

Project Documentation

Real-Time Number Plate Detection System

1. Introduction

This document details the design, development, and implementation of a real-time vehicle number plate detection system using computer vision and deep learning. The system is capable of identifying and reading license plates from a live video feed using a webcam, and storing detected plates in a local database for further use. This system is suitable for applications such as traffic surveillance, parking management, and security checkpoints.

2. Objective

- Detect license plates in real time from video streams.**
- Extract readable text from detected plates using OCR.**
- Store detected plate numbers and timestamps in a database.**
- Develop a system that is accurate, lightweight, and efficient.**

3. Tools & Technologies

Python, OpenCV, YOLOv5, EasyOCR, SQLite3, PyTorch

4. System Architecture

- 1. Video Stream: Captured from webcam using OpenCV.**

- 2. Detection Module:** YOLOv5 detects the location of license plates.
- 3. Cropping Module:** Detected plates are cropped from the image.
- 4. OCR Module:** EasyOCR extracts alphanumeric text from cropped images.
- 5. Database Logging:** SQLite stores the plate number and detection timestamp.
- 6. Display Output:** Annotated frame is shown with bounding boxes and recognized text.

5. Implementation

Step-by-step setup including package installation, model loading, database creation, and real-time detection loop using OpenCV and EasyOCR.

6. Results

- Successfully detected and read plates in real-time.**
- Accuracy was satisfactory for frontal and near-frontal plates.**
- Stored logs with timestamps allowed easy review of all captured data.**

7. Applications

- Smart parking systems for entry/exit tracking.**
- Traffic law enforcement and surveillance.**
- Toll booth automation.**
- Gate security at private premises.**

8. Future Work

- Integration with cloud database for centralized tracking.
- Night vision compatibility using IR imaging enhancements.
- GUI dashboard using Flask or Streamlit.
- Alert system for blacklisted vehicle detection.

9. Conclusion

This project demonstrates an effective, real-time solution for automatic number plate recognition using deep learning and computer vision. Its modular design and use of lightweight components make it a practical base for deployment in smart traffic and surveillance applications.

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