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Approach for Vehicle Number Plate Recognition for automatic toll tax collection

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***Abstract*: - Automatic number plate Recognition is an image processing with OpenCV technology .The main objective is to design an efficient automatic authorized number plate identification system. This system is implemented on the entrance for security control of the University Campus. The developed system primarily detects the moving vehicle at the entrance and then captures the vehicle number plate image. Vehicle number plate region is extracted using the image and video segmentation in an image. Optical character Recognition technique is used for the character recognition. The resulting data is then used to store on a database so as to come up with the specific information like the vehicles number plate time taken and frequency of the data. This system is implemented and simulated by using the technologies like CNN, Tensor flow, Image AI and its performance is tested on real images and videos. The vehicle information (such as passing time, date, toll amount) is also stored in the database to maintain the record. The hardware & software integrated system is implemented & a working prototype model is developed. It is observed from the experiment that the developed system successfully detects and recognizes the vehicle number plate on real images and videos**

Keywords: *- ANPR, Character Segmentation, Convolutional Neural Networks, Edge Detection, License Plate Extraction, Morphology, OCR*

I INTRODUCTION

System proposed smart toll collection which reduces the time consuming long queue of vehicles. The product basically works for automatic vehicle number detection and toll tax collection using IoT and deep learning technique. Each vehicle owner having a E-wallet where he can refill amount from any bank account. Whenever transaction has done system automatically deduct tax amount from available wallet balance. System can gives penalty to vehicle owner if he didn't paid the minus amount within given time. The plate detection stage (dotted box in the top half of the image) predicts the presence of plates in the query image (classification) and the respective positions (localization). The query image is normalized according to mean and standard deviation values computed at training time Optical Character recognition (OCR) is a technology that is mainly used for recognizing machine printed or human written text in scanned documents, images and then converting into editable form. This system about how we detect the number plate of different vehicles and storing them in the database. The ideology of the project had come up with the difficulties faced by the security to record the numbers of various vehicles at the gate way of the campus. Sometimes the user might not be able to record the data due to various inferences such as bad vision, Light factor, bad interpretation, failure to record the data when there are multiple buses at an instance. This might not be considered as a serious issue but in case of failure of recording the data at gate ways where there is large scrutiny and high security it may lead to some serious security issues. Image pre-processing is an important step in any image analyzing system. Without a proper pre-processing, the recognition will be ineffective or may give improper results in later stages. The main motive of pre-processing is to enhance the quality of the image that will be processed for recognition. Various processes that we are going to apply are converting RGB image to Grayscale, noise reduction and binarization of image

II LITERATURE REVIEW

According to [1] only Observe Once in order to improve OCR accuracy, we applied the [YOLO] V3 model for Region of Interest [ROI] and a Convolution Neural Network [CNN]. Following the identification of the ROI, the data will undergo some pre-processing in order to better prepare it for input into the CNN model. A dataset of 6439 photos of various alpha-numerical characters from Indian Number Plates' Font was compiled. Weiner filtering is utilized for picture deblur, YOLO V3 is used for ROI, images are enhanced by segmentation, and OCR is performed using Convolutional Neural Networks.
In [2] a critical examination and theoretical evaluation of many established works in the subject. This research posits a multi-step identification procedure that begins with gathering pictures using cameras and ends with recognized complete plate numbers. These steps include image capture, area detection, character segmentation, database comparison, and database storage. A review of the technology behind reading license plates to determine the location of a vehicle. Using several image processing methods, a system for reading license plates is created.

According to [3] incorporating diagnostics and monitoring of license plate numbers automatically by the use of several

techniques (thresholding, morphological approaches, contour detection, etc.). In the end, KNN is utilized to classify data with higher precision. The latest method for unattended license plate reading of moving vehicles. It first employs a variety of techniques for edge detection, number outline detection, etc. The KNN technique for letter classification may be used for subsequent classification to improve results.

According to [4] at the toll plaza of a bridge. Both the vehicle and the driver's license number will be recorded in the suggested model's data table. In addition to accepting the first toll payment, the planned digital toll management system would also offer a framework for easing tensions in the toll system.

According to Mittal, N. et. al. [5] can be used for the further general estimation of individuals about state of mind too. Likewise it is valuable to comprehend the sentiment an image delineates to and consequently anticipate the class label. As a chunk of this task, it intends to give a sentiment based class to an image. Images conventionally fall under five classifications - love, happiness, sadness, violence and fear.

Kumar, A. et. al.[6] several posts on social media rarely contain any textual caption, but are rather flooded with images. Thus primarily contributing to a variety of opinions and emotions being conveyed quite implicitly merely through visual content. One can express sentiments through text, image or videos. Although several works in past have employed techniques to decipher sentiments from user posts, especially on social media.

According to Soomro, Shoaib Rehman et al [7] the goal is to design and implement an efficient Vehicle Number Recognition System for automatic tax collection. The computer first detects the car and then pictures the vehicle's front view. The number plate of the car is placed and the characters are segmented. The system is designed to detect the number plate regardless of color for gray images. When digital camera advanced and processing speed increased, various groups of scientists became interested in VNR after the 1990s. VNR is an imaging technology that enables digital images to be retrieved from the vehicle's license number. Template matching technique is used for character recognition. The resulting vehicle number is then compared to all available vehicle records for collecting vehicle type information and paying the toll tax accordingly. The machine is then allowed to open the vehicle's road barrier and produce the receipt of toll tax. The specifications of the car are also contained in the database. the record.

According to Saiyadi, Parviz et.al [8] Attempts to implement an algorithm that first uses the Sobel Operator to locate vertical edges of the vehicle plate image and then extracts the vehicle plate from the image by evaluating the histogram and composing the morphological operators. To determine the exact location of the vehicle plate in the picture and classify the vehicle plate numbers and letters, a system should be designed and implemented for this purpose. Time analysis in plate recognition systems is distinct based on different techniques and is of particular importance in the application context. Tried to apply a mixture of edge detection method, histogram analysis and morphological operation; there wasn't much processing time and processing was done quickly.

In [9] an approach based on a simple and effective method for morphology and sobel edge detection. We also present an easy approach for segmenting all the letters and numbers used in the plate number. Using histogram equalization, we are trying to improve the contrast of the binarized image after the noise from the input image. We focus on two measures in particular: the first is to locate the number plate and the second is, and many more.

In [10] The LPR The solution consists of two key modules: a module for finding the license plate and a module for classifying the license number. The former attempts to extract license plates from an input image, separated by abstract disciplines, while the latter attempts to translate the number into a license plate, conceptualized as neural artifacts. Soft computing techniques rooted in fuzzy and neural disciplines were implemented to account for the inconsistencies caused by noise, measurement error, and imperfect processing. Although the proposed algorithm concerns the license plates of one country, some parts of the algorithm are easily extended to other license plates countries.

Table 1: Summary of the vehicle license plate recognition methods

Author & Year	Detection Methods	Datasets	Advantages	Future Opportunities
Kumar, 2019 [11]	Gradient based Segmentation, Edge detection techniques	Their own dataset ontains 78 images.	This system to be helpful for the security of the vehicles.	This technique can be applied for any type of character segmentation and recognition.
Yaseen, 2019 [12]	AdaBoost based HOG features	North Iraq Vehicle Images (NI-VI) dataset,	The dataset must cover all real-life vehicle conditions	This dataset can be further used for Automatic Number

			likely to start, such as weather conditions, size, color, and license plates.	Plate Recognition systems.
Pustokhina, 2020 [13]	OKM-CNN, Improved Bernsen Algorithm (IBA), CCA	Stanford Cars, FZU Cars and HumAIn.	Performs in real time.	Multilingual LPs can be increased to recognize the efficiency of the OKM-CNN model.
Arafat, 2020 [14]	Connected component analysis, integrated edge based technique	Malaysia nLPs	For real-time applications, this technique is useful.	In the future, it ispossible to recognize LP characters using the DL architecture
Laroca, 2019 [15]	Fast-YOLOv2 and Fast-YOLOv3 models.	Caltech Cars, EnglishLP, UCSD-Stills, ChineseLP, AOLP, OpenALP	Proposed system achieved an impressive trade-off between accuracy and speed.	Further optimization the system can
		R-EU, SSIG-SegPlate, UFPR-ALPR		

III LIMITATIONS OF THIS STUDY

- The proposed system, due to the presence of noise, lack of lighting, and blurring of remote license plates, is not high enough in many realistic scenarios.
- The detection rate is significantly influenced by the luminosity of the body of the vehicle license plate.
- Proposed method is failed to detect the numbers, which have different width/height ratio when the training stage.
- Black license plate cannot detect the edge properly.
- The identification rate of their proposed scheme is lower for unclear plates, blurring and non-standard vehicle number plates.

IV CONCLUSION

This research article provides a brief summary of the technologies for detecting and recognizing vehicle number plates that are currently in use for efficient traffic monitoring and observation. The detection and identification of vehicle license plates plays a crucial role in the development of a smart transportation network. Vehicle number plate recognition has long been challenging due to factors such as illumination, glare, the lack of a standardized design for license plates, variations in plate style, and environmental color effects. Image processing and neural networks may be used for recognition of license plate characters, distance photographs, coding schemes, and photos taken at an angle or from the side. This research provides an accuracy-based categorization of the many approaches to vehicle number plate detection and identification. In this paper, we provide a fully automated license plate identification system built on convolutional neural networks (CNNs) educated on simulated photos. We present a single CNN architecture and optimize it for both the plate and character identification tasks. The networks are trained using a fabricated dataset, saving time and effort over manually annotating actual photos. We use a dataset of genuine photos captured by commercially available imaging devices in ambient light to evaluate the efficacy of our method

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