License Plate Recognition System

Overview

The License Plate Recognition System is a Python program designed to automatically detect and extract license plate information from images of vehicles. It utilizes image processing techniques and Optical Character Recognition (OCR) to identify and extract the alphanumeric characters present on license plates.

Dependencies

- **OpenCV (cv2)**: Used for image processing tasks such as reading images, edge detection, contour detection, and drawing contours.
- **imutils**: Provides convenience functions for basic image processing operations.
- **NumPy (np)**: Utilized for numerical operations and array manipulation.
- **Matplotlib.pyplot (plt)**: Enables the plotting and visualization of images.
- **Pytesseract**: Python wrapper for Google's Tesseract-OCR Engine, used for performing OCR to recognize text within images.

Functionality

1. **Image Preprocessing**:
    - Conversion of input image to grayscale to simplify processing.
    - Application of a bilateral filter to reduce noise while preserving edges.
    - Detection of edges using the Canny edge detection algorithm.
2. **Contour Detection**:
    - Identification of contours within the edged image to outline potential objects or regions of interest.
3. **License Plate Detection**:
    - Sorting of contours based on their area to prioritize larger objects.
    - Iterative search for a contour with four corners, indicating the likely presence of a license plate.
4. **License Plate Extraction**:
    - Creation of a mask to isolate the region of interest (ROI) containing the license plate.
    - Cropping of the license plate region from the original image for further processing.
5. **Optical Character Recognition (OCR)**:
    - Application of Tesseract OCR to recognize and extract alphanumeric characters from the cropped license plate image.

6. **Output Display**:
    - Visualization of the original image with detected contours highlighting the license plate.
    - Display of the extracted license plate region along with the recognized license plate number.

Usage

1. Ensure that all dependencies are installed in the Python environment.
2. Provide the path to the Tesseract OCR executable using **pytesseract.pytesseract.tesseract_cmd**.
3. Load the input image of the vehicle.
4. Execute the License Plate Recognition System to automatically detect and extract license plate information.
5. View the output displaying the original image with detected contours and the extracted license plate region along with the recognized license plate number.

Conclusion

The License Plate Recognition System streamlines the process of extracting license plate information from vehicle images, offering potential applications in various domains including traffic management, law enforcement, and automated toll collection.