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An Intelligent Architecture for Automatic Number Plate Detection Using OCR and YoloV8 Model

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Abstract: - Automatic number plate recognition (ANPR) equipment in security, protection, and commercial has improved over the previous few years. NPR using computer vision (CV) is utilized to give rapid and precise recognition and classification. Several electronic methods have been implemented to classify vehicle process particulars based on vehicle license NP images using Yolov8 object detection methodologies. In the research architecture it utilized OCR and Yolov8 detection model for ANPRS. A yolov8 model trains the model to detect the vehicle number plate. The vehicle number plate registration is cropped, resized, and ROI extracted from the image; a yolov8 model uses OCR to verify the number plate and letters. They used the Kaggle ANPRS database and attained a maximum accuracy of 98.1 %. The implemented model could detect ANPRS on real-world car number plate images. The proposed model can be used for safety regions, army fields, and government agencies.

Keywords*: Automatic Number Plate Recognition System (ANPRS), Optical Character Recognition (OCR), You Only Look one (Yolo), Region-of-interest (RoI), Computer Vision (CV).*

1. Introduction

Nowadays, many vehicles are global, highlighting the requirements for efficient vehicle tracking solutions. New technology, specifically computer-based systems, gives practical ways to monitor vehicles without manual tracking. This automation significantly improves the tracking accuracy rate. One such technology is the number plate recognition system (NPRS), designed to verify number plates (N.P.s) from video footage cameras. It includes processes such as N.P. extraction, segmentation, character recognition (C.R.), etc. This system merges hardware and software features, considering N.P.s and converting them into images. Its uses extend to several entry points, like gate entrances, where the accuracy of the extracted image from the N.P. captured by the camera is precise and high resolution [1]. In some previous years, the recognition of license plates (LPs) has been a broadly beneficial method designed for vehicle surveillance (VS). It is used in several community locations to accomplish functions like automatic toll text collecting, a car parking system, etc. ANPR algorithms usually consist of four steps:

- Image capture of the car;
- Identification of the license NP;
- Segmentation of NP characters and
- Character Extraction or recognition.

Few methods fall into more than a single class based on several ways. It detects vehicle NP, and the following parameters should be considered [2]:

- Plate size
- Location of NP.

- Background of NP.
- Screw

The size of NP may be different from the in-vehicle image. NP may be located anywhere in the vehicle. N.P. may have distinct colors and backgrounds depending on the vehicle category. For illustration, a govt. Vehicle N.P. could have a different location than other community vehicles. A plate can have an attachment, measured as a character.

There are several advantages [3] of the License NP; the recognition system follows as follows:

- Monitoring and Surveillance
- Still and Video Recording
- Enhance Security
- Minimum Manned Surveillance

Several limitations in the automatic license NP recognition system will help them consider their study in this domain and design a vigorous license NP recognition system. There are generally several challenges [4] in India's automatic approval NP recognition system. All these limitations affect the precision of the license NP recognition system and the significant processing time for the scheme to be utilized in real time. The license NP recognition system experiments can be internal or outside issues of the license NP recognition system shown in Figure 1.

Experiments due to exterior issues of the license NP recognition system can be categorized into different main classes:

- Plate changes (i.e., size location, color, a character font, occlusion, noise, Obstructions, damaged plate)
- Environmental changes (i.e., lighting and surrounding effects)
- Camera mounting changes (i.e., angle, plate distance from the camera).
- Experiments due to internal parameters of the license N.P. recognition system can be categorized.
- The method utilized in the license NP recognition system
- Hardware used in the license NP recognition system (i.e., Motion blur, quality of image, an area of interest).

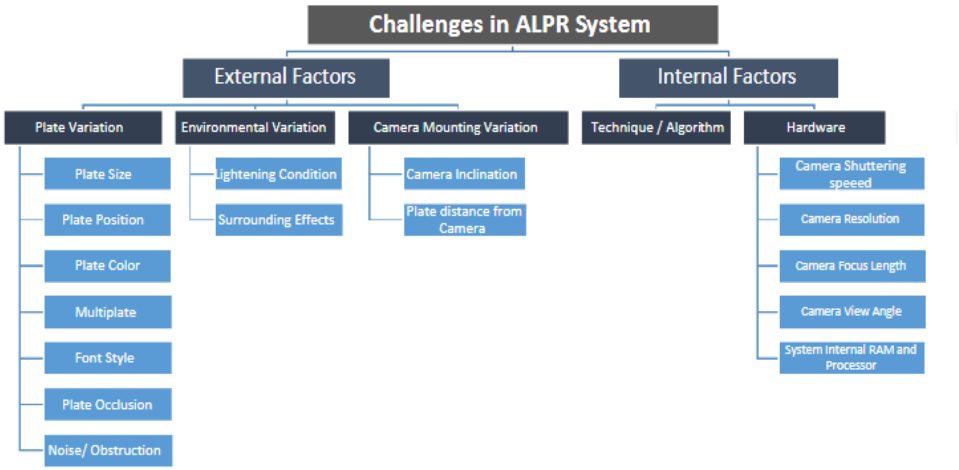

Figure 1. Categories of distinct automatic license N.P. recognition system challenges [4]

Several articles were studied. The author[6] discussed and proposed a model to reduce the existing problems, such as lowering accuracy rate and speed, using the deep learning (DL) model for license NP recognition. Generally, they add an enhanced channel consideration device to the downsampling procedure of the YoloV5 (You only look once). The location data included ones to reduce the data loss from the sample that can enhance the Model's feature extraction (FE) capability. So, they optimize the no. of metrics on the input side and set only one class in the YOLO Layer, which enhances the effectiveness and precision of the detection of vehicle number plates. *Ashok Kumar et al. (2020) [7]* presented an automated tool for automatically detecting an Indian vehicle's number plate. An author's suggested approach for automating the number plate changeover for Indian cars is described. Many different vehicles were operating on Indian roads, each with a different size and construction, which led to various NPs. Although there are tight standards for number plate designs, it was possible to see several variations on the actual number plates of many cars. However, the licensing plate issuing authority's standard was Hindu Arabic numbers with Latin letters, even though NPs were printed in many different Indian languages. The authors utilized the Prewitt filter for feature extraction, and three techniques, like Decision Tree (DT), k-nearest Neighbor (KNN), and Artificial Neural Network (ANN), were utilized. *Reshu Kumari et al. (2017) [8]* developed an automated tool for number plate detection. The authors built a training base for vehicle NPD. The combination of characters on license plates was exclusive and utilized various things. The complete procedure was divided into three steps: image capturing, plate localization and analysis of plate symbols. They also utilized HOG features for training motivation, and the SVM method was deployed for study and classification. The performance of the proposed was better by using more than a hundred input images.

A. Motivation

The existing license number plate location issue is under challenging environments like minimum resolution and various vehicles [5]. This article introduces a vehicle number plate recognition or detection approach based on YOLOv8. Initially discussed, this article analyses the traditional licence number plate recognition approach and its benefits. It analyses several feature extraction and DL methods used in number plate detection. It developed image pre-processing and segmentation techniques using the OTSU. It implemented an optimized YOLOv8 model for classifying the vehicle number plate. It calculated the performance metrics such as accuracy, error, etc.

Verifying these existing issues, a new YOLOv8 method to improve the detection and classification of the number plates (NP) is defined in this article. The input data are initially collected from the Kaggle [22] (Vehicle number plate detection) images. Then, image pre-processing phases are applied to collected images to convert the RGB2gray, crop images, remove noises, and filter the processed images for improvement and give better results. Next, the OCR was used to recognize the characters; after recognition, the Yolo V8 model was used to improve the classification and detection in the number plate system. Yolov8 was implemented to enhance accuracy and error rates on Kaggle VNPRS images compared to the existing methods.

This article is discussed in sections: Section 2 provides the existing issues surveyed in the last years. Section 3 describes the current problems and research gaps. Section 4 discussed the characteristics and methods of traditional licence number plate recognition (LNPR). Section 5 describes the research methodology and proposed method in detail. Section 6 discusses the result analysis of the implemented Model and compares it with the existing models. Lastly, section 7 explains the conclusion and further work related to the proposed work.

2. Related Works

M. Maheswari et al. (2020) [9] described that the number of vehicles, 2-3 wheelers, used for road transportation increased significantly with the invention of the automobile and developments in the manufacturing world. As several vehicles increased, the number of traffic offences on the roads increased as well. Depending on the Indian traffic road system, keeping track of a violation from such an incident was laborious and difficult. However, measures were taken to monitor traffic infractions on the road by using a system to identify vehicles with license plates involved in speeding or breaking the law. In the context of vehicle license plate identification for innovative transportation structures, license plate position was a fundamental subject.

Abhishek Kashyap et al. (2018) [10] described the NP recognition system as a security measure. In the NPRS, the IP (image processing) concept was applied. The OCR model was also used to detect the vehicle number plate image. Numerous uses exist for number plate recognition systems. Liked tollway specialists used this technique to open the toll road intended for that specific automobile after repeatedly identifying that car's license plate and offering it delivery for payment. Parking officials also employed this method to permit vehicles to park in their region. The number plate images were reserved and managed, and every character from the plate was delivered to confirm accurate recognition. The proposed Model provides around 75-85% performance for Indian number plates.

Hengliang Shi et al. (2023) [11] described the DL model for license NP position and detection in natural scenarios, which was recommended in a determination to address the subject of limited accuracy and speed through traditional methods. Firstly, the authors improved the channel care method of the you-only glanced once(YOLOv5) downsampling procedure. To reduce information loss due to sampling, site data was added to the ones, which might have increased the Model's robustness for feature extraction. The detector for finding license plates was made more effective and precise by reducing the number of metrics on the input side and setting only one class in the yolo layer. Gated recurrent units (GRU) and connectionist temporal classification (CTC) were used to complete the acknowledgment network.

Ravi Kumar et al. (2020) [12] described significant groups of intelligent transportation and detection mechanisms (STDM). They were composed of tools in which the use allows the system to detect and mechanically read the license I.D. of the vehicle NP from digitally considered images. Automatic recognition of the license NP was the development of distinguishing and transforming the pixel data of a digital image into plain texted data or ASCII code-based number plate. Using measured morphological operations, the authors implemented a method for detecting vehicle number plates from the photo. The primary motive of the developed model was to deploy and compose various morphological developments in which the license NP of a particular vehicle could be distinguished and translated effectively. The implemented model could detect the license NP perfectly and rapidly from the vehicle's picture.

V. Gnanaprakash et al. (2020) [13] described Individuals who strongly desire a safe way of life and travel in this era of speedily emerging skills. The number of automobiles on the road has developed over the last ten years. Tracking individual vehicles became challenging as the automotive industry continued to create dramatically daily. The authors proposed an automated vehicle tracking model that used roadside security cameras to track rapidly moving automobiles. Attaining CCTV footage in the background in real-time was a somewhat laborious task. An effective DL model was employed for object detection to address this subject.

Yang Yang Lee et al. (2022) [14] developed ANPRS that mainly utilized CNN processing. That was considered to be the standard processing method for complex data. New CNN model strategies and post-processing approaches using varying levels of ALPR performance were proposed in numerous ALPR studies. Conversely, with some model tuning, high-performing models such as YOLOv3 and SSD in more wide-ranging faced identification and recognition tasks could be effectively applied to the license NP detection use. This investigation's primary emphasis was researching preparation parameters in transferring the YOLOV3 model strategy and optimizing the training mainly for license NP identification tasks. Table I discussed the existing research work with different metrics, datasets, gaps, etc.

TABLE I. ANALYSIS OF VARIOUS EXISTING WORK

Author Name	Methods	Problems/ Gaps	Simulations/ Dataset	Parameters Utilization	Outcomes
M.Maheswari et al. (2020) [9]	COCO-API RCNN KNN	This method does not detect various dimensions and large number patterns.	Number plate captured image	Accuracy	This method provides better performance for number plate detection.
Abhishek Kashyap et al. (2018) [10]	Automatic number plate recognition Thresholding	Limited performance accuracy	9745 images	Accuracy	They composed various methods for number system tracing
Henglian g Shi et al., (2023) [11]	DL based YOLOv5	The proposed Model not understand the real-world application in life.	CCPD dataset 12500 images	Accuracy Time Precision	It provides overall recognition results in complex situations with strong stability and robustness.
J.M. S. V. Ravi Kumar et al.(2020) [12]	Bilateral Filtering	Complexity in the utilization of criminal data	Images captured by ANoIR camera	Accuracy	The proposed method provides scalability, security, less expensive and optimized performance.
V. Gnanapr akash et al.(2020) [13]	YoLo Model Neural network	Complex implementation process due to large dataset.	IMAGEAI tool And Kaggle dataset	Accuracy Mean average Precision (mAp)	Utilized Tamil Nadu license plate imageries for detection and reached better accuracy.
Yang Yang Lee et. Al (2022) [14]	CNN	Lack of real-world utilization of specified Model.	32MP image with a DSLR telephoto lens, Malaysian LP dataset.	Train test ratio, L2 regularization, Learn rate, 3D fold AP, miniBatch size, numberofEpochs	Deliver better performance as compared to existing methods.

3. Problem Statement and Research Gaps

Number plate detection and identification are essential for various traffic regarded uses and represent an active research field within IP. Many experts have developed methods and tools to enhance the performance of number plate detection systems. However, several challenges and complications persist, impacting the effectiveness of the detection process. Researchers face additional real-life challenges and practical application issues, including plate category registration, color, font features, font style, and plate locality registration. Environmental factors such as lighting and climate also play a significant role. Moreover, identifying license plates can be complex due to variations in formats across different countries, including differences in color, font, and language. Some number plates have colored borders, while others have plain backgrounds, adding indirect challenges to capturing and identifying car number plates.

Ojo Abayomi Fagbuagun et al. (2020) [15] encountered a significant issue when a single camera detected two vehicles simultaneously, resulting in inaccurate detection of both license plates. Addressing this limitation could involve enhancing the system to detect multiple number plates accurately.

Imran Shaf et al. (2022) [16] implemented their method using a large dataset, which improved detection performance. However, they noted that their approach might not be suitable for smaller datasets. To enhance the Model's robustness, consideration of weather conditions and smaller datasets may be necessary.

Anchal Baliyan et al. (2022) [17] developed a model to detect Indian car number plates, limiting its applicability to other countries. The Model could be extended to broaden its utility with a diverse dataset that includes foreign number plates. Table II summarizes the limitations identified in previous research on number plate detection.

TABLE II. RESEARCH GAPS

Author's name	Limitations/Gaps
Ojo Abayomi Fagbuagun et al. (2020) [15]	This method cannot extract two number plates when similar cameras detect two vehicles.
Imran Shaf et al. (2022) [16]	Requires massive datasets for implementation and provides limited robustness.
Anchal Baliyan et al. (2022) [17]	This method does not apply to foreign number plate datasets.
Raluca Marina Sferle et al. (2019) [18]	This method is insufficient to detect horizontal and vertical angles beyond thirty degrees.
Fahd Sultan et al. (2023) [19]	This method does not correctly manage occlusion in number plate detection.
Vaddi et al. (2023) [20]	There is a high probability of having errors as it is a manual task and may also lead to data loss. Sometimes, a person who is violating the principles is being taken manually.

4. Traditional Automatic Number Plate Recognition System (NPRS)

It relies on license plate characteristics and image processing theory. Deep learning and computer vision advancements have led to more sophisticated algorithms using CNNs and object detection models for improved accuracy. License plates are unique alphanumeric codes used in traffic monitoring, law enforcement, and automated toll-collection systems [21]. The traditional license plate location algorithm accurately detects and localizes them in images or videos.

A. License number plate features

License plates, both domestic and foreign, are designed with distinctive color schemes, numbering systems, designs, holographic elements, and security features to prevent counterfeiting.

- *Color*: License number plate boundaries are determined by color matching patterns, allowing for accurate identification and efficient processing in applications like automated toll collection systems and law enforcement activities, as the color distribution and arrangement on the plate are crucial.
- *Text*: China's domestic license NP consists of seven characters: a region-specific Chinese character, a capital English letter indicating the city or district, and a unique combination of letters and numbers for individual vehicle identification.
- *Geometric*: China's license plate design, primarily rectangular or parallelograms with a 3:1 aspect ratio, is being researched for alternative shapes and aspect ratios to improve aesthetics and functionality.
- *Grayscale*: The license plate image uses contrasting gray colors for characters, background, and vehicle body, enhancing visibility and legibility and a gray gradient edge for visual appeal.
- *Position*: The fixed position of license plate images on vehicles allows easy identification and efficient data processing by surveillance cameras and law enforcement.

B. Number Plate Recognition System (NPRS)

Various license plate location algorithms, including Adaboost, texture features, color information image segmentation, mathematical morphology, and neural network, are analyzed, and their advantages and disadvantages are evaluated [21]. These algorithms are used in object detection, facial recognition, and autonomous vehicles. Adaboost localization is known for high accuracy, while texture features handle complex backgrounds. Color information image segmentation is effective in varying lighting conditions, and mathematical morphology is helpful in partially occluded license plates. Neural networks offer versatility but require extensive training data.

- *Adaboost-based:* The Adaboost-based LNPRS method uses extensive sample data to train a robust classifier that effectively handles complex backgrounds and lighting conditions. It achieves high accuracy by combining multiple weak classifiers, each focusing on different license plate features [22].

- *Texture Characteristics based:* The license NP position method uses texture, geometry, and grey features, along with digital image processing, to accurately identify and extract license plates from images or videos, ensuring precise localization and handling lighting conditions, angles, and license plate sizes [23].
- *Color Segmentation based:* The license plate location algorithm converts license plate images into color space, identifies valuable color areas, and employs horizontal and vertical projection techniques for data extraction and analysis [24].
- *Mathematical Morphology Based:* It is a set theory-based method for analyzing image structure, used for FE, edge detection, enhancement, and restoration. Combining it with edge feature detection algorithms can enhance license number recognition [25].

Many LNP images have problems, like the low quality of image shooting, interference of image perspective, intense light caused by vehicle surface reflection, and color comparison between the license NP and car body, so the method must meet the robustness necessities. Table III details that traditional automatic number plate recognition algorithms have advantages and disadvantages.

Table III. Advantages And Disadvantages Of Traditional Number Plate Recognition System [21]

Algorithms	Advantages	Disadvantages
Adaboost	The fast-processing speed of the algorithm is crucial for efficient data analysis, real-time decision-making, rapid image processing, and high-speed data transmission in various applications.	License number plate recognition failure occurs when the distance or viewing angle change range is significant, making it challenging to accurately interpret and locate license plate information.
Texture Characteristic	A license number plate recognition system is highly effective due to its high contrast, clear texture, ability to identify oblique or deformed plates, and performance under uneven illumination.	The driver's sensitivity to noise significantly reduces location speed when encountering similar license plate texture characteristics like bumpers and exhaust valves.
Color Segmentation	High algorithm location accuracy is crucial for navigation systems and autonomous vehicles, requiring advanced sensor technologies, robust data processing, and accurate environmental modelling.	Slow processing speed can reduce the accuracy of license plate location when there is a billboard or background similar to the license plate's color in the image.
Mathematical Morphology	Fast algorithm processing speed is crucial for efficient data analysis, image processing, high-speed data transmission, and improving system performance.	Integrating multiple location algorithms improves system accuracy and reliability, leveraging strengths and addressing weaknesses, providing a robust, comprehensive solution for diverse applications.

5. Research Methodology

Vehicle number plate recognition system (VNPRS), the proposed Yolov8 method, defined different steps:

- Input data is collected from the onsite Kaggle site.
- Pre-processing is applied using grayscale, resize, crop, noise removal, smooth images, and segmentation methods.
- A novel Yolov8 model was implemented for segmentation and detection purposes.

- Valuable features of vehicle license NPSR are attained in feature and distance evaluation equations. The research model workflow Yolov8 approach is defined in Figure 2.

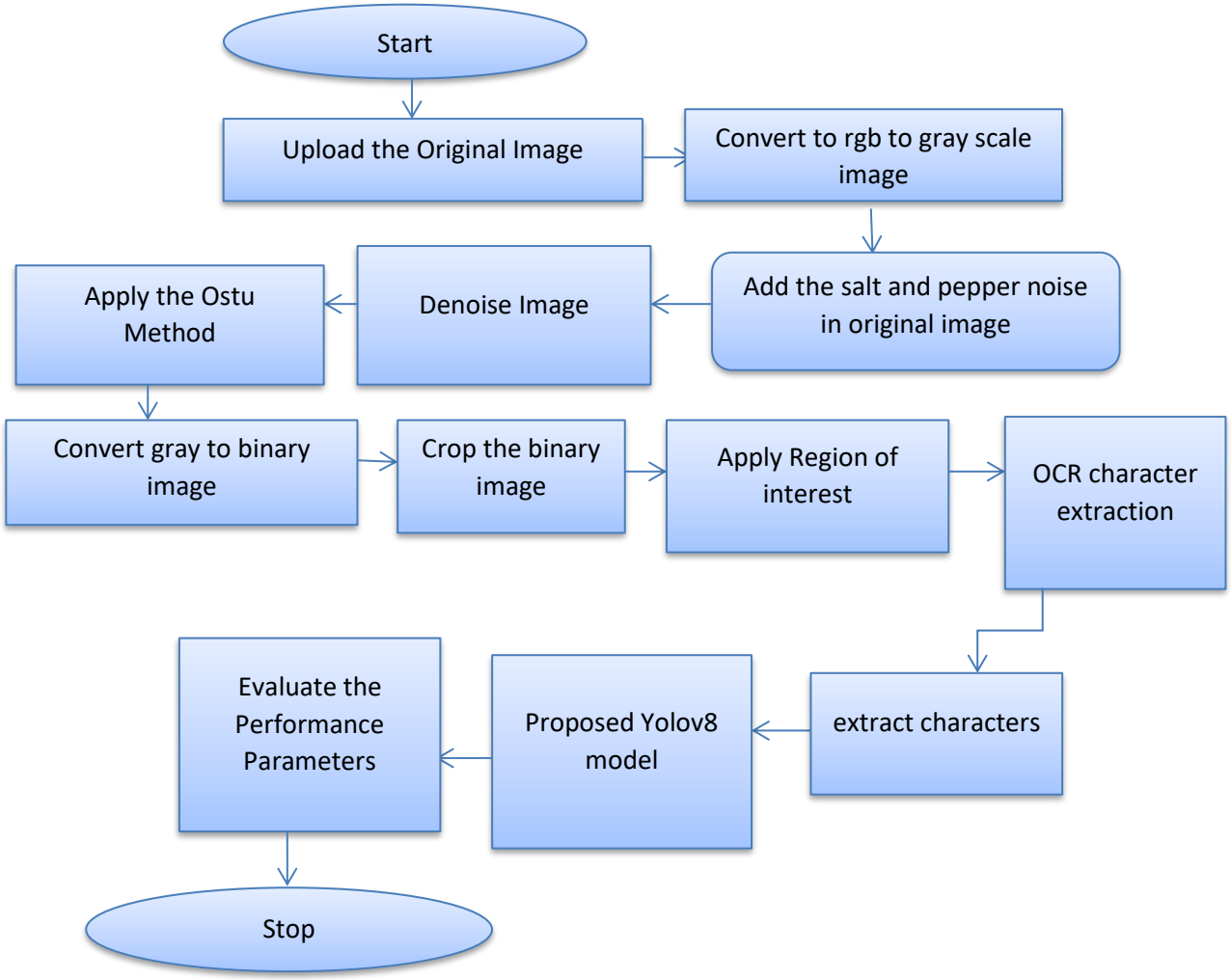

Figure 2. Proposed Flowchart

A. Datase Collection

The first phase of the automatic number plate recognition system (ANPR) [26] and its inclines to get the frontend image of a vehicle via a good camera. The database consists of 1000 images of front views of vehicles like cars, jeeps, etc. Of that, 900 images are novel number plate systems, while 560 are old plates. The vehicles were considered from distinct positions in Nigeria using 16 megapixels, which is more cost-effective than more costly digital cameras. Figure 3 represents the train image of vehicle number plate images.

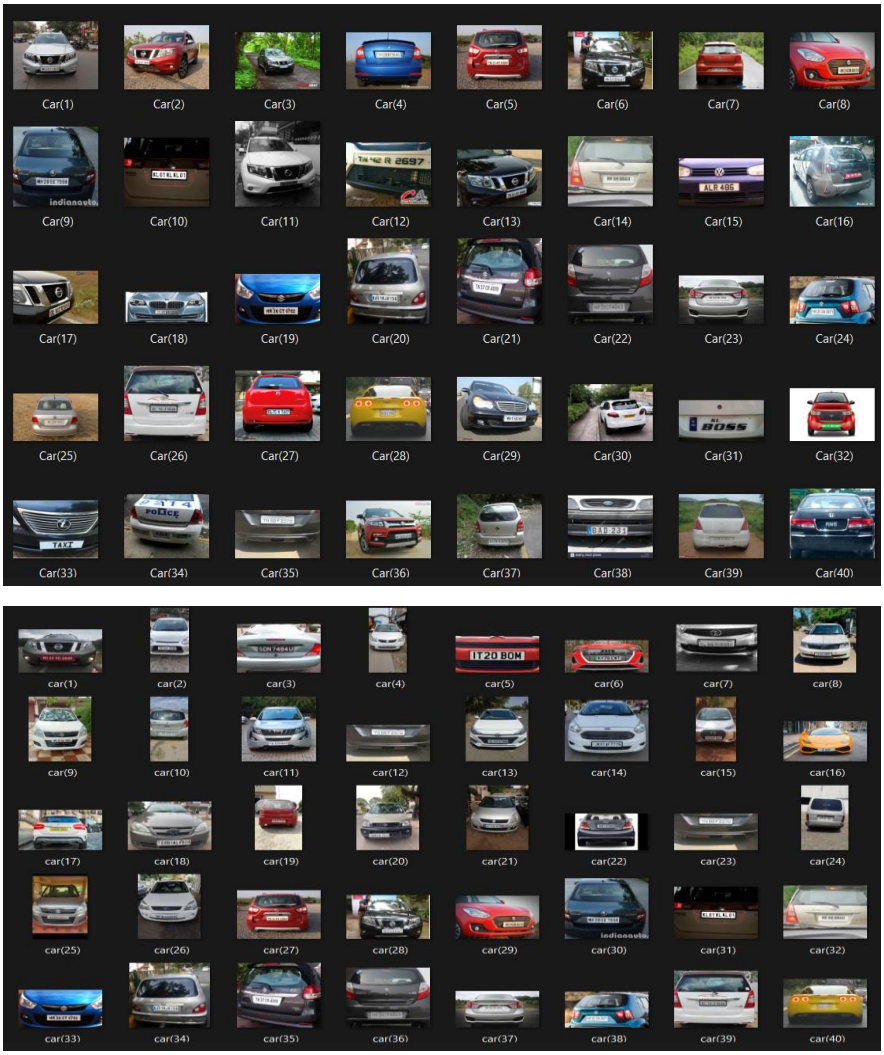

Figure 3. Train and Test Vehicle NPRS (Number Plate Recognition System)

B. Pre-processing

The image pre-processing phase helps in improving the vehicle image for further processing.

- *RGB2gray:* After the image is collected, the next phase is to convert the RGB fromat to grayscale image to optimize the quality of data in the image into a reliable phase without cooperating with its quality. The eq (i) for interchanging from RGB format to grayscale level is defined in eq (i).

$$A = 0.299\ R + 0.58\ G + 0.11\ B \quad \ldots\ldots\ldots(i)$$

Here, eq (i), R represents red, G represents green, and B represents blue. Figure 4 illustrates the uploaded image. Figure 5 defines the crop of the input image according to the dimensions, which is m*n.

Figure 4. Input RGB format Image

Figure 5. Cropped image

- *Filtration*: The noise the optical camera represents can cause disconnected line segments and gaps that can affect further processing. It is also called unwanted noise that can eliminate the image quality. The noise is optimized via a noise reduction method known as the median filter approach. Filter, which is the non-linear filter, is utilized to remove impulse noise called salt and pepper noise.
- *ROI using the Otsu Method*: It extracts the image segmentation known as ROI; the number plate (NP) characters manifest with the help of a green border box. In the future, the needed features of the image will be saved within the corresponding. Figure 6 shows the ROI image using the Otsu method.

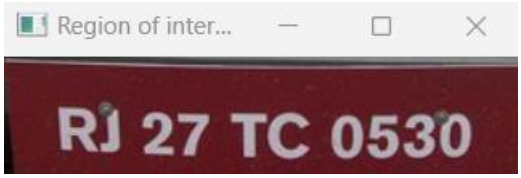

Figure 6. ROI Image

C. OCR (optical Character Recognition)

The technology recognizes characters through the eyes, similar to human reading abilities in Figure 7. It is widely used in document scanning and text extraction, enabling efficient digitization of printed or handwritten text. OCR also improves accessibility for visually impaired individuals by converting printed materials into audio or braille formats.

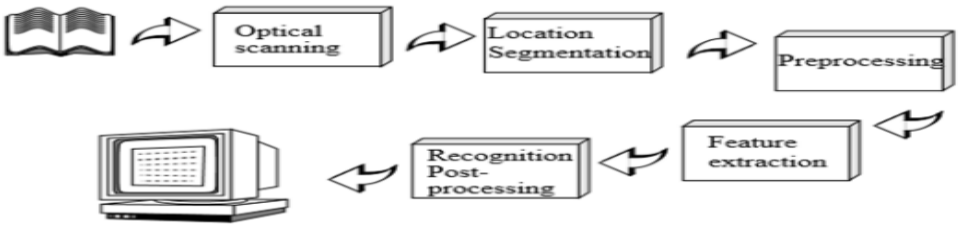

Figure 7. General Configuration of OCR [27]

The brain processes the image, varying based on factors. OCR technology uses letters, numbers, and symbols to represent characters in documents, digitizing them, extracting symbols, and processing them to eliminate noise, improving data entry and document management efficiency. Figure 8 illustrates the flow diagram of OCR for number plate detection. OCR is a technique used to extract text from various sources such as images, papers, boards, and medicines, ensuring further data processing before output. Figure 9 shows that character extraction and recognition are done using the OCR method in vehicle number plates.

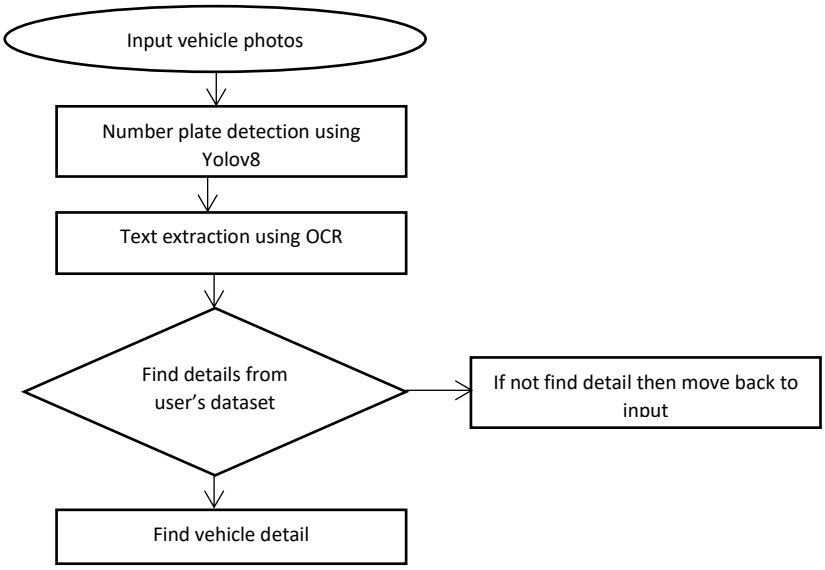

Figure 8. Flow diagram of OCR [28]

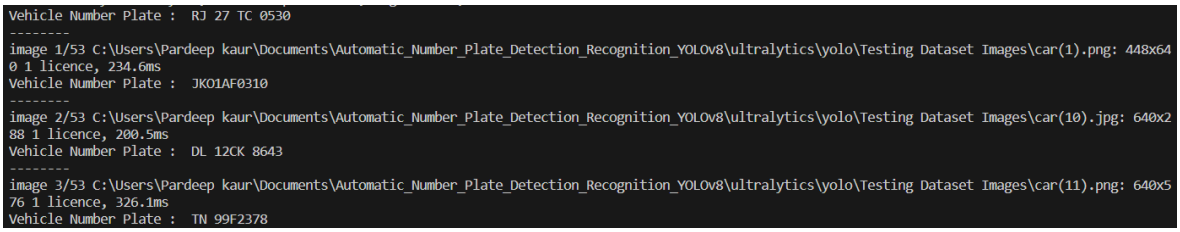

Figure 9. OCR Character Recognition

D. Yolov8 using Classification and Detection

It shows the model collection for object detection (OD), classification, and segmentation jobs. Yolo stands for *you only look once* a sequence has gained popularity in CV for its substantial precision while recollecting a compact model framework. Yolo models are agreeable to training on a single GPU, interpreting them widely accessible to developers. YoloV8 [29] attains robust performance on the Kaggle dataset. It was chosen as the base framework for automatic NPRS. Yolo is called for its real-time OD capabilities and has been broadly used in CV uses. The decision to utilize Yolov8 was based on its enhanced precision and presentation compared to others shown in Figure 10.

Figure 10. YoloV8 detection

6. Simulation Result Analysis

The proposed Model is developed using Python software with the system requirements, operating system (OS)-Windows 10, random access memory (RAM) -128GB, processor Intel Core i7, and HD-4TB. It evaluates the effective OCR-YoloV8 model, and the currently implemented work is compared with existing approaches, such as CNN, Yolo, etc., on the Kaggle Automatic NPRS database. In this research result, the performance of the proposed Model is proposed in terms of accuracy, error rate, etc. The performance parameters are discussed in eq (i) and (ii).

- *Accuracy:* The performance metric is the ratio of precisely classified explanations between the total remarks. The complete error rate is determined by subtracting the precision percentage from 100.

$$Accuracy = ((Tr\_p + tr\_n)/(tr\_p + tr\_n + fa\_p + fa\_n)) * 100 \quad \ldots\ldots (i)$$

$$Err\ rate = (100 - Accuracy); \quad \ldots\ldots\ldots\ldots (ii)$$

Here, eq (i) Tr_p = true_positive; Tr_n = True_negative; fa_p = false_positive; fa_n = false_negative.

A. Results

In this results section, the automatic NPRS Kaggle database is suggested to analyse the calculation of the proposed OCR+Yolov8 model. The proposed Model is generally compared with existing recognition and classification methods, like CNN, OCR, Yolov5, etc., to validate its efficiency over other methods. The research work measured different vehicle NP images used for simulation analysis for the Kaggle dataset, in which 80% of image data was used for training and 20% for testing- by analysing Table IV, the proposed Model Yolov8 with OCR attained better outcomes in car number plate image detection and classification than other approaches using accuracy, etc. The proposed Model obtained a 98.1 % accuracy rate (%) and 1.12 error rate with evaluation in different Images.

Table IV. Performance Calculation With Proposed Model (OCR-YoloV8)

No. of Images	Accuracy (%)	Error Rate
10	63.8	36.1
20	75.1	25.9
30	88.7	12.3
40	92.1	8.9
50	98.1	1.12

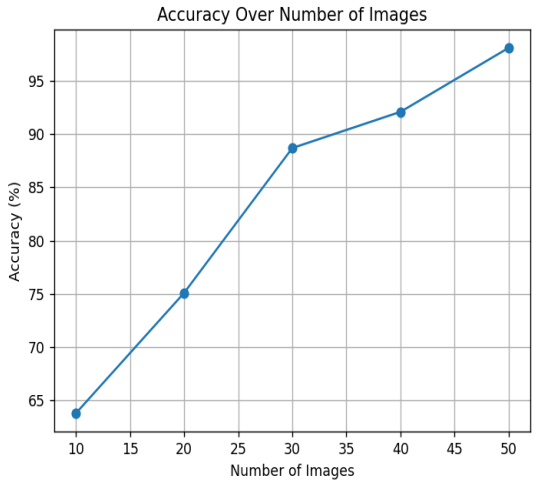

Figure 11. Proposed Model (OCR-Yolov8) Accuracy (%)

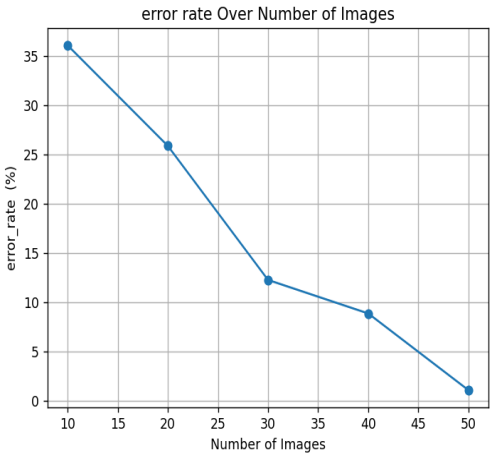

Figure 12. Proposed Model (OCR-Yolov8) error rate

Automatic NPRS database, the proposed (OCR-Yolov8) model, represented a maximum accuracy of 98.1% and an error rate value of 1.12 with different numbers of images. The graph shows the analysis of the proposed model on the automatic NPRS database, shown in Figures 11 and 12.

Table V. Comparison With Existing Methods With Automatic Number Plate Recognition System (NPRS)

Authors	Methods	Accuracy (%)
Yash et al. 2023[30]	LPD	96.2
	RCNN	92
	Yolo	90
	Yolov3	91
	Deep CNN	88
Umair et al. 2021 [31]	DALPR	60
	KLPR	72
	CNN	89
Proposed Model	OCR-Yolov8	98.1

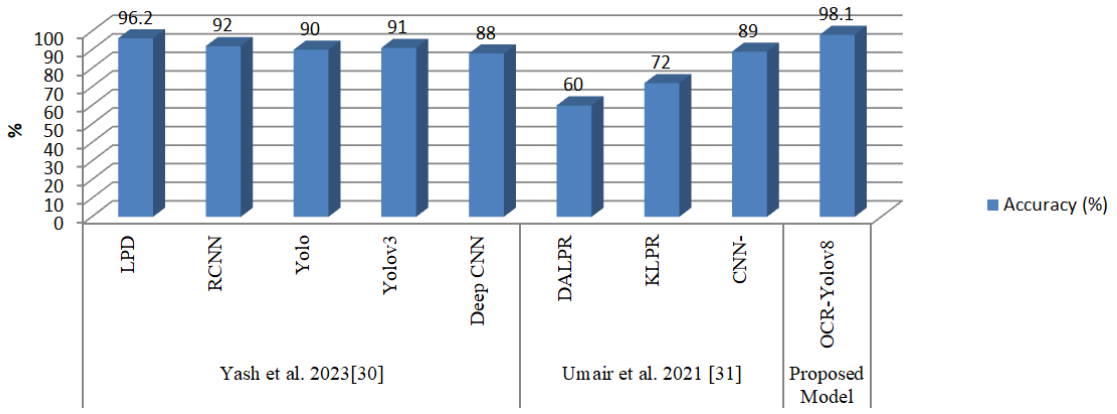

Figure 13. Comparison Analysis with Different Methods

Table V shows the LPD, RCNN, Yolo, Yolov3, Deep CNN, etc., performed better using the ANPRS database accuracy rate (%). The LPD methods obtained a 96.2% accuracy rate, CNN of 89%, etc. The graphical representation shows the comparative analysis of the existing techniques on the Kaggle automatic NPRS database, shown in Figure 13.

7. Conclusion and Future Scope

This research article presents the proposed OCR with the YoloV8 method to detect and classify the number plate recognition system from the images. The main objective of this implemented article is to execute the character extraction using the OCR method and detection using YoloV8 methods for the vehicle NPRS. The proposed model comprises three phases: preprocessing, recognition, and detection. Preprocessing eliminates unwanted noises, filters the number plate, and extracts the region of interest (ROI). After preprocessing, the OCR approach extracts the character data in the number plate image. The proposed represented a Yolov8 version for classifying and detecting Indian vehicle NPRS. The proposed model attained 98.1% accuracy with an error rate value of 1.12 for automatic NPRS and compared with existing models such as CNN, RCNN, Yolov3, etc. The proposed model can be used as an MLP (Multiple Layer Perceptron) method with YoloV8 to spontaneously verify the NP character's language based on training data.

Refrences

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