

Number Plate Extraction

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Abstract- This project presents an Automatic Number Plate Recognition (ANPR) system using the YOLO object detection model and Optical Character Recognition (OCR). The system detects vehicle number plates from images or video using YOLO, then extracts and preprocesses the plate region for better clarity. OCR is applied to recognize and convert the alphanumeric characters into machine-readable text. The proposed system provides a fast, accurate, and real-time solution for vehicle identification, useful in traffic monitoring, toll collection, parking management, and security applications. It reduces manual effort and improves efficiency through deep learning and image processing techniques.

Keywords – Automatic Number Plate Recognition (ANPR), YOLO (You Only Look Once), Object Detection, Optical Character Recognition (OCR), Deep Learning, Computer Vision, Image Processing.

I. INTRODUCTION

Automatic Number Plate Recognition (ANPR) is a computer vision technology used to detect and read vehicle registration numbers automatically. It is widely used in traffic monitoring, toll collection, parking systems, and security applications.

In this project, the YOLO model is used to detect number plates in images or video, and Optical Character Recognition (OCR) is applied to extract the alphanumeric characters. Image preprocessing techniques improve accuracy under different conditions. The system provides a fast, accurate, and automated solution for vehicle identification using deep learning and image processing technique.

and image processing techniques. First, input images or video frames are captured using a camera. The YOLO (You Only Look Once) model is then applied to detect and localize the number plate region from the vehicle image. Once the number plate is detected, the extracted region undergoes preprocessing steps such as grayscale conversion, noise reduction, resizing, and thresholding to enhance text clarity. After preprocessing, Optical Character Recognition (OCR) is used to identify and extract the alphanumeric characters from the number plate. Finally, the recognized number is converted into machine-readable text and stored in a database for further applications such as vehicle tracking, access control, or traffic monitoring. This methodology ensures accurate, fast, and real-time number plate extraction.

II. LITERATURE REVIEW

Automatic Number Plate Recognition (ANPR) has evolved from traditional image processing methods like edge detection and character segmentation to advanced deep learning approaches for improved accuracy and speed. Earlier systems struggled under varying lighting conditions and complex backgrounds. Recent research highlights the effectiveness of object detection models such as YOLO for real-time and accurate number plate detection. Additionally, Optical Character Recognition (OCR) techniques, combined with image preprocessing methods, have significantly improved character recognition performance. The integration of YOLO and OCR provides a reliable and efficient solution for modern ANPR systems.

III. METHODOLOGY

The proposed Automatic Number Plate Recognition (ANPR) system follows a structured process combining deep learning

IV. EXPERIMENTAL RESULTS AND ANALYSIS:

The developed Automatic Number Plate Recognition (ANPR) Dashboard was successfully implemented and tested in a real-time local environment (Flask server running at 127.0.0.1:5000). The system integrates YOLO-based number plate detection with OCR-based character recognition and provides a web-based monitoring interface for visualization and control.

1. **Total Detections Counter** – Displays total number of detected vehicles.
2. **Unique Plates (Today)** – Shows count of unique vehicle numbers detected on the current day.
3. **Snapshots** – Stores captured plate images.
4. **Control Buttons** – Start, Stop, Refresh, and Logs for real-time system monitoring.
5. **Search and Date Filter** – Enables plate-based and date-wise filtering.
6. **Export CSV Option** – Allows downloading detection records for analysis.

V. HARDWARE ACCELERATION

Hardware acceleration significantly enhances the real-time performance of the implemented ANPR system, as reflected in the responsive dashboard interface with dynamic detection counters, instant snapshot display, and auto-refresh functionality. Since YOLO-based number plate detection requires high computational power, GPU acceleration reduces inference time through parallel processing, enabling faster object detection and seamless video stream analysis compared to CPU execution. Optimized libraries such as CUDA and cuDNN further improve deep learning computations by accelerating convolution operations and reducing latency. Additionally, deployment on edge devices like NVIDIA Jetson allows efficient, low-power, on-site processing suitable for traffic monitoring and security applications. Overall, hardware acceleration ensures reduced latency, faster recognition, and improved system efficiency for real-time ANPR deployment.

VI. DISCUSSION

The implemented ANPR system successfully integrates YOLO for number plate detection and OCR for character recognition, as shown in the real-time dashboard with detected plates, timestamps, and snapshots. The system performs accurately under normal lighting and clear image conditions, with preprocessing improving recognition results. Minor performance drops may occur in low light, blurred, or tilted plates. Hardware acceleration ensures smooth real-time updates and faster processing.

VII. CONCLUSION

The proposed YOLO–OCR based ANPR system provides a fast, accurate, and reliable solution for automatic number plate detection and recognition. The dashboard interface, live monitoring, and data export features make it suitable for real-time applications such as traffic surveillance and security systems, demonstrating practical deployment capability.

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REFERENCES

1. R. Laroca, E. Severo, L. A. Zanlorensi, et al., A robust real-time automatic license plate recognition based on the YOLO detector, arXiv.
2. R. Laroca, L. A. Zanlorensi, G. R. Gonçalves, et al., An efficient and layout-independent automatic license plate recognition system based on the YOLO detector, arXiv.
3. "Enhanced YOLOv8-Based System for Automatic Number Plate Recognition," Technologies, 2024.
4. "Automatic Number Plate Recognition Using YOLOv8 Model," International Journal of Scientific Research in Science and Technology.
5. programming languages." Empirical Software Engineering, 27, 1–52 (2022).