License Plate Recognition Using OCR and SVM Classifiers

Introduction

License plate recognition plays a crucial role in various applications, such as traffic monitoring, automated toll systems, and security surveillance. This project focuses on utilizing Optical Character Recognition (OCR) in conjunction with a Support Vector Machine (SVM) classifier to enhance the accuracy of license plate text extraction.

Why This Project? Societal Impact

The need for accurate and efficient automatic license plate recognition is growing, particularly in smart city initiatives. By implementing OCR-based recognition, this project enables automated vehicle identification, reduces manual effort in law enforcement, and enhances security. It also supports intelligent traffic systems, helping streamline transportation management.

Methodology

Architecture Diagram and Explanation

The approach includes the following steps:

1. **Image Preprocessing** – Convert images to grayscale and resize them for uniformity.
2. **Text Detection Using EasyOCR** – Extract potential license plate text from images and filter results.
3. **Feature Extraction Using HOG (Histogram of Oriented Gradients)** – Convert image information into numerical features that enhance classification.
4. **Classification Using SVM** – A polynomial kernel-based SVM model classifies and validates license plate text.
5. **Prediction and Validation** – Model prediction accuracy is evaluated using real-world datasets.

Dataset Selection and Description

The dataset consists of labeled license plate images annotated with ground-truth text for validation. Images are preprocessed to maintain consistency, ensuring optimal performance in classification. Data is split into training and testing sets, ensuring robust model evaluation.

Result Comparison and Ablation Study

A comparative study was conducted to evaluate the performance of the SVM model against other machine learning and deep learning approaches. The analysis compared:

- CNN-based deep learning models
- YOLO-based object detection models

- Traditional OCR methods

Findings:

- The SVM model achieved **63% accuracy**, showcasing reasonable performance in classification.
- CNN-based models demonstrated higher accuracy but required extensive training datasets.
- YOLO models performed well for real-time detection but lacked precision in OCR-based extraction.

Justification

Some methods performed well due to their ability to recognize complex license plate variations, while others struggled with image noise and distortion. The SVM classifier excelled in text-based recognition but lacked robustness against non-standard fonts and plate damages. Deep learning models showed improved accuracy, but their computational complexity limited real-time applications.

Conclusion

This project demonstrates an effective approach to automatic license plate recognition using OCR and SVM classification. While the model achieves a reasonable accuracy rate, future improvements could integrate advanced deep learning techniques for enhanced precision. The study provides valuable insights into balancing accuracy, computational efficiency, and real-time application feasibility.

Presented by

Karmugilan.E,

N.Sree Sairam Rithik Prasanna,

Vivin.T,

Saran.P