Monocular camera applications in perception system of autonomous driving

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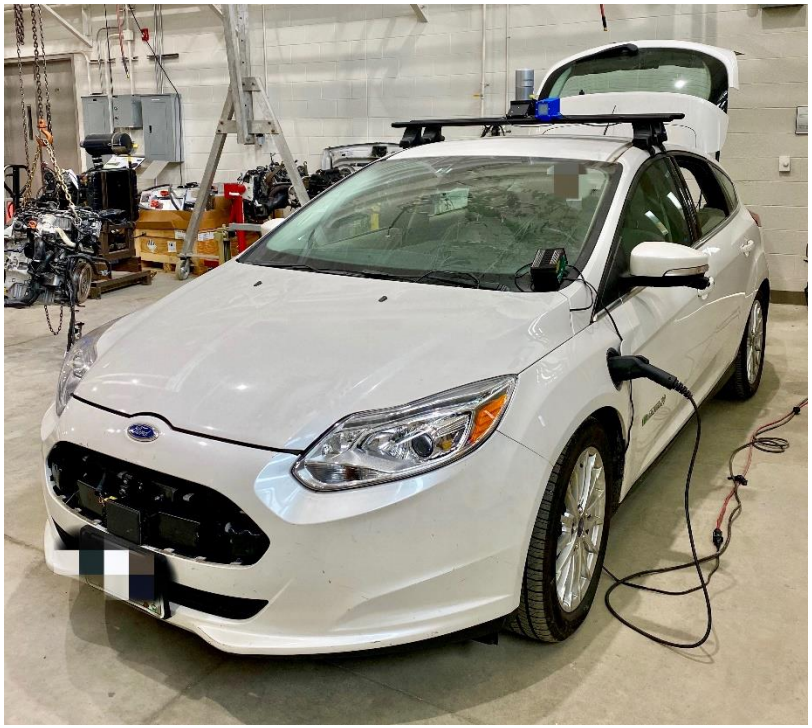
Project Description

- As the 1st stage of autonomous driving, the perception system is to perceive and understand the surrounding environment accurately in real-time
- Visual camera is the most common used sensor, which can get rich visual cues as human visual system and currently is the cheapest and most robust device
- Calmcar Vision System is installed, including one front-view camera + four surround-view cameras (front, rear, left and right sides)



Objective(s)

- Static (e.g. cars…) and dynamic (e.g. lanes…) obstacles detection using monocular camera
- Deep learning algorithms

Tasks/Plan

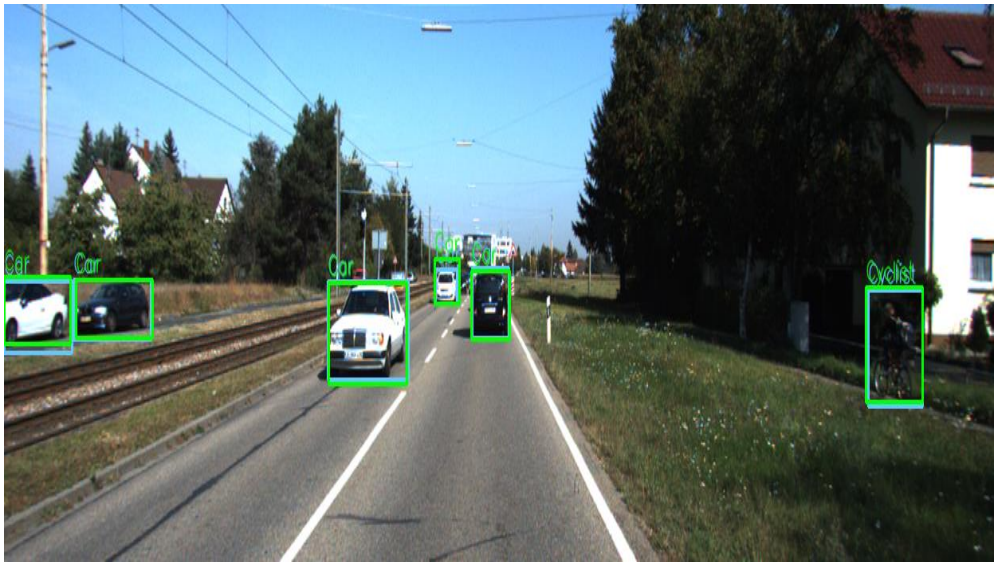
- Objects detection: classify and localize objects
- License plate (LP) detection and recognition: detect and read LPs' numbers with OCR technology
- Lane detection: extract highway lane features and model lane fittings

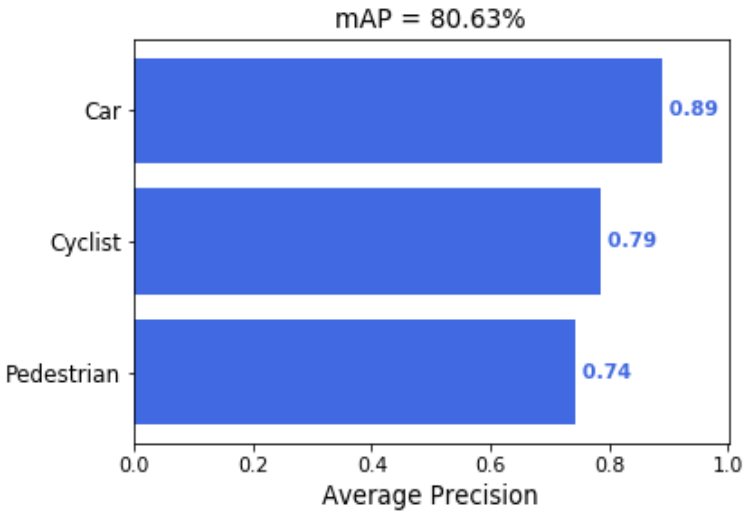
Expected Outcome & Deliverables

- Detect dynamic objects with high precision (done)
- Recognize license plate numbers accurately (done)
- Detect lanes on highway with high accuracy (in progress)

Progress Report – Object Detection

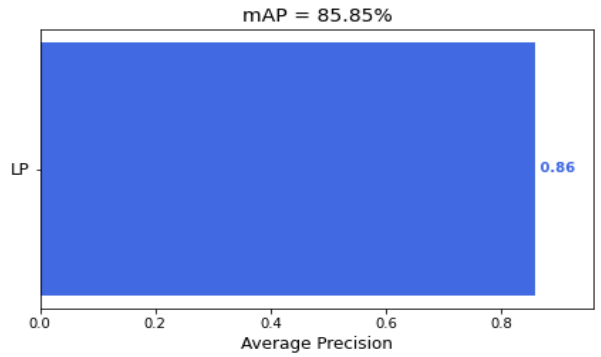
- Algorithm: YOLOv3
- Dataset: KITTI dataset
- Challenges: occlusion/truncation, data imbalance, object size





Progress Report – License Plate (LP) Detection and Recognition

- Detection:
  - Algorithm: YOLOv3
  - Dataset: mixed data with labeled LPs from different regions
- Recognition:
  - Algorithm: CRNN (Convolutional Recurrent Neural Network)
  - Accuracy achieves 97.17%



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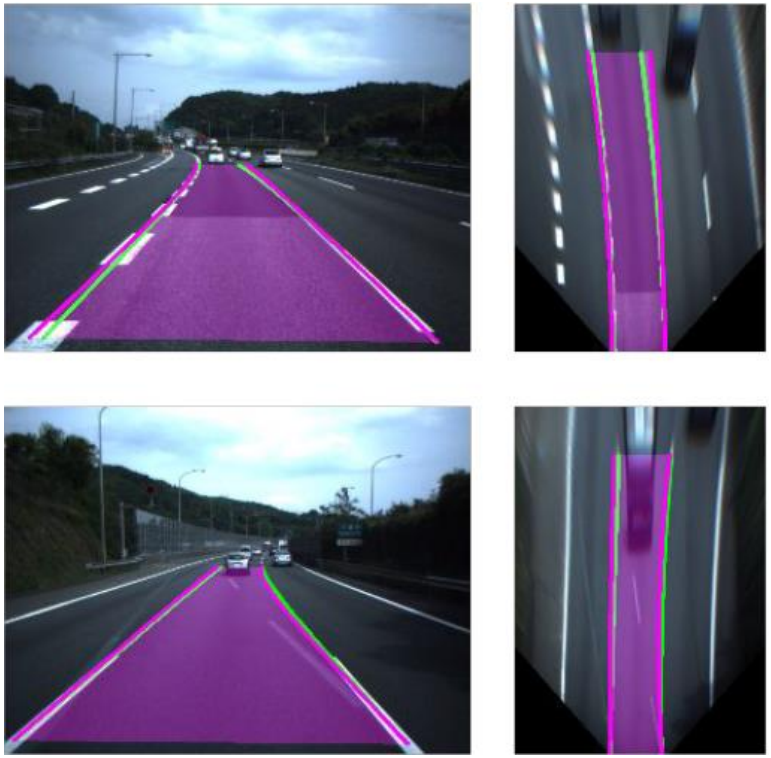
Progress Report – Lane Detection

- Algorithm: Differentiable Least-Squares Fitting
- Dataset: TuSimple (highway lanes)



B. De Brabandere, W. Van Gansbeke, D. Neven, M. Proesmans, and L. Van Gool, “End-to-end lane detection through differentiable least-squares fitting,” arXiv preprint arXiv:1902.00293, 2019.

THANK YOU