Automated License Plate Reading with Commodity Hardware

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YOLOv8

- **Function:** Advanced deep learning model for real-time object detection.
- **Usage:** First for detecting license plates, then for classifying characters on those plates.

Commodity Hardware

- **Why iPhone 13:** Offers high-resolution camera capabilities and sufficient processing power.
- **Advantage:** Easily accessible and cost-effective for practical applications.

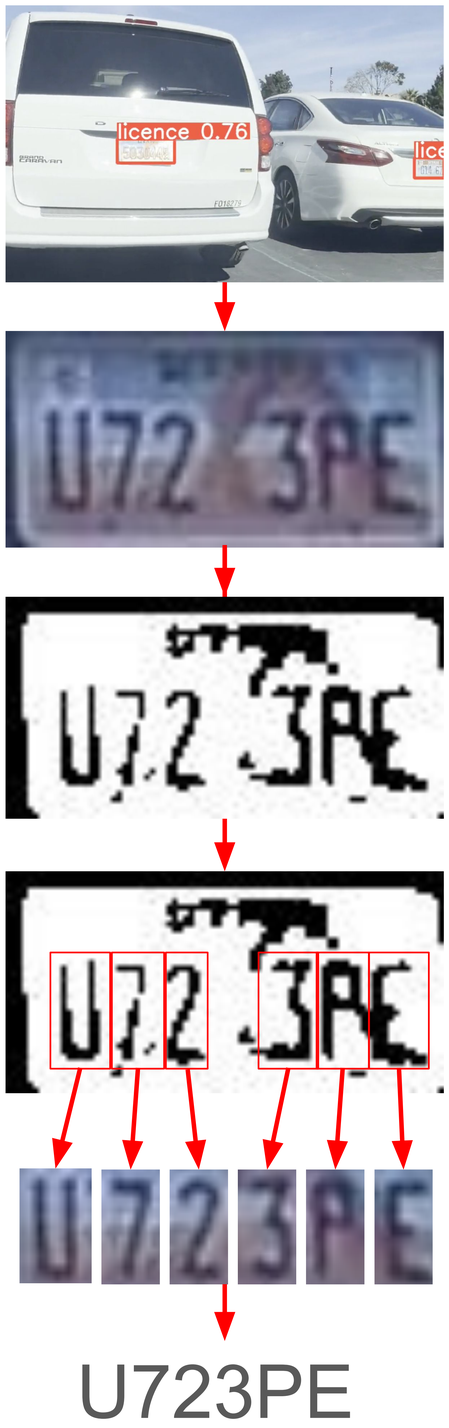
OpenCV

- **Function:** Processes cropped images to isolate individual characters.
- **Method:** Utilizes contour detection to identify and extract character boxes.
- **Importance:** Enables accurate character recognition by providing clear input for the secondary YOLOv8 model.

Methodology

- **Image Capture:** Utilize iPhone 13 to take real-time photos of vehicles.
- **Initial Detection:** Apply YOLOv8 model to identify license plates in images.
- **Image Cropping:** Extract and crop detected license plates for further processing.
- **Character Segmentation:** Use OpenCV to detect contours and segment characters from the cropped license plate images.
- **Character Recognition:** Implement a secondary YOLOv8 model to classify the segmented characters.
- **Testing:** No labeled test dataset; results evaluated based on visual verification and consistency checks.

Process



Results

Plate Location

Confidence Threshold	Number of Plates	Plates Recognized	Non-Plates Recognized
0	51	51	31
0.7	51	44	0
0.9	51	7	0

Optical Character Recognition

Number of Plates	Average Edit Distance	Average # of Correct Contours
15	4.93	2

Average # of Incorrect Contours	Average Total Contours	Average # of Characters
1.47	3.53	5.93

Future Work

- **Real-Time Implementation:** Adapt the system to read license plates directly on the iPhone 13 in real-time.
- **GPS Integration:** Combine the recognition system with GPS technology to ascertain the specific type of parking lot (e.g., economy, premium) the vehicle is in.
- **Database Integration:** Integrate with the university's parking permit database to automatically verify whether a parked vehicle possesses a valid permit.
- **OCR Experimentation:** Explore and test various optical character recognition (OCR) techniques to improve accuracy and reliability under different conditions.