IJARETY

International Journal of Advanced Research in Education and TechnologY (IJARETY)

Volume 12, Issue 2, March-April 2025

Impact Factor: 8.152

www.ijarety.in editor.ijarety@gmail.com

International Journal of Advanced Research in Education and TechnologY(IJARETY)

| ISSN: 2394-2975 | www.ijarety.in| | Impact Factor: 8.152| A Bi-Monthly, Double-Blind Peer Reviewed & Refereed Journal |

|| Volume 12, Issue 2, March-April 2025 ||

DOI:10.15680/IJARETY.2025.1202059

Localization of Number Plate using Dark-Net for Crime Prevention

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ABSTRACT: Automatic Number Plate Recognition (ANPR) is a technology that uses Optical Character Recognition(OCR) to read the registered vehicle number plate. image processing technology which uses a number (license) plate to identify the vehicle. In this paper, we have introduced by using Optical Character Recognition(OCR) how the respective authority can monitor vehicles for a criminal record. In this system Vehicle Number plate first get detected, Identified and monitored of vehicles for criminal records. so Basically the system includes 4 Modules i.e Detection, Identification, Monitoring and Web application (for Notifying police) Respectively. The objective is to design an efficient automatic vehicle identification system by using the vehicle number plate. The system can be implemented on residential societies, tolls, business complexes and parking spaces in India where crimes happen because of a lack of an automation system for vehicle monitoring.

KEYWORDS: Automatic Number Plate Recognition (ANPR),OpticalCharacterRecognition(OCR),criminal record, Detection,Identification,Monitoring.

I. INTRODUCTION

Number Plate Detection System is an advanced License technology computer vision based system and has the power to mechanically determine the vehicle by capturing and recognizing the number plates of any vehicle with the assistance of a video, provided by CCTV cameras. In the previous couple of years, various Plate Detection has been one in all the helpful approaches for vehicle surveillance . It will be applied at a variety of public places to achieve some of the needs like traffic safety, social control, automatic toll text assortment,car park system and Automatic vehicle parking system. ANPR algorithms are usually divided into four steps Vehicle image capture, Number plate detection, Character segmentation and Character recognition. The first step is to capture the video and the 2nd step to capture the image of a vehicle appearance terribly straightforward however it's quite exigent task because it is very troublesome to capture a picture of a moving vehicle in real time in such a way that none of the elements of the vehicle particularly the vehicle number plate should be lost. The success of the fourth step depends on whether the second and third step are ready to find vehicle variety plates and separate each character. Automatic number plate recognition helps to combat organised high-risk locations like connecting roads, town centers, airports and public buildings. moveable and stationary.

ANPR cameras and analysis computer code give continuous traffic surveillance work. Recorded ANPR knowledge is transmitted in real time then processed in a very secure knowledge center. The Web Application is then used to evaluate the information for comparison against watchlist instantly alerting the police and security authorities once a suspect vehicle is knownANPR systems use CCTV cameras, this can be to not say that CCTV is analogous to ANPR.The CCTV system sometimes captures the videos and from that video this algorithm can discover the pictures of bikes, cars etc. whereas its number plate and records the number plate knowledge within the sort of a text. There will be information which incorporates vehicles that are taken or those linked to crime. This technique is

Power theft, a significant issue in the energy sector, refers to the illegal consumption of electricity through unauthorized means, such as bypassing meters or tampering with electrical infrastructure. It is a major concern for utility companies, as it results in significant revenue loss, increased operational costs, and safety hazards. To combat power theft effectively, innovative technologies and detection systems have been developed. These systems rely on a combination of data analytics, sensor technologies, and machine learning algorithms to detect anomalies in energy consumption patterns. By identifying irregularities in real-time, power theft detection systems help utilities pinpoint fraudulent activities, reduce losses, and improve the overall efficiency of power distribution networks.

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This approach not only helps in curbing theft but also ensures a fair distribution of electricity, minimizes environmental impact, and enhances customer satisfaction. In this context, the need for advanced, scalable, and robust power theft detection solutions has never been more critical. In recent years, technological advancements have revolutionized how power theft is detected and prevented. Traditional methods of identifying and addressing power theft were often reactive, based on routine inspections and

physical checks. These methods were time-consuming, costly, and, in many cases, ineffective due to the sheer scale of the problem. The need for more efficient, proactive, and accurate systems has led to the development of modern power theft detection techniques. The integration of smart meters, remote sensing technologies, data analytics, and machine learning algorithms offers utilities the ability to identify fraudulent activities with greater precision and speed. This evolution of power theft detection technology is essential not only for reducing financial losses but also for improving the sustainability and integrity of power systems.

As the world transitions toward more advanced grids, such as smart grids and renewable energy-powered networks, the ability to detect power theft will become even more critical in maintaining a stable and reliable energy supply. Additionally, the push for energy conservation and carbon footprint reduction makes it vital to eliminate wasteful practices, such as power theft, that exacerbate the environmental impact of electricity production. For example, countries in South Asia, Africa, and Latin America have seen some of the highest rates of power theft. The scale of the problem can lead to an increased cost of electricity for legitimate consumers, as utilities are forced to recover their losses through higher tariffs. Additionally, power theft can create unfair disparities, as those who engage in theft benefit from free or reduced-cost electricity at the expense of paying customersphysical checks. These methods were time-consuming, costly, and, in many cases, ineffective due to the sheer scale of the problem. The need for more efficient, proactive, and accurate systems has led to the development of modern power theft detection techniques. The integration of smart meters, remote sensing technologies, data analytics, and machine learning algorithms offers utilities the ability to identify fraudulent activities with greater precision and speed. This evolution of power theft detection technology is essential not only for reducing financial losses but also for improving the sustainability and integrity of power systems.

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II. LITERATURE SURVEY

We have prepared this paper which represents the approach which is completely based on simple and efficient operation and some morphological operation and some edge detection method. It presents a simple approach to capture all the alphabets and numerics used in the plate. After capturing the image from the video to analyze the contrast of the machine-coded image using some algorithm named histogram equalization.

We mainly concentrate on two steps, first is to check the number plate and the second is to detect all the numbers and letters to identify each number separately. This system is prepared based on images and can be easily applied to toll systems for the use of documenting access of passing services, security usage of roads, and also to prevent car theft issues.

The proposed algorithm is based on a combination of morphological operation with area criteria tests for number plate localization. The discussed paper presents a car plate recognition system.it describes design algorism and the future of implementation. This method is readily supported in pictures and may be simply applied to toll systems for the employment of documenting access of passing services, security usage of roads, and conjointly to forestall automobile thievery problems.

Those are plate localization, character segmentation, and character recognition. First, the number of the plate is extracted from the original image, then the characters from it are isolated, and finally, each character is recognized.

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The algorithms were developed using a set of training images. The final program is capable of extracting the desired information in a high percentage of the test images. An efficient and robust method of locating license plates is presented. The method makes use of the rich corner information in the plate area and the edge information of license plates. It can deal with more difficult location problems, especially with a license plate that is already in existence in a complicated background.

III. PROPOSED METHODOLOGY

centered around developing an automated system that can detect and localize vehicle number plates using deep learning techniques. The process begins with gathering a wide range of vehicle images, particularly from surveillance footage, traffic cameras, and relevant datasets. These images are then manually annotated to mark the exact location of number plates, preparing the dataset for training.

Using the Darknet framework, the YOLO (You Only Look Once) object detection algorithm is configured and trained on the annotated data. This involves setting up model parameters suitable for number plate detection and leveraging GPU support to speed up the training process. The model learns to identify and localize number plates within various lighting conditions, angles, and image qualities.

After training, the model is evaluated on a separate test set to ensure its accuracy and reliability in detecting number plates. Once validated, the model is integrated into a real-time detection pipeline, where it processes live or recorded video feeds to identify number plates. To further enhance its use in crime prevention, the system can be extended with Optical Character Recognition (OCR) to extract textual information from the detected plates. This data can then be cross-checked against law enforcement databases to flag suspicious or wanted vehicles, enabling timely alerts and action.

IV. SYSTEM DEVLOPMENT

4.1 Architecture

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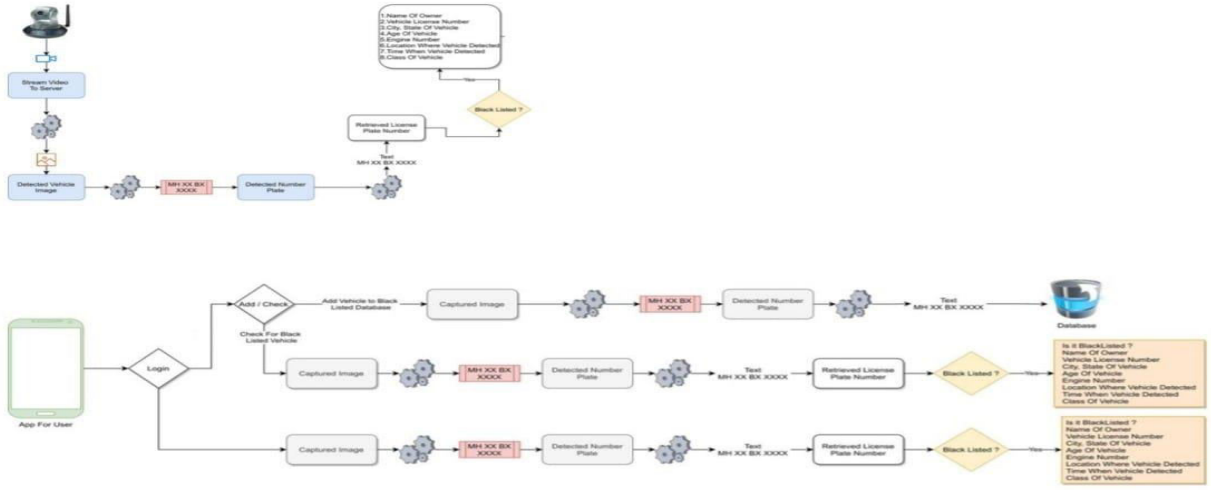
PZEM-004T Sensor: A three-phase energy metering sensor that measures voltage, current, power, and energy consumption. It communicates with the microcontroller via serial communication. The PZEM-004T communicates with microcontrollers (such as Arduino or ESP8266/ESP32) via the UART (serial) interface, making it easy to integrate into various projects. It is capable of measuring voltage in the range of 80V to 260V, current up to 10A, and power up to 2.2 kW. Additionally, it provides data on energy consumption in kilowatt-hours (kWh), helping users track the energy usage over time.



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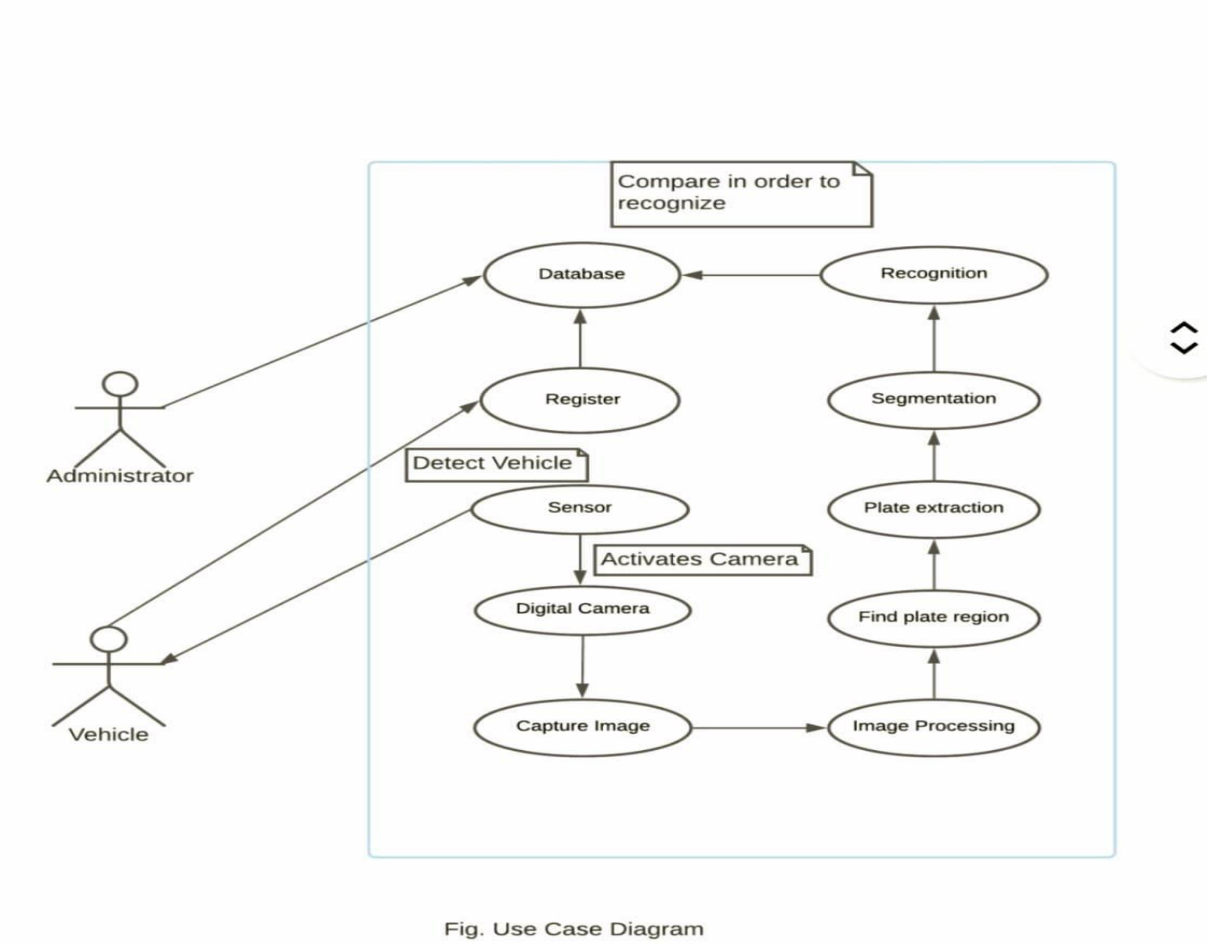

Fig. Use Case Diagram

fig shows the use case of the proposed system for the Vehicle number plate detection, Identification and monitoring of vehicles for a criminal record and demonstrates different types of actors involved in this system and actions associated with them. while using this "Vehicle number plate detection, Identification and monitoring of vehicles for a criminal record" system all the actors (i.e. administrator) should be authenticated first and then only they can use application features or perform actions.police can view all the notification i.e is raised in web application and can take the action on it.

4.3 Modules:

4.3.1 Detection

4.3.2 Identification

4.3.3 Monitoring

4.3.4 Web Application

4.1 Architecture:

Fig 1 depicts the system architecture of the proposed system i.e. Vehicle number plate detection, Identification and monitoring of vehicles for a criminal record. Therefore the architecture will give a brief idea about the current system:

The current application is Vehicle Number plate detection, Identification and monitoring of vehicles for criminal records. so Basically the system includes 4 Modules i.e Detection, Identification, Monitoring and Web application

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Respectively. which are covered in the above architecture.

The process starts from capturing the video of the vehicle , the video is captured through CCTV cameras which are installed on tolls or any other public places. The video will be divided into frames . From that frame the vehicle image will be detected. so now the system will detect the number plate of that vehicle from that detected image.

So in the next process system will identify the extracted text is present in blacklisted database or not .If yes , then the system will notify to the police the information of blacklisted vehicle those are the “Name of the Owner”, “Vehicle license Number”, “City”, “State”, ”Age of Vehicle”, “Engine Number”, “Location where the vehicle detected”, “vehicleType”.

*****Modules:*****

Detection:

This drawback is often tackled by exploiting the Detection approach wherever we'd like to coach our model exploitation of the car/other vehicle pictures with number plates.

This drawback is often resolved by exploitation of OCR(Optical Character Recognition) which might be useful in extracting character set characters from cropped number Plate pictures.

It are often assumed that this resolution needs to be embedded with an internet application moreover wherever once the camera captures the image of the vehicle, the backend would decision the answer and outputting the contents to the user

Identification:
After coaching, pass the check pictures for YOLO. Result obtained may be a JSON file with coordinates of range Plate per image.Using these results, cropped the amount Plate portion and keep in an exceedingly separate folder.

Monitoring:
The Monitoring part will identify the“Name of the Owner”, “Vehicle license Number”, “City”, “State”, ”Age of Vehicle”, “Engine Number”, “Location where the vehicle detected”, “vehicleType”.

Web Application:
Web application that is provided below for monitoring of vehicles.

Scope and limitations:

The limitations of this system are that we can not process random images like a dog, cat as input. In the case of ANPR, sometimes cars in some particular angle are also considered, and rotated images are also allowed. In some cases, the quality of images is bad because of rain or due to any other issue, then such images can not proceed further.

This system only covers crime-related incidents but it can be extended to other applications like fire emergency and medical incidents. We can use this system In Surveillance Of Restricted Areas Like the Army And Governmental Organizations.

V. CONCLUSION

From the consideration of all the above points, we conclude that in this framework, free and open source technologies are matured enough for the scientific computing domain the system works satisfactorily for wide variations in illuminating condition and also works on different types of number plates commonly found in India and it can be a better alternative to the existing system The only purpose of the system it collects the data and is to help people feel more secure while they’re on the road and punish violence.

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International Journal of Advanced Research in Education and Technology

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