Auto-Calibration with Stop Signs

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Cognitive Robotics

Overview

calibrate intrinsics using estimated stop sign corners

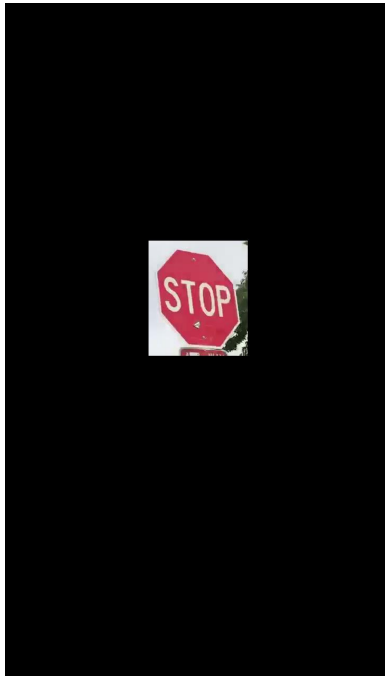
- System Pipeline
- Results
- Issues and Potential Solution
- Short-term Plan

System Pipeline

Video Frame

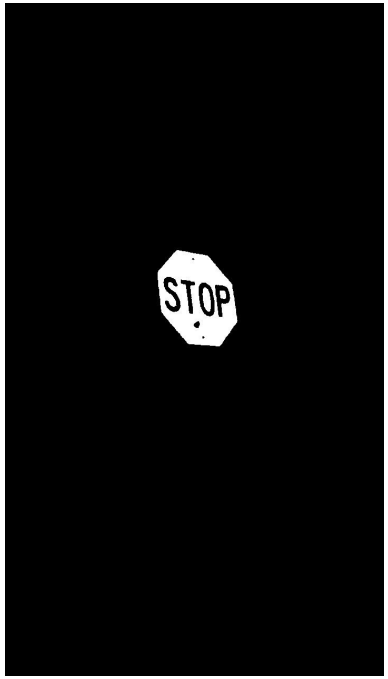
Current
- GNB
- HSV

Future
YOLO



Bounding Box

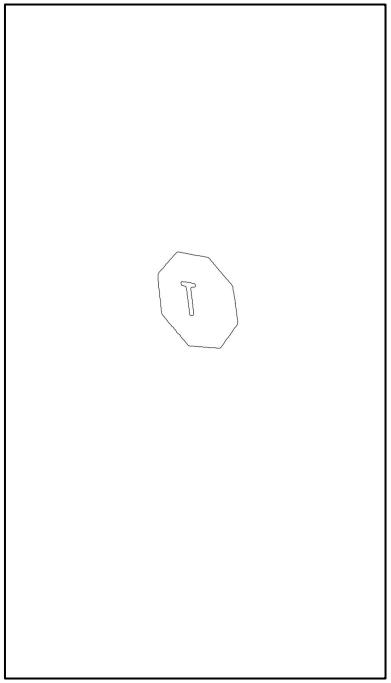
Current
HSV



Pixel-wise Mask

System Pipeline

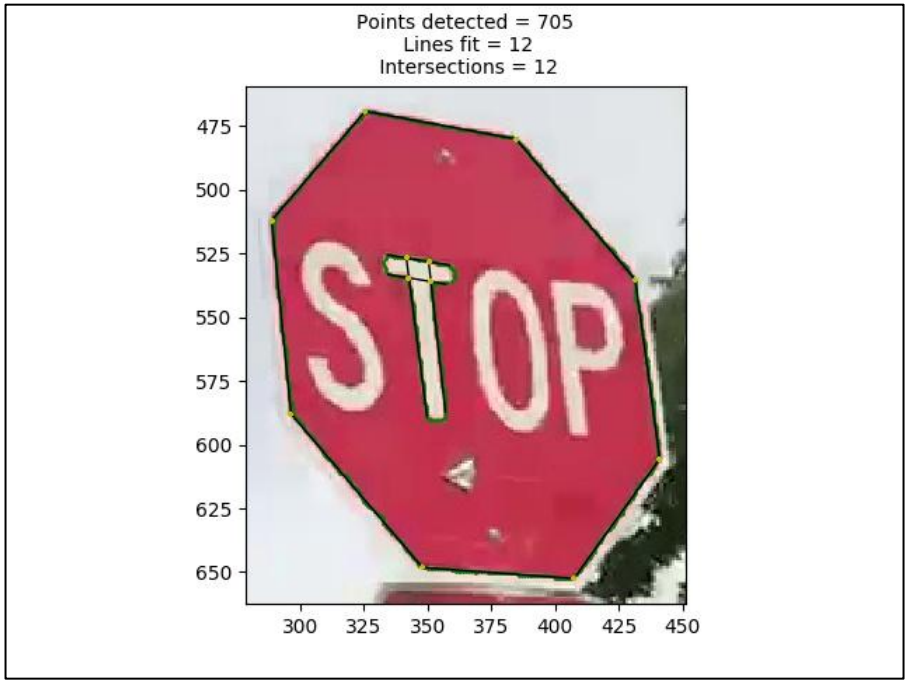
Current
Canny Edge +Devernay Sub-Pixel Correction*



Edge Points

Current
SVD +RANSAC

Future
+Data Association



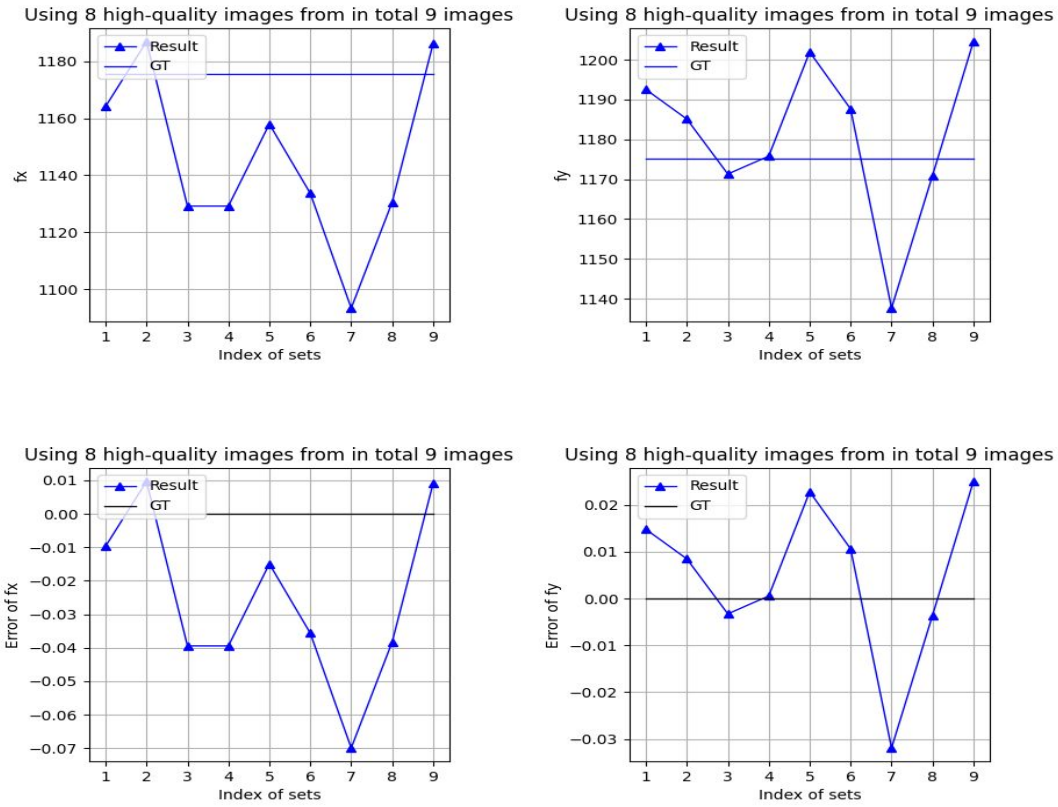
Line Estimation + Intersections

*: R.G. Gioi & G. Randall(2017), "A Sub-Pixel Edge Detector: an Implementation of the Canny/Devernay Algorithm"

Results

By the previous process, we can obtain 9 high-quality images.
Using planer object calibration algorithms, every time we input the estimated corner points on 8 images and repeat it by 9 times.

Auto-calibration results-Groundtruth obtained from chessboard calibration



Results

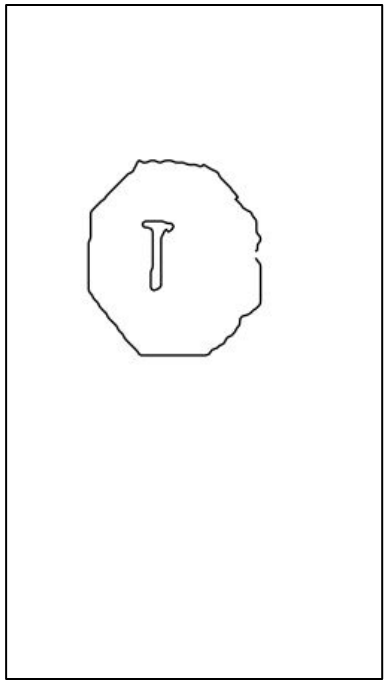
	fx	fy
1	-0.965%	1.479%
2	0.971%	0.847%
3	-3.943%	-0.327%
4	-3.944%	0.054%
5	-1.493%	2.281%
6	-3.563%	1.061%
7	-6.991%	-3.193%
8	-3.828%	-0.362%
9	0.907%	2.503%

	fx	fy
1	-2.483%	0.562%

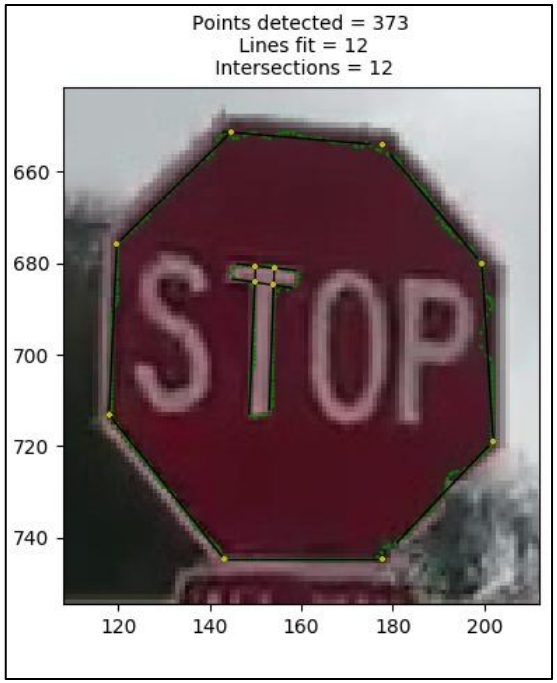
Issues - Bad Quality Images & Points

Bad-Conditioned Image

Missing Part



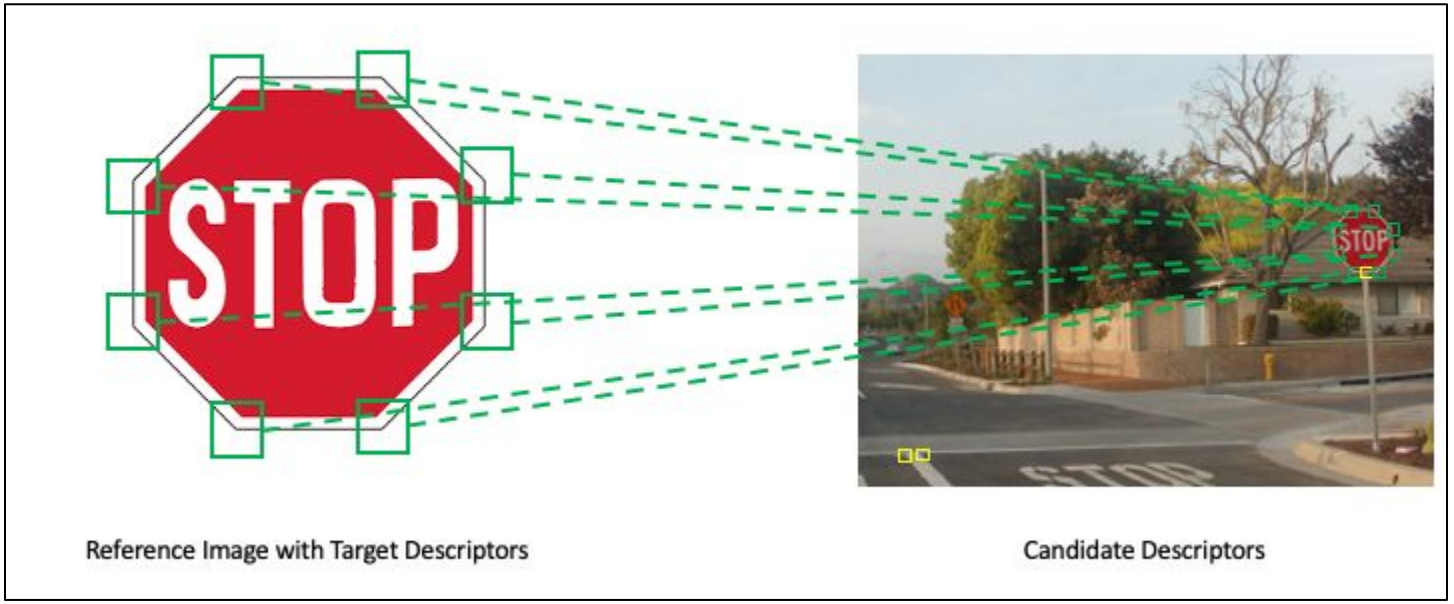
Points Off Edge



False Intersection

Potential Solution

- Improve Images/Points Quality
- Keep Only Good Quality Points => **Data Association**



- Filter out Bad Quality Images/Points
- Automatic Corner Matching

Short-term Plan

Experiments on Other Datasets

- Waymo Open Dataset
- AVL Dataset

Data Association

- Automatically Match Corner Points
- Choose High-quality Images/Points

Thank you!