascaded license plate classifier (CLCP) and using the saliency features of two color channels: HSV and RGB. The system is implemented on two datasets: the Caltech vehicle dataset and their collected PKU dataset. The average accuracy of the system is 96.62% and the average run time is less than other approaches. Different scenes are the limitation of the system and the authors suggested interesting the MSER or Hough transform approach for further study [12].

Gou et al. (2018) presented Character - specific extremal regions (ERs) and hybrid discriminative restricted Boltzmann machines (HDRBMs) for vehicle license plate recognition There are four main steps for vehicle license plate recognition: license plates' coarse detection, character region extraction, license plate detection, and license plate recognition. In the first step, background noises are removed with top - hat transformation, vertical edges are detected with the Sobel filter, and backspaces are removed by applying Closing which is one of the morphological operations. Real AdaBoost classifier is applied to select character - specific ERs as the region of characters in the second step. For the license plate detection step, license plate location and character segmentation are processed by inferring geometrical character attributes. In the last step, a histogram of oriented gradients (HOG) descriptors is used to extract the features of character regions and HDRBM is used to recognize the character as an offline - trained classifier. The system experimented on the dataset and extended the conference version dataset with real traffic monitoring scenes under various illumination conditions. The average performance percentages of the License Plate Detection Rate (LDR), Character Recognition Rate (CRR), and Overall Performance (OVR1 and OVR2) are 95.9, 98.2, 91.9, and 94.1, respectively. Further work may be on deep architectures for location and recognition [13].

Davis et al. (2017) introduced a faster license plate detection mechanism by using a vertical edge detection algorithm (VEDA). The gray image conversion and adaptive thresholding are used in the preprocessing step. After preprocessing, vertical edges detection step is processed by applying unwanted lines estimation algorithm (ULEA) and vertical edge detection algorithm (VEDA). And then, License Plate Extraction are operated by implementing highlight desired details (HDD), candidate region extraction (CRE), plate region selection (PRS) and eliminating unwanted regions (EUR). For working in the global system, the system experiments on Indian vehicle image and also on different countries license plate images. The VEDA for vertical edge detection can more detect than histogram equalization and morphology operations. A license plate detection system based on VEDA takes less computation time and it can detect other text blocks. However, it cannot detect in highly blur images [14].

Fomani et al., (2018) introduced the license plate detection algorithm by implementing adaptive morphological closing to locate the regions of the gray level image, local adaptive thresholding for image smoothing, and morphological opening to separate the license plate region and other regions. Local histogram equalization (LHE) is used to preprocess the image before the main steps of the system. Adaptive morphological closing is composed of dilation, constructed structuring elements, and erosion. Local adaptive thresholding is calculated based on the maximum and minimum values of the width and height of the license plate. The detection rate and computation time of the approach are measured on some real datasets collected in different situations. The detection rate of the algorithm is more than 99% and the computation time of the algorithm is faster than other algorithms [15].

Li et al. (2017) proposed a powerful license plate detection method by using a Convolutional Neural Network (CNN). The system first generates the convolutional feature maps from the vehicle image using CNN, and then the complete license plate sub - window is extracted on the convolutional feature maps by applying a single - scale sliding - window detector. Finally, a regression network is used to locate the license plate. The system is implemented on its own high - quality data set. The CNN - based license plate detection method is more powerful than others and it can reduce the detection time. But, the image that takes on the illumination status is difficult to detect and the CNN - based detection method is needed to add the image enhancement methods [16].

Shi et al. (2019) introduced the detection algorithm that applied the visual feature and convolutional neural network. The algorithm contains two main parts: candidate box generation, and candidate box classification and regression. For candidate box generation, there are two types: edge detection - based method and color model - based method. The edge detection - based method is operated by using Gaussian blurring, grayscale conversion, Sobel edge detection, binarization, and closing operation. In the color model - based method, HSV color space conversion, denoising using mean value, dilation, and closing operation is processed on the color features. In the candidate box classification and regression step, two cascaded convolutional neural networks, namely C - Net and R - Net, are applied. C - Net is used to determine the place that exists the license plate and R - Net is used to judge the position and size on the results of C - Net. The experiment is worked on the UCSD dataset and their own collected Chinese license plate images dataset. The algorithm that used visual features and the convolutional neural network gets good performance on the given dataset, improved accuracy rate, and faster performance speed. However, the algorithm still has issues such as miss - detection in actual scenes that contain many license plates and not satisfaction in the candidate box regression [17].

Ravi Kiran Varma et. all (2019) This work addresses the identification of plates of numbers and plates, concerning Indian plates or license plates of vehicles. The main contributions of this study include considering difficult scenarios such as different lighting, hazy, skewed pictures, noisy pictures, and standard and partially worn - out numeric plates [18].

Ayush Mor et. all (2019) There are different license plate detection systems and many factors depend on how well it may be identified. Essentially, we use three aspects, namely image location, segmentation, and then recognition, for detection. The present research demonstrates a comprehensive examination based on the different comparisons of recognition plates. This study provides critical assessments in five dimensions of experimental validation, i. e. techniques, databases, accuracy, processing time, and real - time relevance [19].

Olamilekan Shobayo et. all (2020) The system used a smart IR sensor to detect moving objects, camera for capturing the picture, extracted text from the image and saved text on a Web page.) This work established a highly efficient, economical and VRPN system.) The Raspberry Pi is the main component chosen for the main system work. OpenCV has been used for character segmentation and recognition in conjunction with python programming [20].

Hana Demma et. all (2019) ANPR is the technique used to derive the information on the number plate from the car image Plate Number. Composite method for plate number recognition Image capture, Pre - processing where many disruptions and noise in the image have been cleaned, Platter region extraction of usable information, segmentation of the character in the recovered number plate, and recognized character, when separated characters are recognized, from the filtered input patterns. This report focuses on recent studies connected to the technicality and the accuracy of the platform identification systems for various countries with distinct environments and license plate formats for proposed algorithms and their limitations [21].

P. Meghana et. all (2019) Automatic identification of numerical plates is a famous concept today due to the fast expansion of cars, motorcycles, and other vehicles. This automatic number plate recognition system incorporates vehicle identification image processing technologies. This document outlines the numerous methods, benefits, and conveniences of recognition and allows everyone the best to choose a user - friendly, effective, and unimpacted approach. Factors such as speed, light, text size, and styles should not affect this system [22].

Anisha goyal et. all (2016) The automatic recognition system employing the license plate for the vehicle is introduced in this paper. In order to identify the car from the database stored on the computer by the user the system applies image processing algorithms. The technique works conveniently for a wide variety of situations and distinctive numerical plates. In Matlab, the system is updated and run and real photos are proven to be performing. Work on countervailed number plates was done in the current work. This procedure has a problem with turmoil and is separated from images. A new technique for de - noising and reorganizing better character through conventional classifiers of neural networks have been proposed in the proposed work to deliver better body detection [23].

Md Yasir Arafat et. all (2019) The Vehicle License Platform Recognition (VLPR) framework has become one of the most important challenges in Smart Transport Systems in recent years. Recently the issue of the examinations of the obstacles and diversities of license plates (LPs), including diverse lighting and dangerous settings, has become a significant and complicated topic for research. An in - depth study was made of existing VLPR approaches in which an analytical review based on the qualities used and methodologies was carried out throughout this document. An analytical comparison of conveniences, discomfort, and results has also been offered according to each categorized attribute [24].

Mr. A. N. Shah et. all (2016) The proposed work shows the automated identification number plate system employing the number plate for the vehicle. The technique has been implemented in Matlab and has been tested on actual pictures. One type of intelligent transport system is a number plate recognition system. In order to retrieve a car numbers plate, the template matching technique is also used. The automatic identification number plate system plays a key role in identifying safety threats. Segmentation of character for the separation of each character here [25].

Ruchita V. Patel et. all (2020) The major goal of this research project is to study the picture segmentation and

the recognition issues in the License Plate Recognition Framework closely and find alternate solutions. In such applications, three main phases are identified. First, the area on a license plate from a bigger scene image must be located and extracted. Second, the alphanumeric characters on the plate must be removed from the background using a license plate region to work with. Thirdly, provide them for recognition in an OCR system. To identify a vehicle by successful reading of the license plate, the plate must obviously be found in the image produced by an acquisition system (e. g., video or still camera) [26].

Anirudh Puranic et. all (2016) The model matching was performed using numerical plates obtained from static pictures and 80.8 percent average accuracy was achieved. By setting the camera appropriately to catch the best frame and by using two neural network layers, this accuracy may be considerably enhanced. Using multi - leveled evolutionary algorithms, the implementation of the suggested system can be extended to include numerous car plates in a single frame [27].

S. Sanjana et. all (2020) The need to construct a better city is traffic monitoring. Motorcycle and helmet detection together with number plate recognition can be performed to penalize motorcycle riders who do not wear caskets. The rapid rise in the number of online tools and numerous integrated models which can be utilized for a wide range of applications has resulted in machine learning and image processing technology [28].

Sweta Singh et. all (2021) The automated license detection system for today's hectic traffic system is an essential system. It helps to monitor traffic regulations and other enforcement activities automatically. In India, rash driving occurs in many situations in cars that violate several traffic rules. Traffic police officers find the details of the car quite challenging. In order to facilitate and quickly monitor the traffic regulations on cars, the automated license detection system was therefore devised and implemented over the years. This article gives a concise examination of different methodologies for automatic license detection [29].

Ashwin Jaware et. al (2020) The automatic recognition system employing the license plate for the vehicle introduced in this paper. In order to identify the car from the database stored on the computer by the user the system applies image processing algorithms. The technique works conveniently for a wide variety of situations and distinctive numerical plates. In python/java, the system is updated and performed and real photos are tried. Work on countervailed number plates was done in the current work. This procedure has a problem with turmoil and is separated from images. A new technique for de - noising and reorganizing better character through conventional classifiers of neural networks have been proposed in the proposed work to deliver better body detection [30].

3. Conclusion

From review of various papers we conclude that there are different techniques available for recognition of car number plate such as by using open cv, sobel edge detection method and existing methods is complex for simple demo execution. Therefore we use opencv and pytesserect library that available in python for detecting the object and identifying the letters in the object for recognizing number plate detection from a vehicle.

References

[1] Kim KK (2000) “December. Learning - based approach for license plate recognition”. In Neural Networks for Signal Processing X. Proceedings of the 2000 IEEE Signal Processing Society Workshop 2: 614 - 623.
[2] Han C, Hsieh CT, Chen YN, Ho GF, Fan KC, et. al. (2007) October. License plate detection and recognition using a dual - camera module in a large space. In 2007 41st Annual IEEE International Carnahan Conference on Security Technology 307 - 312.
[3] Mondal M, Mondal P, Saha N, Chattopadhyay P (2017) December. Automatic number plate recognition using CNN based self - synthesized feature learning. In 2017 IEEE Calcutta Conference 378 - 338.
[4] Agbemenu AS, Yankey J, Addo EO, (2018) An automatic number plate recognition system using opencv and tesseract ocr engine. International Journal of Computer Applications, 180: 1 - 5.
[5] License Plate Recognition System - Survey P. R. Sanap and S. P. Narote AIP Conference Proceedings 1324, 255 (2010): https: //doi. org/10.1063/1.3526208
[6] Laroca R, Severo E, Zanlorensi LA, Oliveira LS, Gonçalves GR, et. al. (2018) A robust real - time automatic license plate recognition based on the YOLO detector. In 2018 International Joint Conference on Neural Networks, 1 - 10.
[7] Dhar P, Guha S, Biswas T. Abedin MZ (2018) A system design for license plate recognition by using edge detection and convolution neural network. In 2018 International Conference on Computer, Communication, Chemical, Material and Electronic Engineering 1 - 4.
[8] Lin CH, Li Y (2019) - A License Plate Recognition System for Severe Tilt Angles Using Mask R - CNN. In 2019 International Conference on Advanced Mechatronic Systems 229 - 234.
[9] Saif N, Ahmmed N, Pasha S, Shahrin MSK, Hasan MM, et. al. (2019) - Automatic License Plate Recognition System for Bangla License Plates using Convolutional Neural Network. In TENCON 2019 - 2019 IEEE Region 10 Conference, 925 - 930.
[10] Nazmus Saif (2019) - A System to detect and recognize the Bangla license plate from+ the vehicle picture by using the convolutional neural networks.
[11] Rabbani. (2017) - The License Plate Detection and Recognition System for Bangladeshi License by utilizing Morphological operation and convolutional neural network.

[12] Yuan et al. (2018) - The robust and efficient techniques for the real time detection of license plate in complex scenes
[13] Gou et al. (2018) - Character - specific extremal regions (ERs) and hybrid discriminative restricted Boltzmann machines (HDRBMs) for a vehicle license plate recognition
[14] Davis et al. (2017) - The faster license plate detection mechanism by using vertical edge detection algorithm (VEDA).
[15] Fomani (2018) - The license plate detection algorithm by implementing adaptive morphological closing
[16] Li et al. (2017) - A powerful license plate detection method by using Convolutional Neural Network (CNN).
[17] Shi et al. (2019) - The detection algorithm that applied the visual feature and convolutional neural network.
[18] Ravi Kiran Varma (2019) - The identification of plates of numbers and plates, concerning Indian plates or licence plates of vehicles.
[19] Ayush Mor (2019) - The different license detection systems by using open cv in python.
[20] Olamilekan Shobayo (2020) – License plate detection by IR sensor and open cv in python.
[21] Hana Demma (2019) - To derive the information of the number plate from the car image Plate Number using ANPR technique.
[22] P. Meghana et. all (2019) - Automatic identification of numerical plates.
[23] Anisha goyal et. all (2016) - The automatic recognition system employing the license plate for the vehicle
[24] Md Yeasir Arafat et. all (2019) - The Research on Vehicle License Platform Recognition (VLPR).
[25] Mr. A. N. Shah et. all (2016) - The Research on the automated identification number plate system employing the number plate for the vehicle.
[26] Ruchita V. Patel et. all (2020) - The Research on identifying vehicles by their number plates.
[27] Anirudh Puranic et. all (2016) - The model for numerical plates recognition by using a camera.
[28] S. Sanjana et. all (2020) - The Research on application of license plate detection in traffic monitoring.
[29] Sweta Singh et. all (2021) - The automated license detection system for today's hectic traffic system.
[30] Ashwin Jaware et. all (2020) - The automatic recognition system employing the license plate for the vehicle.