BRAVO SECURITY SERVICES

TECH STACK

Frontend: React, Tailwind CSS(Frontend): React's component-based architecture facilitated the creation of a responsive and interactive user interface (UI). Components could be reused efficiently, enhancing development speed and maintainability. Tailwind CSS's utility-first approach allowed rapid prototyping and customization of UI elements, ensuring a clean and modern design that adapted well across different devices and screen sizes.

Backend: Python, Streamlit (Backend): Python's versatility and extensive libraries supported the backend logic and integration with object detection and OCR models. Streamlit provided a straightforward way to develop and deploy data-driven web applications, enabling quick iteration and easy visualization of results from the detection algorithms. Its simplicity in creating interactive elements like sliders or dropdowns enhanced user engagement and usability.

Object Detection: YOLOv8(Object Detection): YOLOv8's real-time object detection capabilities were crucial for accurately identifying number plates in images or video streams. Its speed and accuracy, coupled with the ability to handle complex scenes and varying lighting conditions, ensured robust performance of the ANPR system. Fine-tuning YOLOv8 parameters and integrating it into the backend workflow streamlined the detection process, delivering reliable results for further processing.

Optical Character Recognition: EasyOCR and Tesseract OCR (Optical Character Recognition): EasyOCR and Tesseract OCR complemented YOLOv8 by extracting alphanumeric characters from detected number plates. EasyOCR's pre-trained models provided fast and accurate recognition, while Tesseract OCR offered customization options for optimizing performance based on specific plate designs or languages. Their integration into the backend workflow enabled seamless conversion of detected plates into machine-readable text, a critical step in ANPR systems.

Database: MongoDB (Database): MongoDB served as the backend database, storing metadata and processed results from the ANPR system. Its document-oriented structure facilitated flexible schema design and efficient data retrieval, accommodating dynamic data requirements typical in image processing applications. Integration with Python allowed straightforward implementation of database operations, ensuring data consistency and scalability as the application processed more images or videos.

ABSTRACT

In response to the growing need for efficient and enhanced security measures, we have developed an advanced Automatic Number Plate Recognition (ANPR) system. This system leverages cutting-edge computer vision and machine learning techniques to automate the detection and recognition of license plates in real-time, addressing the shortcomings of manual entry and exit record-keeping which are often labor-intensive and error-prone.

Our ANPR system operates across three distinct modes to cater to diverse operational scenarios. Firstly, in live detection mode, the system utilizes camera feeds to continuously capture images of vehicles passing through designated points. It then applies YOLOv8, a state-of-the-art object detection model, to identify and localize license plates within these images swiftly and accurately. Concurrently, Easy OCR and Tesseract OCR technologies are employed to extract alphanumeric characters from the detected plates, ensuring high precision in optical character recognition.

Secondly, our camera mode allows users to manually capture vehicle images using their devices. Upon submission, the system promptly processes these images to extract and recognize license plate details using the same advanced OCR capabilities.

Lastly, in upload mode, users can submit pre-captured vehicle images for plate recognition. This feature supports batch processing of images, facilitating efficient handling of archived data or remote monitoring scenarios.

Central to our ANPR system is its seamless integration with MongoDB, a flexible NoSQL database, where the extracted license plate data is stored alongside corresponding timestamps. This database-driven approach enables efficient record-keeping, historical data retrieval, and data analytics, empowering stakeholders with actionable insights for improved decision-making in traffic management and security operations.

The implementation of our ANPR system yields several tangible benefits. It significantly reduces the workload for security personnel and administrative staff by automating tedious manual tasks. Moreover, it contributes to substantial cost savings associated with traditional paper-based record-keeping systems, such as reduced consumption of paper and ink. Importantly, by eliminating human errors inherent in manual data entry, our system enhances the accuracy and reliability of vehicle tracking and monitoring processes.

Furthermore, the versatility of our ANPR solution allows for seamless integration with existing security infrastructure, enhancing overall system efficacy and providing a comprehensive solution for traffic management and security enhancement across various operational environments.

In conclusion, our ANPR system represents a significant advancement in leveraging technology to streamline operations, improve efficiency, and enhance security measures in contemporary urban environments. Its robust functionality, powered by state-of-the-art AI technologies and database management, underscores our commitment to delivering innovative solutions that meet the evolving needs of modern-day traffic management and security challenges.

WORKING

The developed ANPR system is designed to operate in three distinct modes: live camera mode, upload mode, and camera mode. Each mode caters to different use cases, enhancing the system's versatility and usability.

1. Live Camera Mode:This mode continuously captures video feed from a connected camera, processing each frame in real-time to detect and recognize number plates. This is particularly useful for applications requiring continuous monitoring, such as traffic surveillance and automated toll collection.

2. Camera Mode:Users can capture snapshots using a camera. The captured image is then processed to detect and recognize the number plate. This mode is ideal for interactive applications where the user needs to manually trigger the capture process, such as vehicle registration and inspection.

3. Upload Mode:In this mode, users can upload static images containing vehicle number plates. The system processes these images to extract and recognize the plate numbers. This mode is suitable for scenarios where batch processing of captured images is required, such as parking management and post-event analysis.

The overall workflow of the ANPR system can be described in the following detailed steps:

1. Image Acquisition:The system captures images either from a live camera feed, uploaded images, or snapshots taken with a camera. This step ensures that the input is adequately acquired for further processing.

2. Number Plate Localization:YOLOv8 processes the image to detect and localize number plates. The algorithm outputs bounding boxes around detected number plates along with associated confidence scores, indicating the reliability of the detections.

3. Character Recognition:The localized number plate regions are cropped and passed to EasyOCR for character recognition. EasyOCR processes these regions, extracting and decoding the characters on the number plates into text strings.

4. Data Storage: The recognized number plate information, including the detected text and metadata such as timestamps and confidence scores, is stored in a MongoDB database. This allows for efficient data management, retrieval, and analysis.

5. User Interface:The detected number plates and their recognized characters are displayed on the user interface, providing real-time feedback to the user. The UI is designed to be intuitive and responsive, allowing users to interact with the system easily.

LANDING PAGE OF THE PROJECT

Warning

📞 1234567890

Bravo Security Services

Home   Contact   About   APPLY NOW

How it Works

📄 Upload Image

Upload mode is used when the other modes aren't working or there's a problem, the user can provide a photograph of the vehicle on real time.

UPLOAD

📹 Live Upload

When live mode is enabled, data is captured in real time and stored in the database for immediate analysis and reporting.
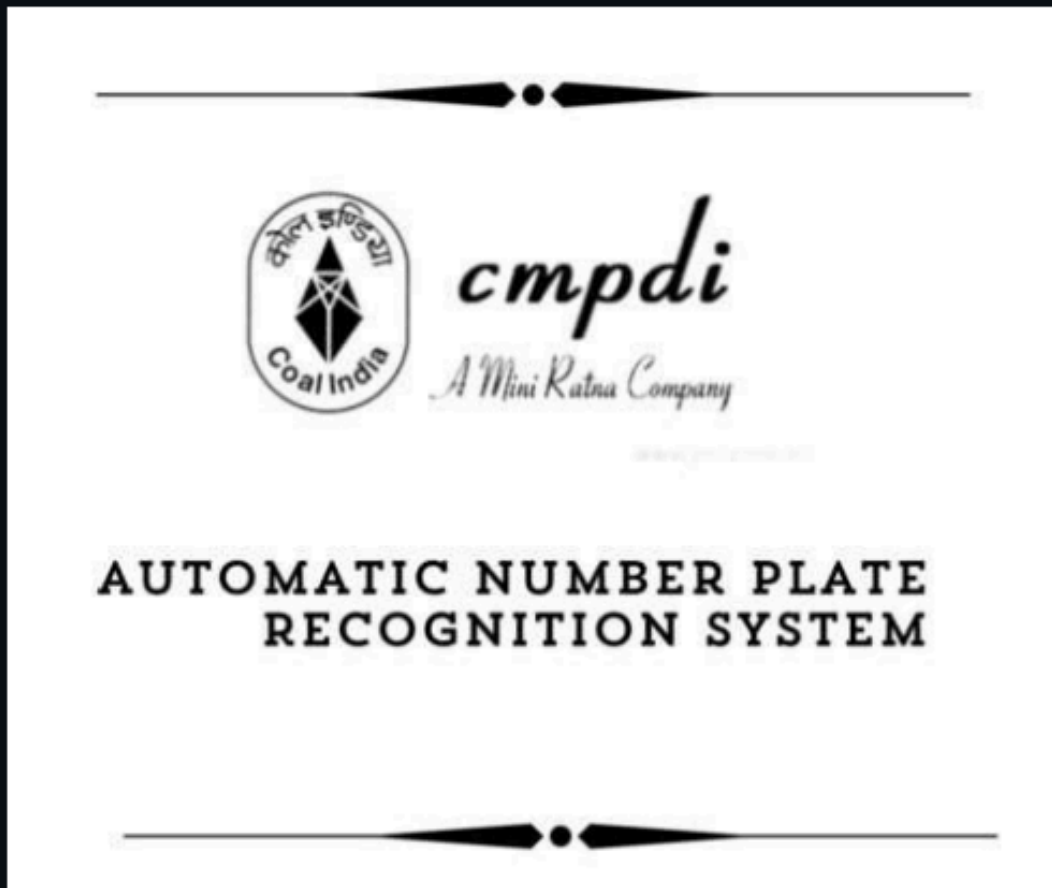
LIVE

📷 Click Image

The purpose of the camera mode is to enable manual detection using the phone's camera in the event that the live mode is unavailable.
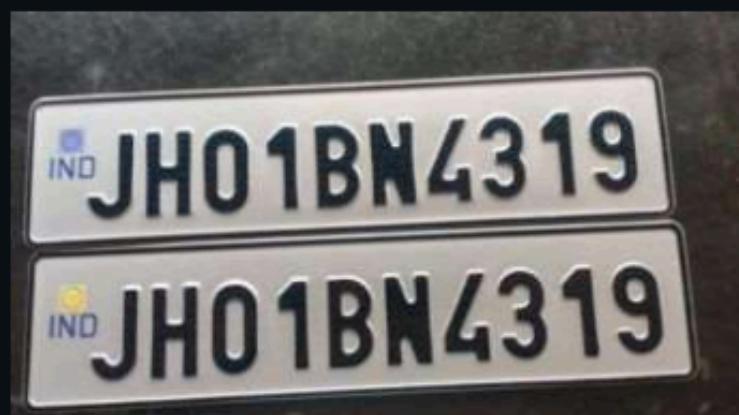
CAMERA

💥 License Car Plate Detection 🚗

Computer Vision Detection with YoloV8 🧪

The differents models detect the car and the license plate in a given image, then extracts the info about the license using EasyOCR, and crop and save the license plate as a Image, with a JSON file with all the data.
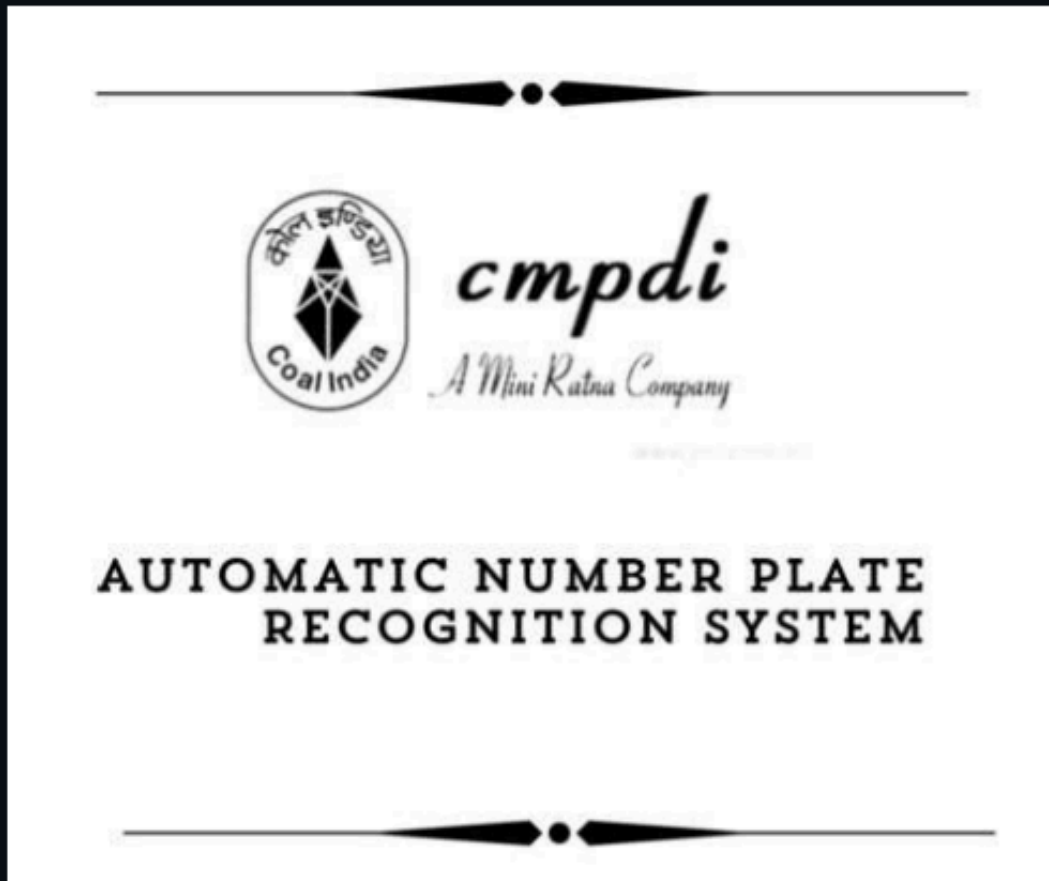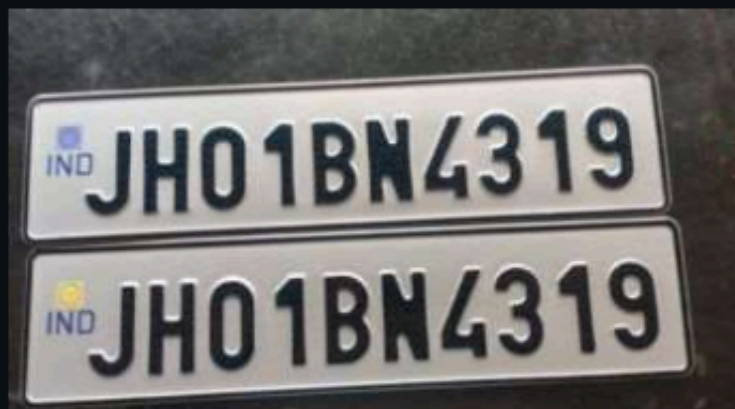
LIVE CAMERA MODE

💥 License Car Plate Detection
🚗

Computer Vision Detection with YoloV8 🧪

The differents models detect the car and the license plate in a given image, then extracts the info about the license using EasyOCR, and crop and save the license plate as a Image, with a JSON file with all the data.

Check It-out the License Car Plate Detection Model 🔍 !

Take a Photo

Take a Photo:

✕ Clear photo

Apply Detection

Detection Results ✅ :

License Cropped ✅ :

License Number: KA013C5758

	_id	0
0	668be261b3b1aebc6bcac7b6	{'timestamp': '2024-07-08 18:28:09', 'car': {'bbox': [386.7622985839844, 3.26025
1	668fbb05ce0fa53edad8cf4b	{'timestamp': '2024-07-11 16:29:17', 'car': {'bbox': [0, 0, 0, 0], 'car_score': 0}, 'lice
2	66938abd5f2b8d20b91d262d	{'timestamp': '2024-07-14 13:52:21', 'car': {'bbox': [0, 0, 0, 0], 'car_score': 0}, 'lice
3	66938b0a5f2b8d20b91d2631	{'timestamp': '2024-07-14 13:53:38', 'car': {'bbox': [0, 0, 0, 0], 'car_score': 0}, 'lice
4	66941640704b10fcb43e8805	{'timestamp': '2024-07-14 23:47:36', 'car': {'bbox': [0, 0, 0, 0], 'car_score': 0}, 'lice
5	66941a41df444d7ddb00480f	{'timestamp': '2024-07-15 00:04:41', 'car': {'bbox': [0, 0, 0, 0], 'car_score': 0}, 'lice

UPLOAD MODE

Take a Photo

Drag and drop file here
Limit 200MB per file • PNG, JPG, JPEG

Browse files

download.jpeg 15.7KB ✕

Apply Detection

Detection Results ✅ :

License Cropped ✅ :

License Number: 21 BH 2345 AA

	_id	0
0	668be261b3b1aebc6bcac7b6	{'timestamp': '2024-07-08 18:28:09', 'car': {'bbox': [386.7622985839844, 3.26025
1	668fbb05ce0fa53edad8cf4b	{'timestamp': '2024-07-11 16:29:17', 'car': {'bbox': [0, 0, 0, 0], 'car_score': 0}, 'lice
2	66938abd5f2b8d20b91d262d	{'timestamp': '2024-07-14 13:52:21', 'car': {'bbox': [0, 0, 0, 0], 'car_score': 0}, 'lice
3	66938b0a5f2b8d20b91d2631	{'timestamp': '2024-07-14 13:53:38', 'car': {'bbox': [0, 0, 0, 0], 'car_score': 0}, 'lice
4	66941640704b10fcb43e8805	{'timestamp': '2024-07-14 23:47:36', 'car': {'bbox': [0, 0, 0, 0], 'car_score': 0}, 'lice

SCOPE OF THE PROJECT

The scope of an Automated Number Plate Recognition (ANPR) project extends far beyond simply automating the recording of vehicle entry and exit at company gates. It encompasses a wide range of potential applications and benefits across various industries and sectors, driven by advancements in computer vision, machine learning, and data management technologies.

1. Enhanced Security and Access Control: One of the primary applications of ANPR systems is in enhancing security measures. By accurately and efficiently identifying vehicles entering and exiting premises, such systems bolster access control mechanisms. They can automatically cross-reference license plate data with internal databases or watchlists, alerting security personnel to unauthorized or suspicious vehicles in real-time. This capability is invaluable for safeguarding sensitive locations such as corporate campuses, government facilities, airports, and residential complexes.

2. Traffic Management and Optimization: ANPR systems play a crucial role in traffic management by providing real-time insights into vehicle movements. Integrating ANPR with traffic control systems enables authorities to monitor traffic flow, detect congestion points, and implement dynamic traffic management strategies. This capability not only improves road safety and reduces commute times but also supports urban planning efforts aimed at optimizing infrastructure utilization and reducing environmental impact.

3. Law Enforcement and Compliance Monitoring: Law enforcement agencies leverage ANPR technology for various purposes, including identifying stolen vehicles, tracking suspects, and enforcing traffic regulations. ANPR systems can automatically issue fines for traffic violations such as speeding or running red lights based on captured license plate data. Moreover, they facilitate compliance monitoring in restricted areas, toll collection systems, and controlled parking zones, ensuring adherence to regulations and enhancing overall public safety.

4. Parking Management and Revenue Generation: In urban settings, ANPR systems streamline parking management operations by automating entry and exit processes at parking facilities. By accurately recording vehicle movements and occupancy rates, these systems optimize parking space utilization and improve customer experience. Additionally, ANPR-enabled automated payment systems eliminate the need for physical tickets or manual transactions, enhancing operational efficiency and revenue generation for parking operators.

5. Customer Experience and Operational Efficiency: For businesses, implementing ANPR systems enhances customer experience by reducing wait times at entry points and improving operational efficiency. In retail environments, for example, ANPR facilitates seamless access for customers and employees while enabling targeted marketing initiatives based on vehicle registration data. Similarly, in logistics and distribution centers, ANPR systems streamline vehicle check-in and check-out processes, minimizing downtime and optimizing supply chain operations.

6. Data Analytics and Insights: The deployment of ANPR systems generates vast amounts of data related to vehicle movements, patterns, and behaviors. Leveraging advanced analytics and machine learning algorithms, organizations can derive actionable insights from this data to optimize resource allocation, improve operational decision-making, and forecast future demand. Insights derived from ANPR data also support strategic planning initiatives, infrastructure investments, and customer service enhancements.

TECHNICAL FEASIBILITY

The technical feasibility of an Automated Number Plate Recognition (ANPR) project hinges on several key factors that determine its viability and successful implementation:

1. Technology Stack: Selecting appropriate technologies such as YOLOv8 for real-time object detection, EasyOCR and Tesseract OCR for accurate optical character recognition, React.js for frontend development, and Python with Streamlit for backend processing is crucial. These technologies are proven in their respective domains and offer robust capabilities necessary for ANPR system functionalities.

2. Performance: Ensuring the ANPR system meets performance requirements is critical. YOLOv8's ability to handle real-time object detection and EasyOCR/Tesseract OCR's efficiency in character recognition are essential for swift processing of vehicle images. Optimization techniques such as leveraging GPU acceleration for deep learning inference and implementing efficient data processing algorithms contribute to achieving real-time performance benchmarks.

3. Scalability: The system must scale effectively to handle varying loads and future expansion. This includes designing a scalable architecture with distributed computing capabilities, efficient database management (e.g., MongoDB for storing plate data), and utilizing cloud services for elasticity and resource management.

4. Integration: Seamless integration with existing infrastructure, including security systems, access control mechanisms, and backend databases, is crucial for operational continuity and data interoperability. API compatibility and adherence to industry standards facilitate smooth integration with third-party systems and future upgrades.

5. Security: Addressing security concerns such as data encryption, access control, and compliance with data privacy regulations is paramount. Implementing robust security measures at both application and infrastructure levels ensures the protection of sensitive information captured and processed by the ANPR system.

6. Cost Considerations: Evaluating the total cost of ownership, including development, deployment, maintenance, and operational costs, ensures the project remains financially feasible. Cost-effective technology choices, efficient resource utilization, and long-term scalability planning contribute to optimizing project economics.

CONCLUSION

IIn conclusion, the development of the ANPR system represents a significant milestone in leveraging cutting-edge technologies to revolutionize vehicle identification and number plate recognition processes. By integrating YOLOv8 for rapid and precise object detection, EasyOCR for accurate character recognition, MongoDB for robust and scalable data management, and an intuitive user interface (UI) for seamless interaction, the system achieves a holistic approach to automating and optimizing these critical tasks.

Throughout this project, key objectives were successfully achieved, including enhancing operational efficiency in traffic management and security operations. The ANPR system streamlines the identification and monitoring of vehicles entering and exiting designated areas, reducing manual intervention and potential errors associated with traditional methods. This not only improves productivity but also enhances the overall accuracy and reliability of data collection and reporting.

Moreover, the system's adaptability across diverse operational environments ensures its relevance and effectiveness in various sectors, from transportation and logistics to public safety and urban planning. Its capability to integrate seamlessly with existing infrastructure underscores its potential for widespread implementation and scalability.

Looking ahead, the insights gained from developing this ANPR system provide a solid foundation for future innovations and applications of AI-driven solutions in complex real-world scenarios. This project underscores the transformative impact of technology in modernizing operational processes, enhancing security measures, and advancing towards smarter, more efficient urban environments.