

Automatic License Plate Recognition System Description

Overview:

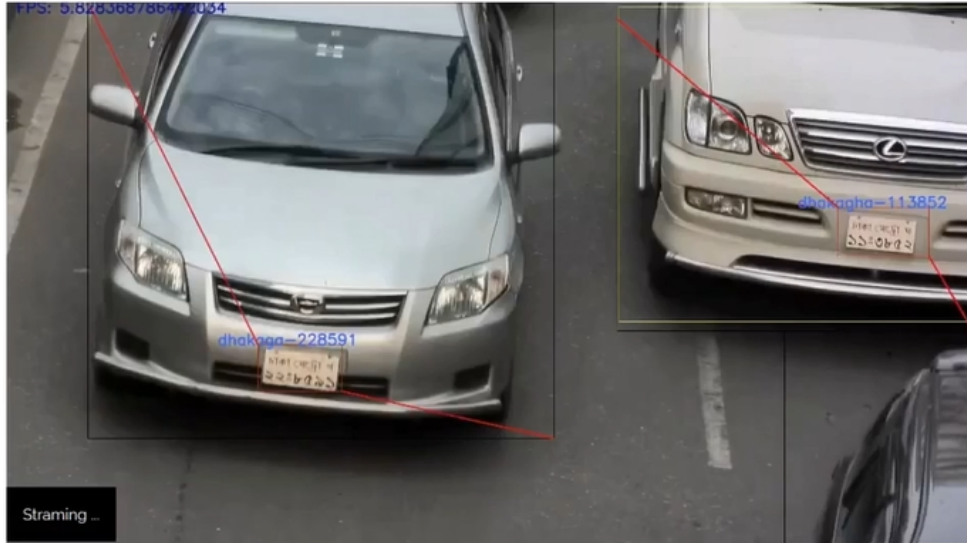
Our Automatic License Plate Recognition (ALPR) system employs cutting-edge technology to enhance vehicle tracking and law enforcement capabilities. Utilizing Optical Character Recognition (OCR) on images, it extracts vehicle registration plates, creating invaluable location data. This sophisticated system incorporates GRPC for seamless communication, YOLOv3 and YOLOv4 for efficient object detection, and a NoSQL MongoDB database for robust data management.



Components:

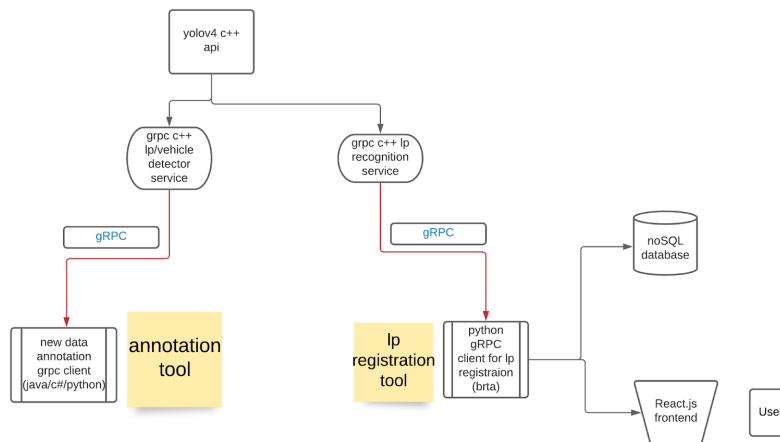
1. GRPC Service (C++ or Python): Facilitates efficient communication between client and server, enhancing system responsiveness.
2. Data Annotation Tool (GRPC Service): Streamlines the annotation process, ensuring accurate training data for the YOLO models.
3. Registration Backend (Python): Manages the registration process, handling frame resizing, base64 conversion, and storage of decoded license plates in the queue.
4. Database (NoSQL, MongoDB): Stores crucial information such as decoded license plates, vehicle images, and relevant metadata.

5. Frontend (React.js): Provides a user-friendly interface, enabling users to view recently registered license plates, perform searches, and modify the database with admin privileges.



License Plate Processing:

Frames undergo a meticulous registration process:



- Resizing and conversion to base64.
- Extraction of license plate (LP) regions.
- GRPC requests for LP recognition.
- Decoding (post-processing) of LP regions.
- Storage in a queue with a counter.

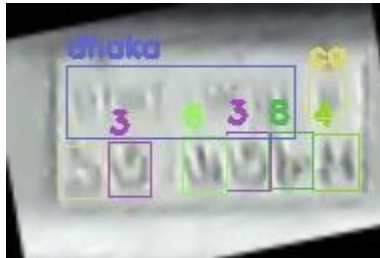
- Database entry upon counter threshold, with additional checks to ensure registration conditions.

Frontend Features:

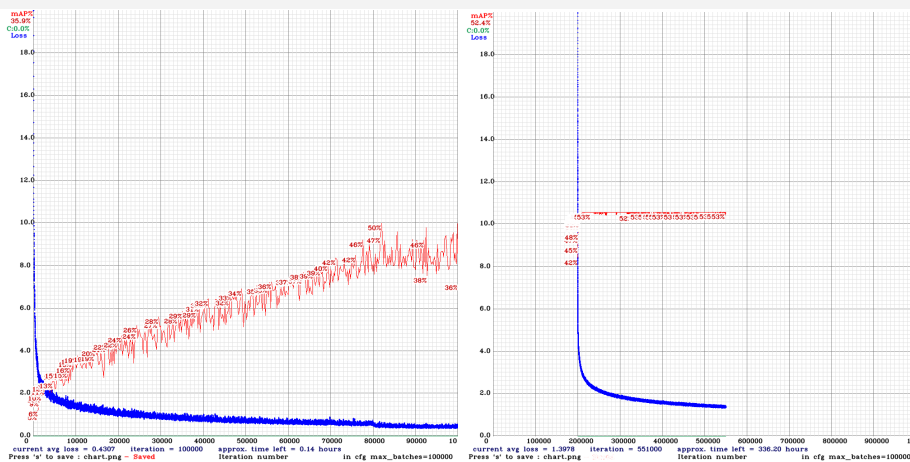
- View recently registered license plates.
- Search vehicles by tags.
- Database modification with admin privileges.

LPV Detector and LP Detector:

- LPV Detector (YOLOv4): Designed for efficient vehicle and license plate detection.
- LP Detector (Custom YOLOv4): Optimized for accurate license plate character recognition.



Datasets:



- Manually labeled datasets for LPV and LP detectors, exceeding 20,000 samples.
- Dataset locations include local drives and specific directories for various datasets.

Demonstrations:

- LP Detector: [Video](#)
- LPV Detector: [Video](#)
- Jetson Nano Demos: [Demo 1](#), [Demo 2](#)

Conclusion:

The ALPR system, leveraging YOLO models and GRPC, achieves a character-level accuracy of 93%. Notably, the use of YOLO Darknet allows for real-time processing. The system's versatility and accuracy make it suitable for law enforcement, traffic management, and parking systems. Ongoing research focuses on addressing challenges and integrating state-of-the-art models for continued improvements.