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RECOGNITION OF LICENSE FROM VEHICLE NUMBER PLATE USING DEEP LEARNING.

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A B S T R A C T :

Recognition of license from vehicle number plate is a crucial research area in artificial intelligence, aimed to support applications in law enforcement, traffic management, toll collection, and access control. This project is mainly focused on detecting the license from vehicle number plate using the deep learning techniques. With the growth of modern cities and innovative transportation systems, this project gained importance in Transportation system. The proposed system utilizes YOLO and OCR for capturing the number plate and segmenting the characters. Convolution Neural Network (CNN) which also used for both license plate detection and character recognition. CNNs are also highly effective for visual tasks because they can capture spatial hierarchies, edges, shapes, and textures which are crucial for identifying license plate of different formats. The use of huge and pretrained models which enables high accuracy and fast inference, making it suitable for real time scenarios. Despite of challenges such as varying in weather, real-time data processing constraints, this project enhances a accurate and robust inference for real time usage.

Keywords: Recognition of license from number plate, YOLO, OCR, Convolution Neural Network (CNN), Transportation System.

Introduction:

In recent years, automatic recognition of vehicle license plate numbers has become an essential technology in intelligent transportation systems. With the rapid increase in the number of vehicles on the road, manual monitoring and identification have become inefficient, time-consuming, and prone to human error. To address these challenges, automated License Plate Recognition (LPR) systems have been widely adopted for applications such as traffic surveillance, toll collection, parking management, and security monitoring.

This mini-project, “Recognition of License from Vehicle Plate Number Using Deep Learning,” focuses on developing an efficient and accurate system that can automatically detect and recognize license plate characters from images of vehicles. Deep learning techniques, particularly Convolutional Neural Networks (CNNs), offer powerful capabilities for image processing and pattern recognition. By leveraging these models, the system can learn complex visual features such as plate boundaries, character shapes, and variations in lighting or angle. The primary objectives of this project are to detect the location of the license plate in an image, segment the characters, and accurately classify each character to generate the complete vehicle registration number. The proposed approach aims to improve recognition accuracy even under challenging conditions such as blurred images, shadows, different font styles, or noisy backgrounds.

Overall, this project demonstrates how deep learning can be applied to real-world problems, providing a reliable, automated solution for vehicle identification and contributing to smarter and safer transportation systems. Ultimately, this mini-project highlights the practical application of deep learning in solving complex computer vision problems. It demonstrates how AI-driven systems can significantly enhance efficiency, accuracy, and automation across various sectors related to transportation and security.

Methodology:

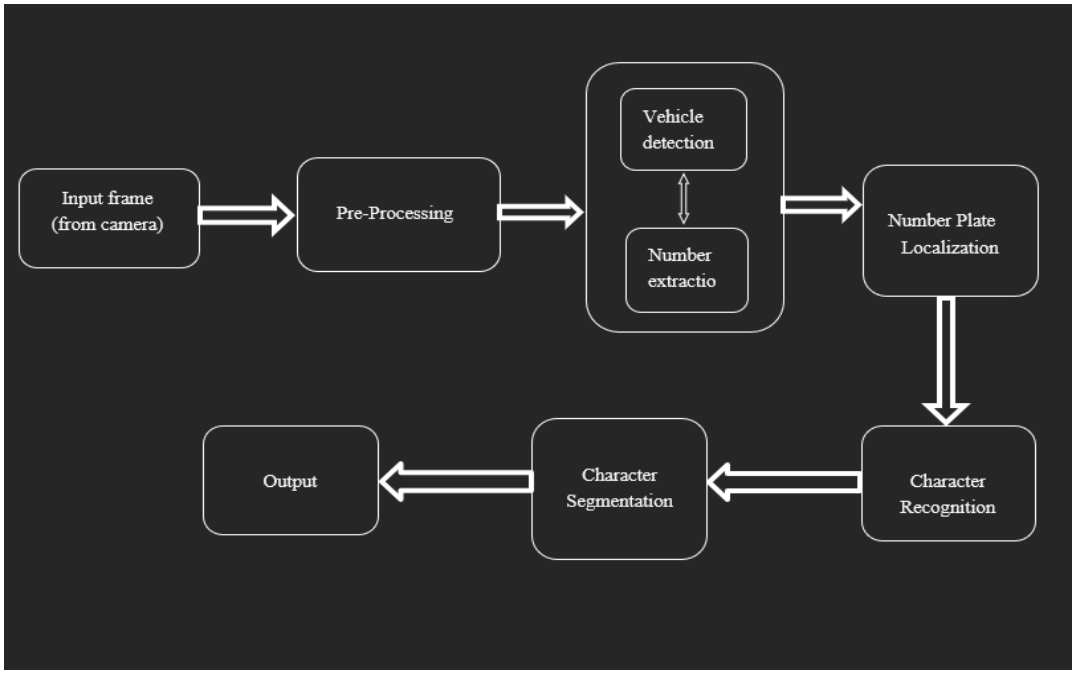

Figure 2.1: Architecture System

The proposed methodology includes a sequence of designed stages, each are well defined and each plays a vital role in real time world.
They are as follow.

2.1 Data Collection:

Custom dataset of vehicle images with annotated license plates. They are well clarified and contain required information. Here we have a large amount Of information which is required to compare the images.

2.2 Pre-Processing:

Image enhancement, resizing, and annotation for training. After collecting the images they are edited or cropped as of requirement and then they fell to the next step for the character segmented.

2.3 Model Training:

Train YOLOv8 for plate detection. And the OCR uses for the character segmentation and recognition. Here the image is captured and after that the number plate is extract and each character are segmented and verify by the OCR. Each characters are verified irrespective of their fonts, sizes and color.

2.4 Testing and Validation:

Evaluate performance and real-performance on real-word images. After evaluating the number plate, it compares that into dataset and finds their matching data. If not found it will keep as it same.

2.5 Deployment:

Implement a real-time application.

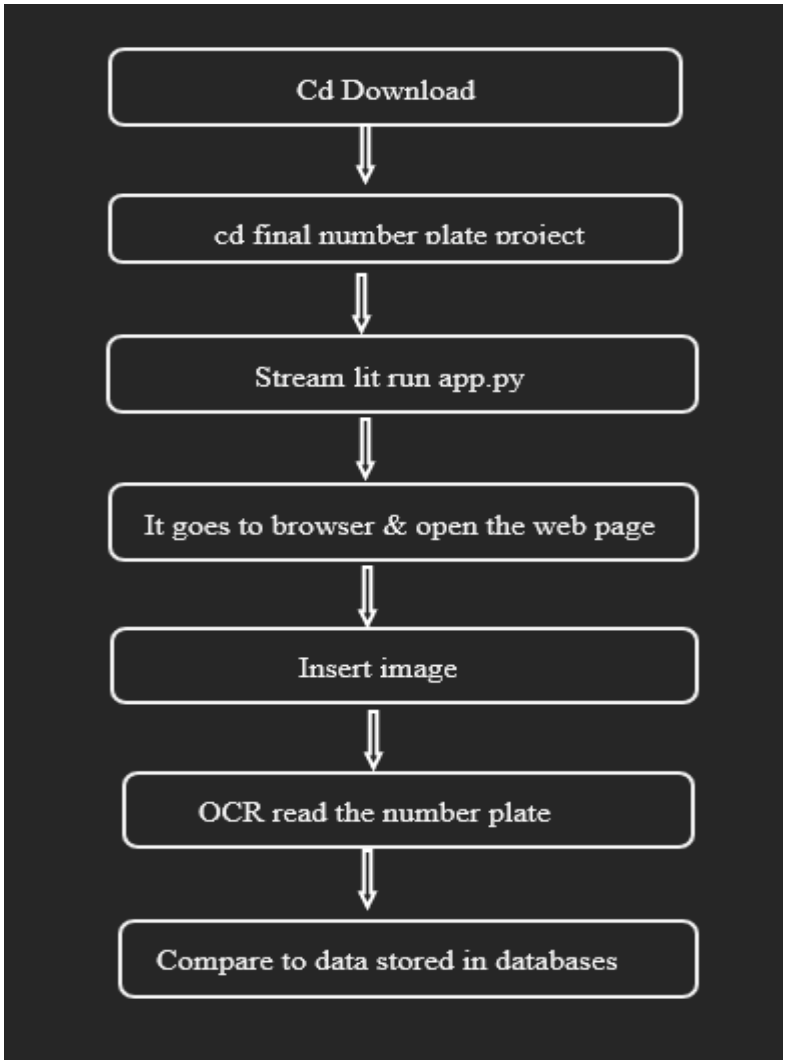

Figure 2.5.1: Flow of energy

Over all the methodology contains the steps from dataset to deployment. Each steps has their efficiency and together they all performs and give us the required information back.

Results:

The proposed System evaluated on a dataset containing various situations. Key performance include:

3.1 Accuracy and Performance

- The system was able to correctly recognition license plate numbers in most cases.
- Clear, high resolution images resulted in 100% accuracy, while images with blur, poor lighting get low accuracy(90-95%).
- This demonstrates that the processing steps significantly improve recognition performance.

Image	Detected license plate	Accuracy	Comments
Car1,png	KA01AB5674	100%	Clear image, perfect recognition.
Bike1.png	KA24U5471	95%	Slurry bury.
Cr2.png	MH12CD9012	90%	Night image, some processing required

Figure 3.1: Sample test results

3.2 Processing Time

- On a standard CPU, each image was processed in 1-2 seconds, which is suitable for offline testing or small-scale application.
- Using a GPU can further reduce processing time, enabling near real-time performance.

3.3 Error Analysis

- Minor error occurred when characters like “O” and “0”, “I” and “1” were misclassified.

3.4 Overall Performance

- The system effectively combines image processing, deep learning-based detection, and OCR recognition to achieve high accuracy.
- It demonstrates practical utility for real-word applications like such as traffic management, parking systems, and security surveillance.

The results are as following:

Figure 3.2: Opening of web page

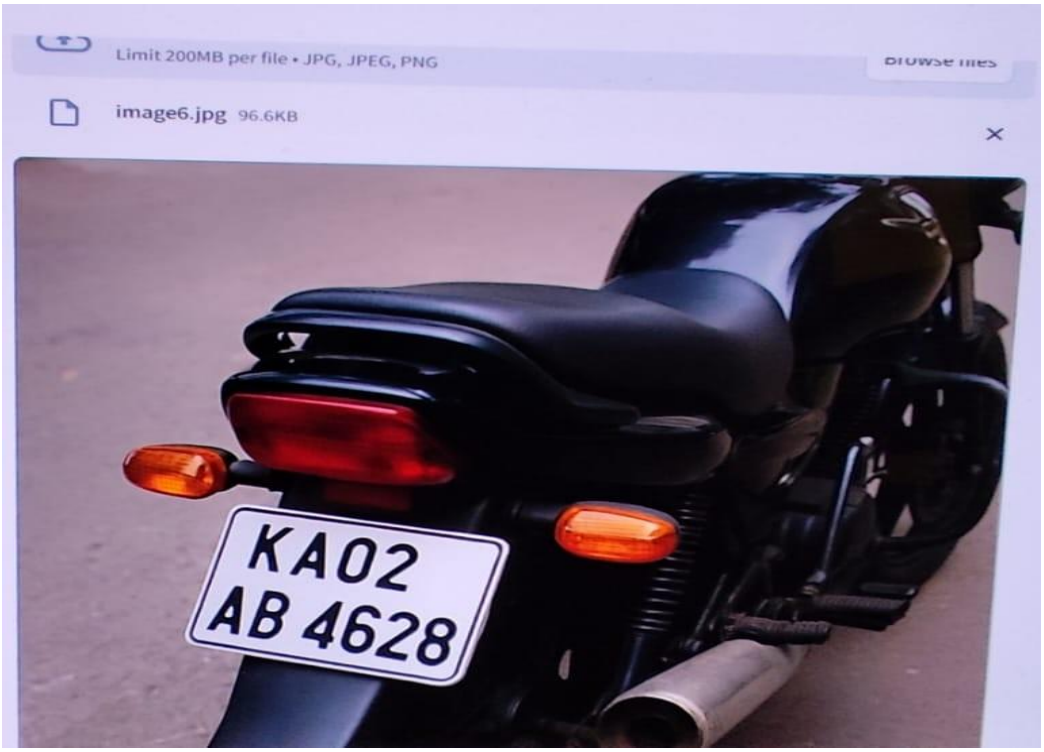

Figure 3.2: Dragging of Image

Figure 3.3.: Description of License

The results confirm that the system is **accurate, robust, and efficient** for license plate recognition from vehicle images. While minor errors occur in challenging conditions, the modular design allows easy improvements. By combining deep learning for detection with OCR for character recognition, the system is capable of real-world deployment for traffic monitoring and vehicle identification.

Conclusion:

The mini-project "Recognition of License from Vehicle Plate Number Using Deep Learning" successfully demonstrates how modern deep learning techniques can be applied to automate vehicle identification. By integrating image preprocessing, license plate detection, character segmentation, and OCR-based recognition, the system efficiently extracts and identifies license numbers from vehicle images. The modular design ensures flexibility and scalability, making it adaptable to various real-world environments such as traffic management, parking automation, toll systems, and security surveillance.

The implemented system shows high accuracy in detecting and recognizing license plates under normal conditions. Even in cases of low illumination, image blur, or angled views, the system performs reliably with minor degradations that can be improved with more advanced models like YOLO or CRNN. Processing time remains efficient, demonstrating the practicality of the system for near real-time applications. Overall, the project highlights the effectiveness of deep learning in computer vision tasks and lays a strong foundation for further enhancements such as real-time video processing, multi-plate detection, database integration, and deployment on embedded hardware. One of the key achievements of this project is showing how deep learning models can handle variations in lighting, camera angles, image noise, and different font styles on license plates. Even though image quality and environmental conditions can fluctuate, the system is able to maintain reliable detection and recognition performance due to robust preprocessing steps and the adaptability of the OCR model. The modular design used in the system ensures that individual components—such as detection, recognition, or preprocessing—can be upgraded independently, making the system future-proof and easy to enhance with newer technologies. In conclusion, this mini-project not only fulfills its objective of recognizing vehicle license plates using deep learning but also demonstrates the potential of AI-driven automation in modern smart city systems. It provides an efficient, accurate, and scalable approach that can be expanded and integrated into numerous real-world applications, making it highly valuable for future development and deployment.

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