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(57) Abstract :
Vehicle Number Plate Detection (VNPD) systems are vital elements in contemporary traffic management, law enforcement, and automated access control systems. This paper discusses a real-time VNPD solution that exploits the strength of deep learning and optical character recognition for high accuracy and reliability. The system employs the YOLOv8 object detection model to accurately and effectively localize vehicle license plates, including in complex and dynamic scenarios. After the License Plate area is recognized, the Easy OCR library is used to recognize and decode alphanumeric characters on the plate. In order to enhance detection and recognition accuracy under difficult conditions like low resolution, inadequate illumination, and partial occlusions, the system employs a number of image preprocessing methods. These involve grayscale conversion, noise filtering, and contrast adjustment. Further, postprocessing operations like error correction and validation guarantee the correctness of the final recognized output. The decoded license plate information is sent through serial communication to a Raspberry Pi Pico microcontroller, which is tasked with managing peripheral hardware. An LCD display is utilized to display system status messages, while a servo motor allows for automated access control based on the identified vehicle number. The system presents high recognition accuracy, effective real-time operation, and robust hardware integration, which can make it ready for use in applications like automated toll collection, smart parking, and secure entry points.

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