License Plate Number Recognition Project

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Idea

- Detect and recognize vehicle license plates in videos
- Real-time processing of dynamic video feeds
- Keeping track of cars/license plates

| Detect cars and crop regions | → | Detect and crop license plate | → | Extract plate numbers |

OR

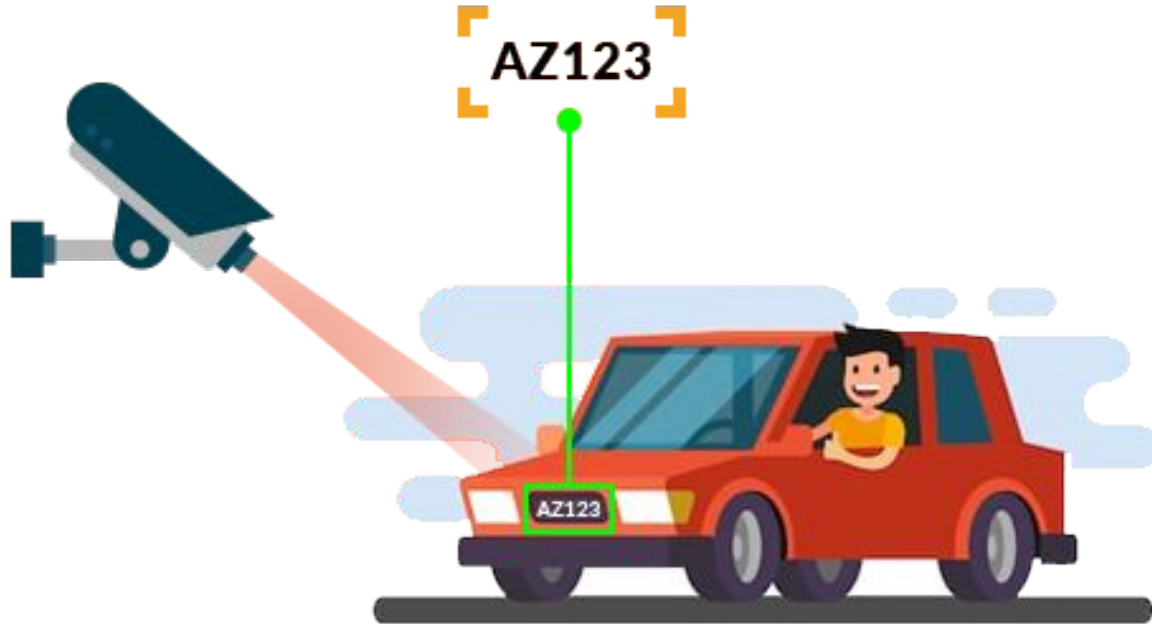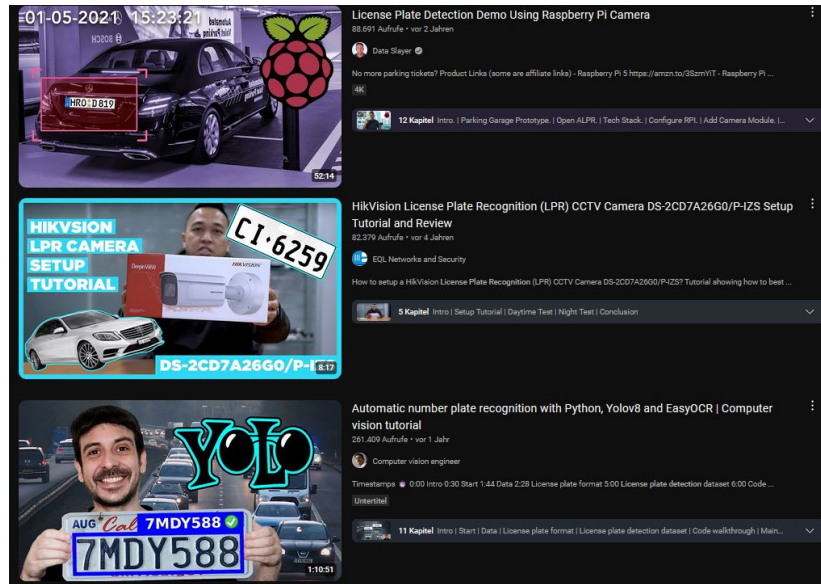| Detect license plates and crop regions | → | Extract plate numbers |
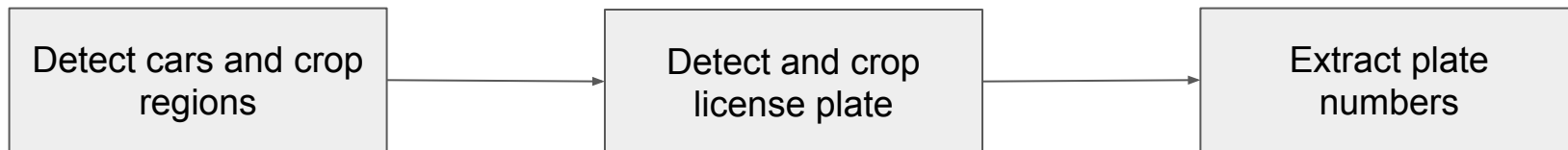
Motivation

- Enhance traffic management, parking automation and law enforcement
- Need for real-time, reliable license plate detection and recognition

Related Work

- OpenALPR and other deployed ALPR solutions
- Widely used in parking facilities or on highways

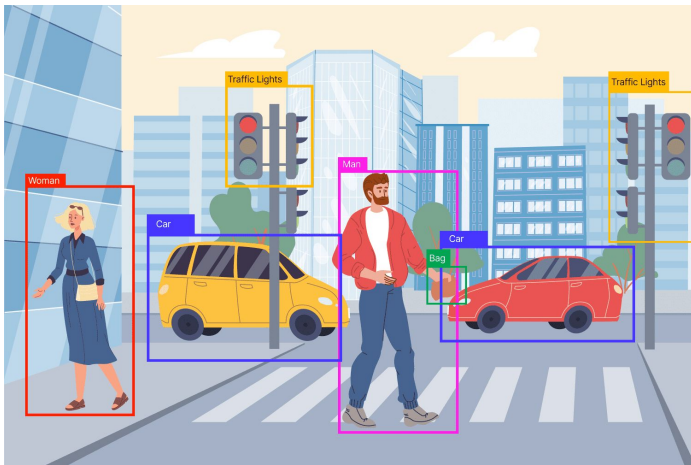**License Plate Detection and Recognition: A Study of Review**

Naaman Omar [1,a], Subhi R. M. Zeebaree[2,b], Mohammed A. M.Sadeeq[3,c], Rizgar R. Zebari[4,d], Hanan M. Shukur[5,e], Ahmed Alkhayyat[6,f], Lailan M. Haji[7,g], Shakir Fattah Kak[8,h]

A Real-Time License Plate Detection and Recognition Model in Unconstrained Scenarios

Lingbing Tao [1], Shunhe Hong [1], Yongxing Lin [1,2], Yanbing Chen [1], Pingan He [3] and Zhixin Tie [1,2,*]

Why?

- Compare various techniques for accuracy and efficiency
- Tailor for personal video challenges (such as unstable videos) and real-time processing
- Use multiple concepts learned in this course (Object detection, OCR)

Datasets

- Roboflow License Plate Recognition Dataset
  - More than 24242 images with license plate bounding boxes

- Kaggle Car Plate Detection Dataset
  - More than 400 images with license plate bounding boxes

- Car Object Detection
  - More than 1000 videos of cars with bounding boxes

- Vehicles
  - More than 4000 pictures of cars with bounding boxes
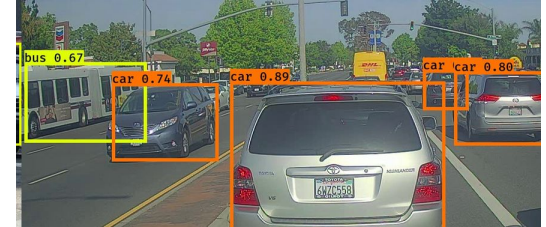
Key Components for Evaluation

- **Object Detection**
  - **YOLO:** High speed & precision
  - **Faster R-CNN**: High accuracy
  - **Single Shot Multibox Detector:** Balanced speed & accuracy

- **Object Tracking**
  - **DeepSORT:** Robust, handles occlusions & re-identifications
  - **ByteTrack:** Tracks crowded scenes with high/low-confidence detections

- **Optical Character Recognition (OCR)**
  - **Tesseract OCR:** Customizable
  - **EasyOCR:** Lightweight
  - **Deep OCR (e.g., CRNN):** Accurate, handles noisy/distorted text

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Evaluation Criteria

- **Object Detection**
  - **Metrics**: Precision, recall, F1-score, mAP, FPS/Processing Time
  - **Evaluation**: Test diverse datasets (lighting, plate types)

- **Object Tracking**
  - **Metrics**: MOTA, MOTP, ID Switch Count

- **OCR Performance**
  - **Metrics**: CRR, WRR, Processing Time
  - **Evaluation**: Test on noisy, skewed, occluded plates, different plate types

APPENDIX

https://github.com/EricCpy/Numberplate_Recognition

Sources

1. **Vehicles Dataset**
   Source: Roboflow Universe [December 01, 2024].

2. **Car Object Detection Dataset**
   Source: Kaggle [December 01, 2024].

3. **DeepSORT: Tracking Algorithm**
   Source: GitHub Repository [December 01, 2024].

4. **Car Plate Detection Dataset**
   Source: Kaggle [December 02, 2024].

5. **License Plate Recognition Dataset**
   Source: Roboflow Universe [December 02, 2024].

6. **A Real-Time License Plate Detection and Recognition Model in Unconstrained Scenarios**
   Authors: Lingbing Tao, Shunhe Hong, Yongxing Lin, Yanbing Chen, Pingan He, Zhixin Tie
   Published: January 2024

7. **Exploring Object Detection Applications and Benefits**
   Source: DeepLobe AI [December 04, 2024].

8. **Numix Video Analytics Solutions**
   Source: Innominds [December 04, 2024].