Lab meeting

Line Detecting & Tracking in Thermal Images

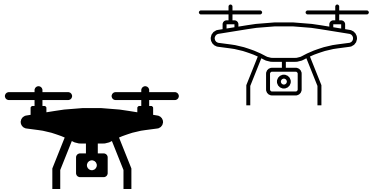
GIST MPIL Machine Perception and Intelligence Lab

25.02.21

Gyuhyeon Song

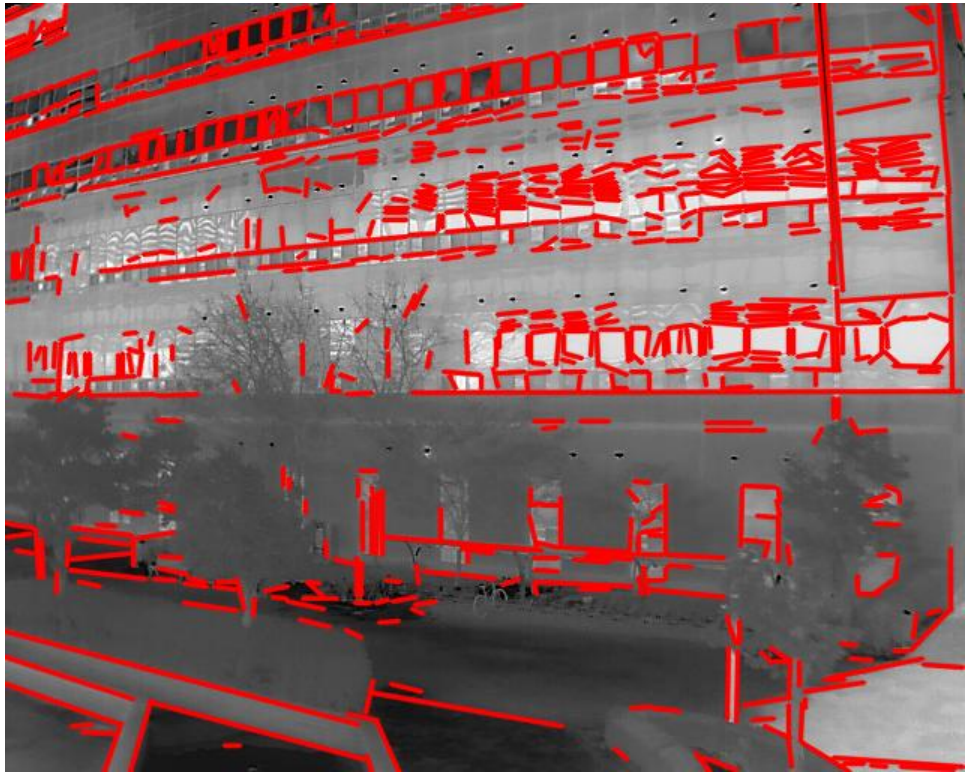
Contents

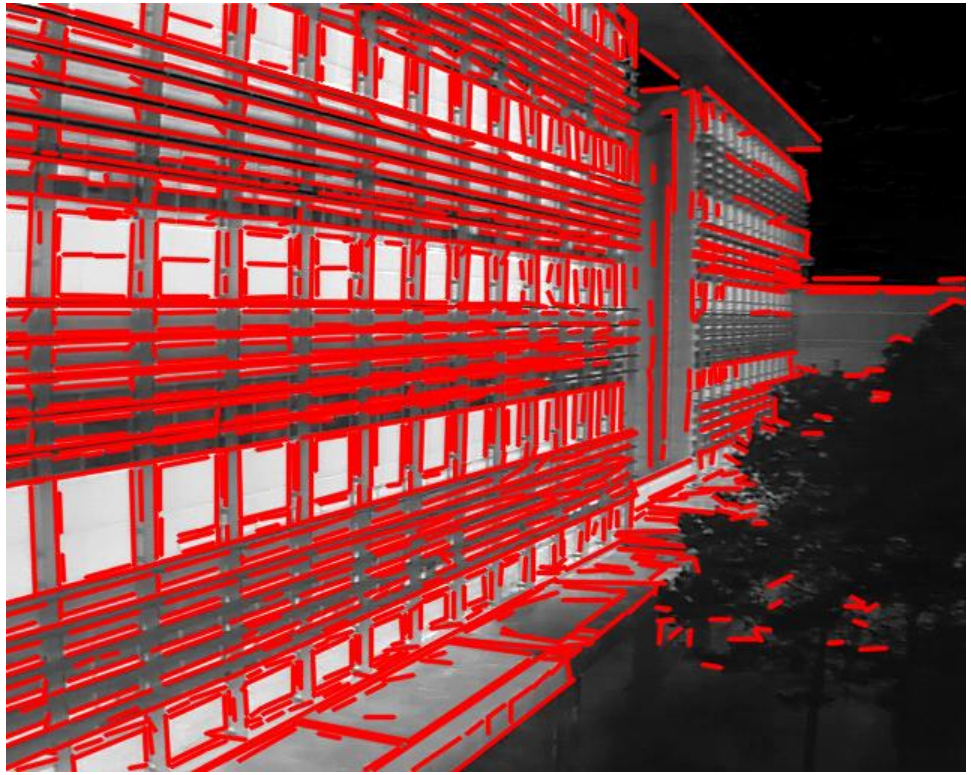
- LSD
- M-LSD
- HAWP
- SOLD2
- Future Tasks



LSD

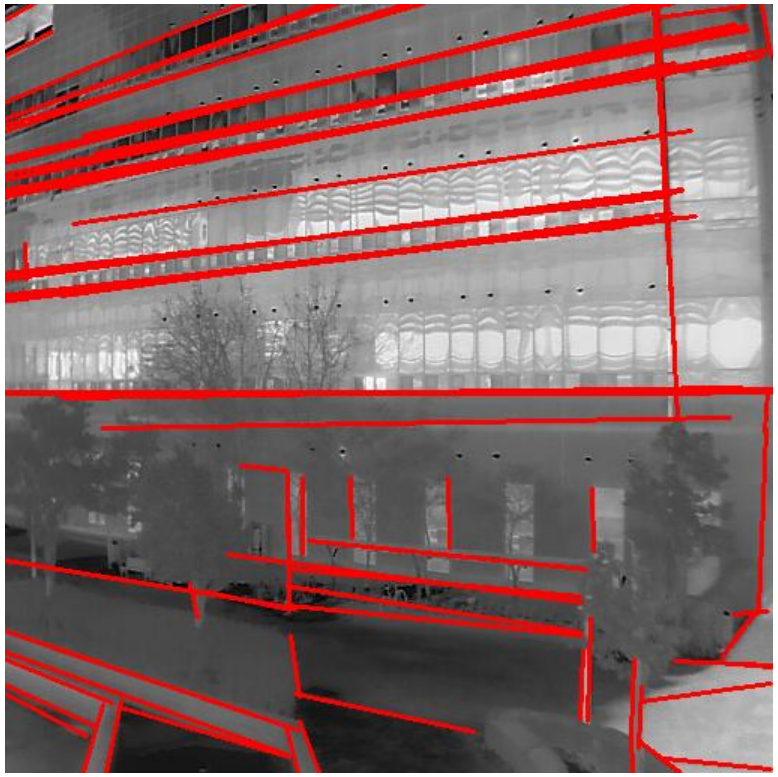
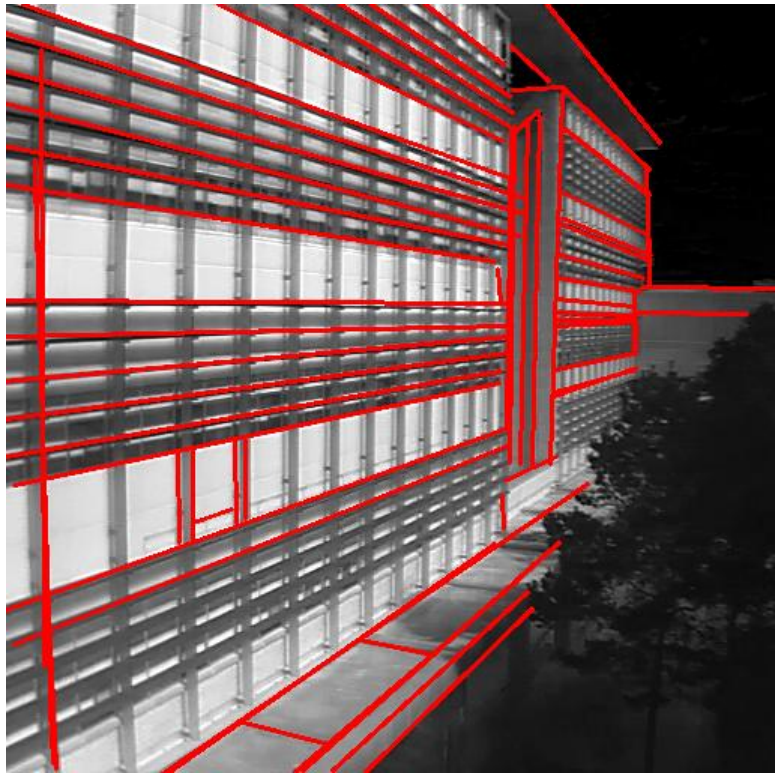
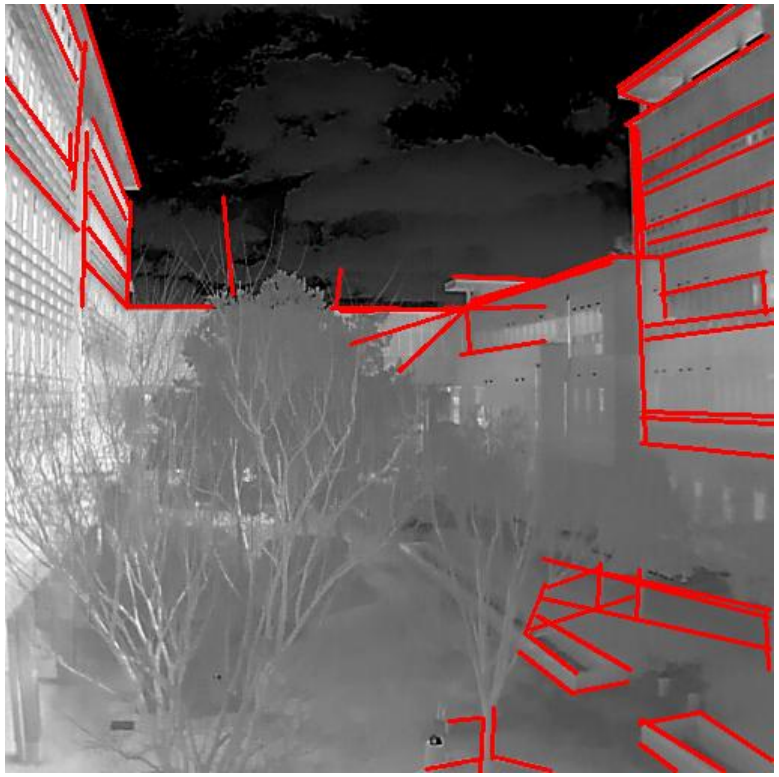
- Without changing any parameters





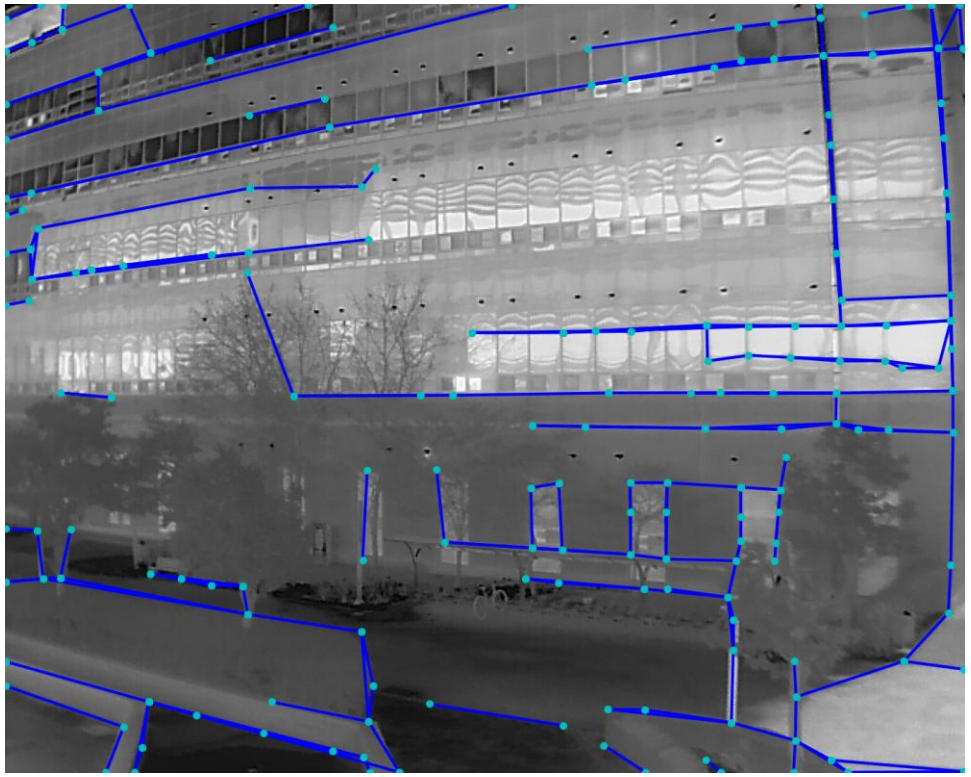
M-LSD

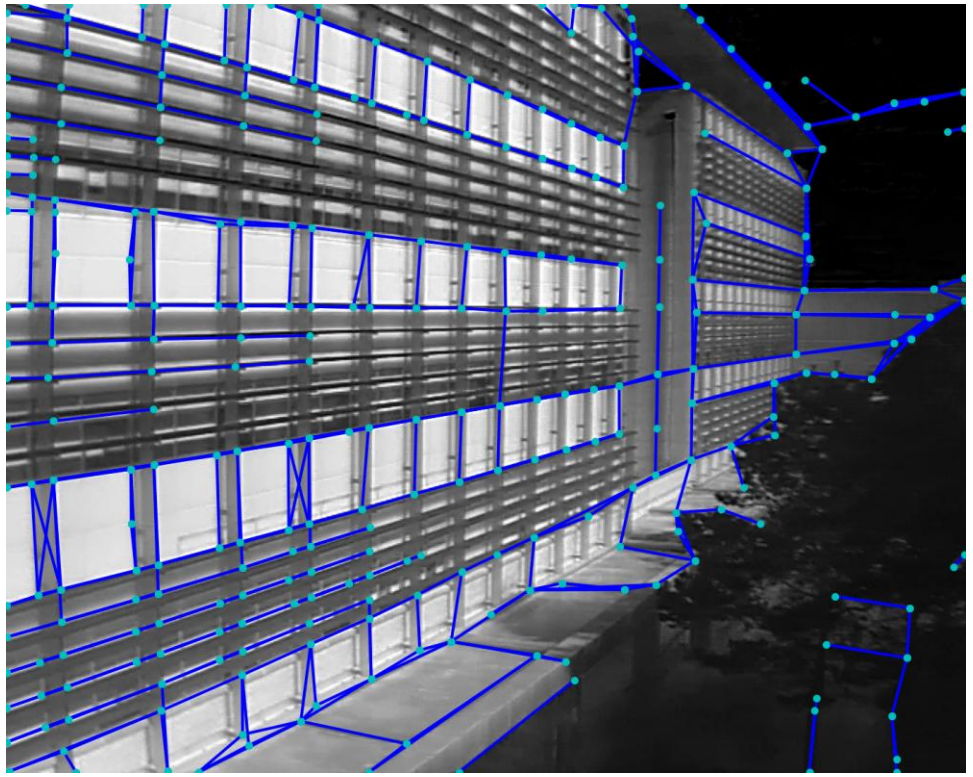
- Towards Light-weight and Real-time Line Segment Detection (2021)

HAWP

- Holistically-Attracted Wireframe Parsing (2020)





SOLD2

- Self-supervised Occlusion-aware Line Description and Detection (2021)
- Input: gray-scale img/ Output: J, H, D
- Robust to occlusion (descriptor)

GIST MPIL Machine Perception and Intelligence Lab

SOLD2

Lines	Desc	Wireframe [18]		ETH3D [49]	
		Precision↑	Recall↑	Precision↑	Recall↑
LSD [57]	LBD [65]	0.496	0.597	0.132	0.376
	LLD [55]	0.123	0.116	0.085	0.230
	WLD [24]	0.528	0.804	0.127	0.398
	SOLD^2 (Ours)	**0.591**	**0.889**	**0.159**	**0.525**
Ours	SOLD^2 (Ours)	**0.882**	0.688	**0.196**	0.538
Ours w/ NMS	SOLD^2 (Ours)	0.777	**0.949**	0.190	**0.688**

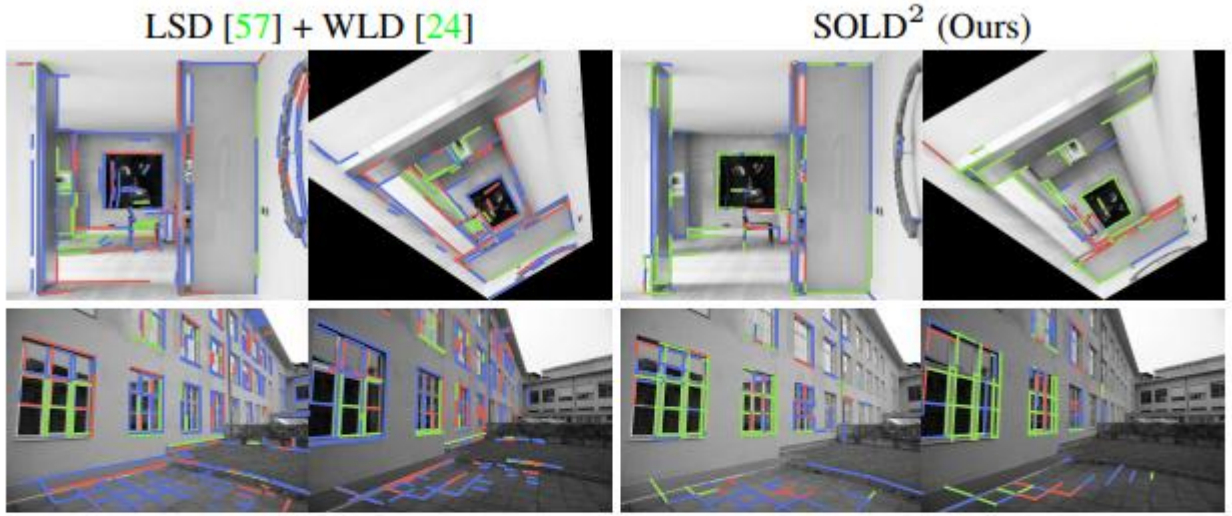
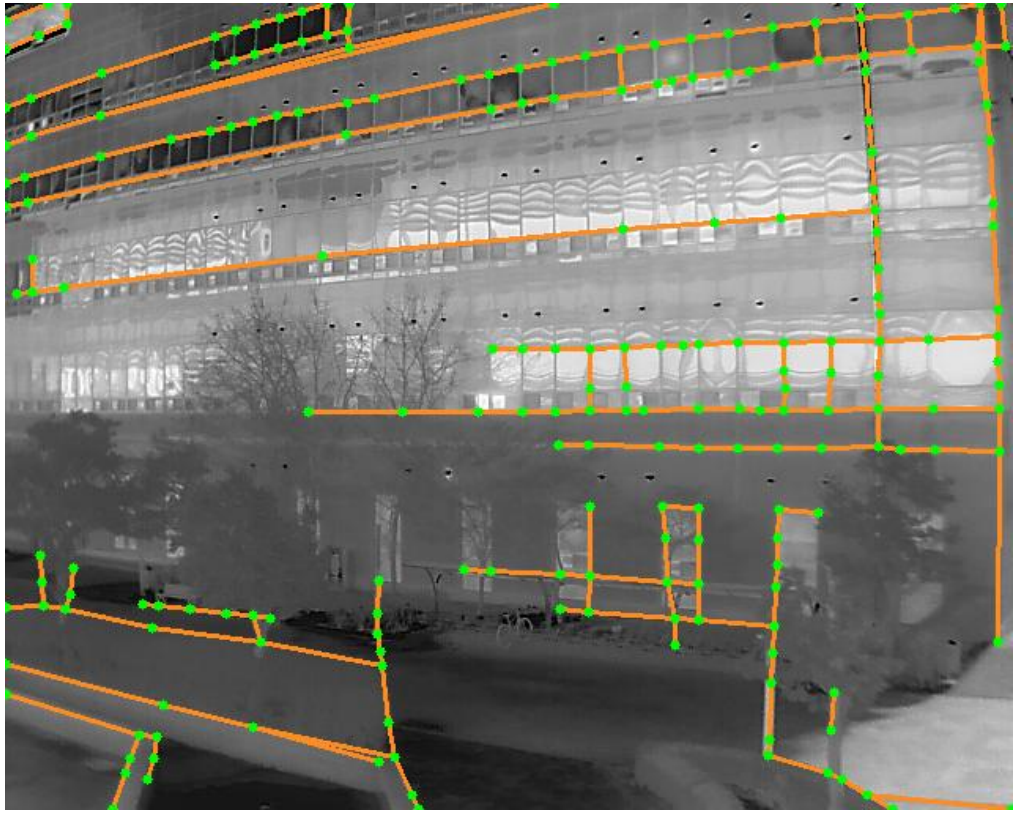
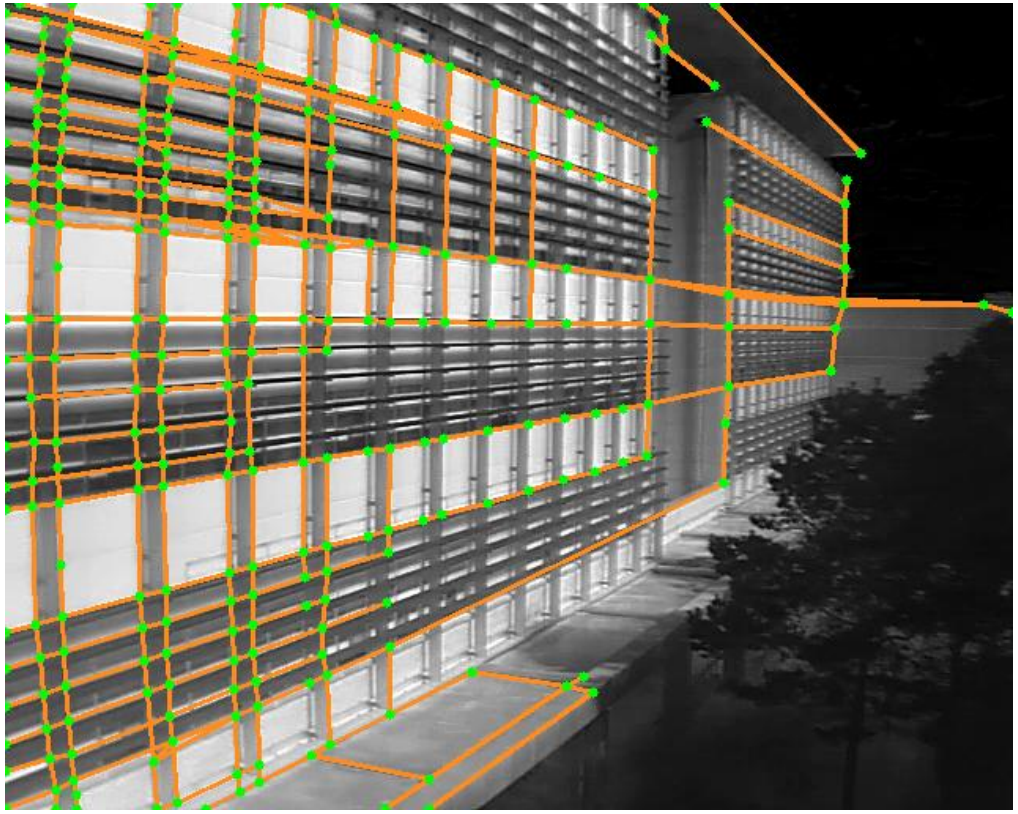


Figure 7: **Line matches visualization.** Comparison of line matches between LSD [57] + WLD [24] and our method with correct matches, incorrect ones, and unmatched lines. SOLD^2 provides fewer but more repeatable lines that can be matched in poorly textured areas and with repetitive patterns.

GIST MPIL Machine Perception and Intelligence Lab

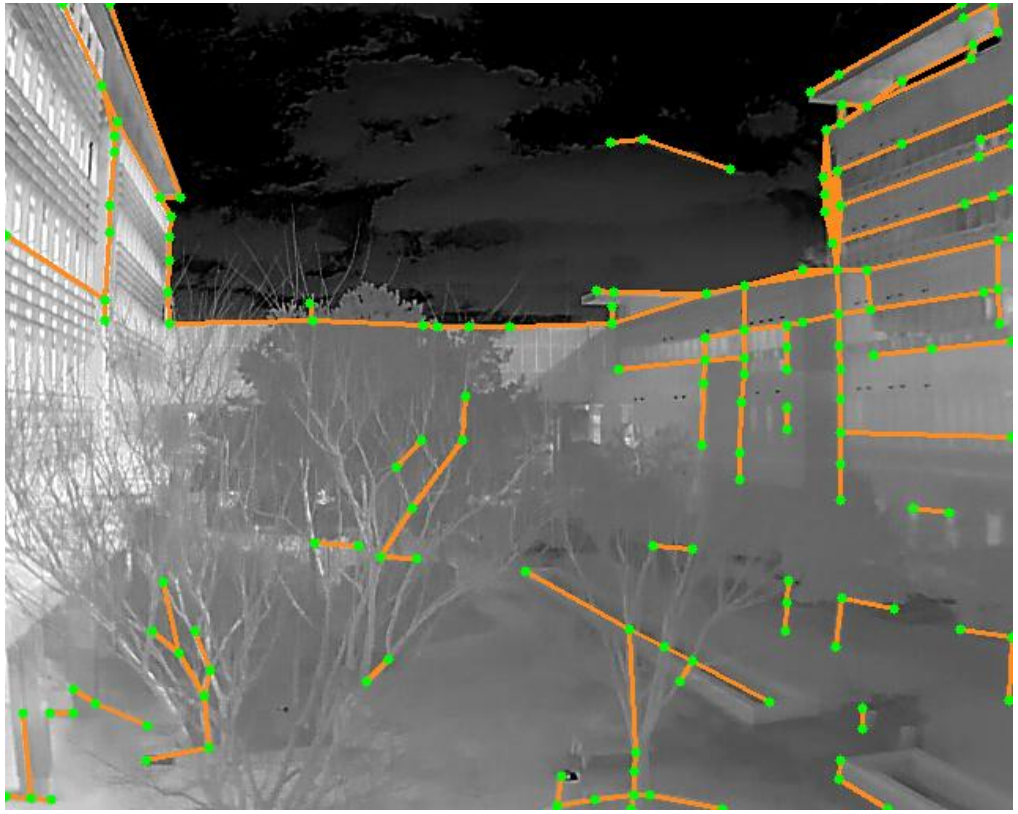
SOLD2

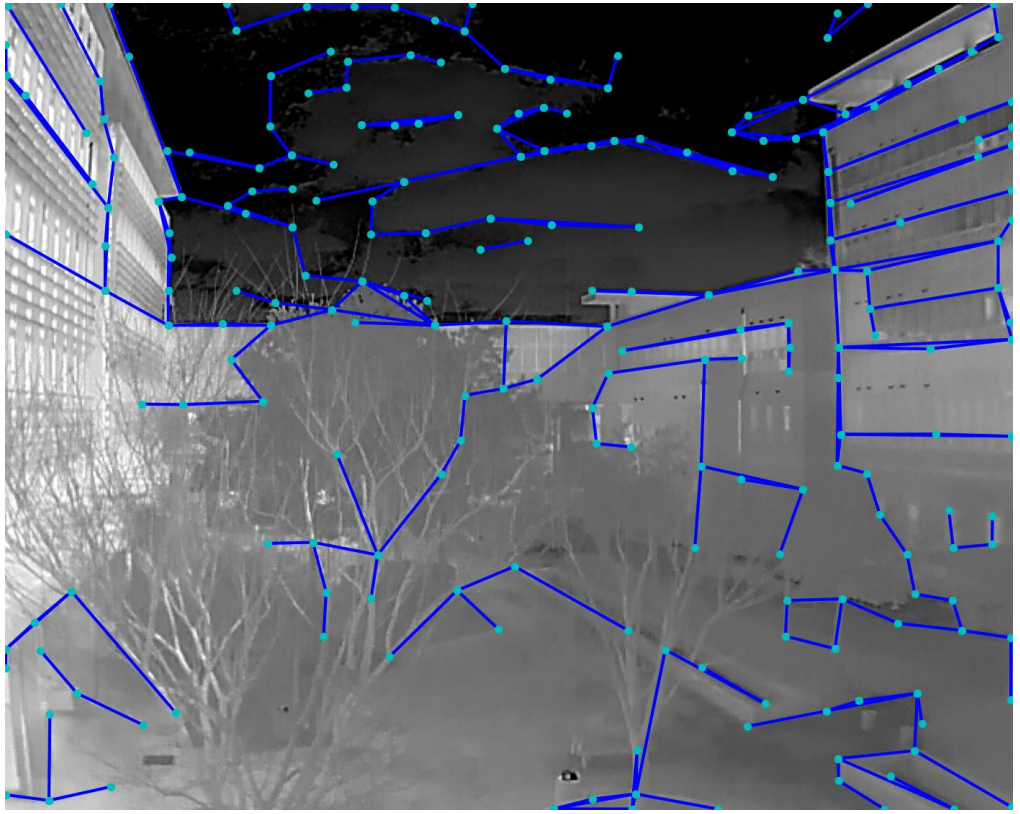




GIST MPIL Machine Perception and Intelligence Lab

SOLD2 (occlusion)

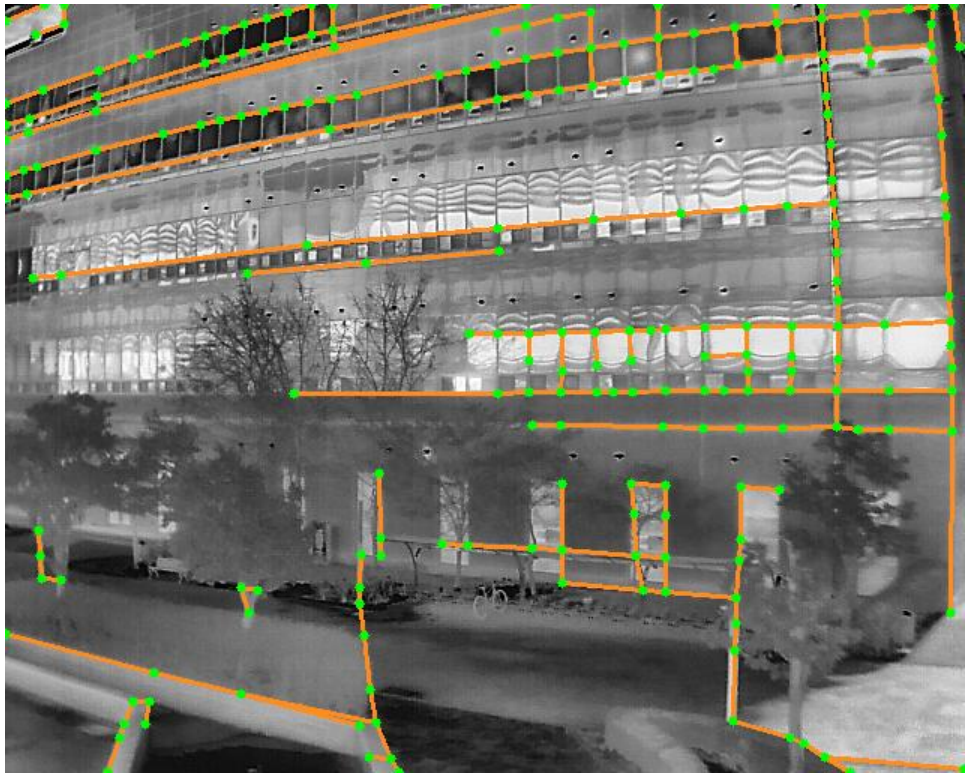


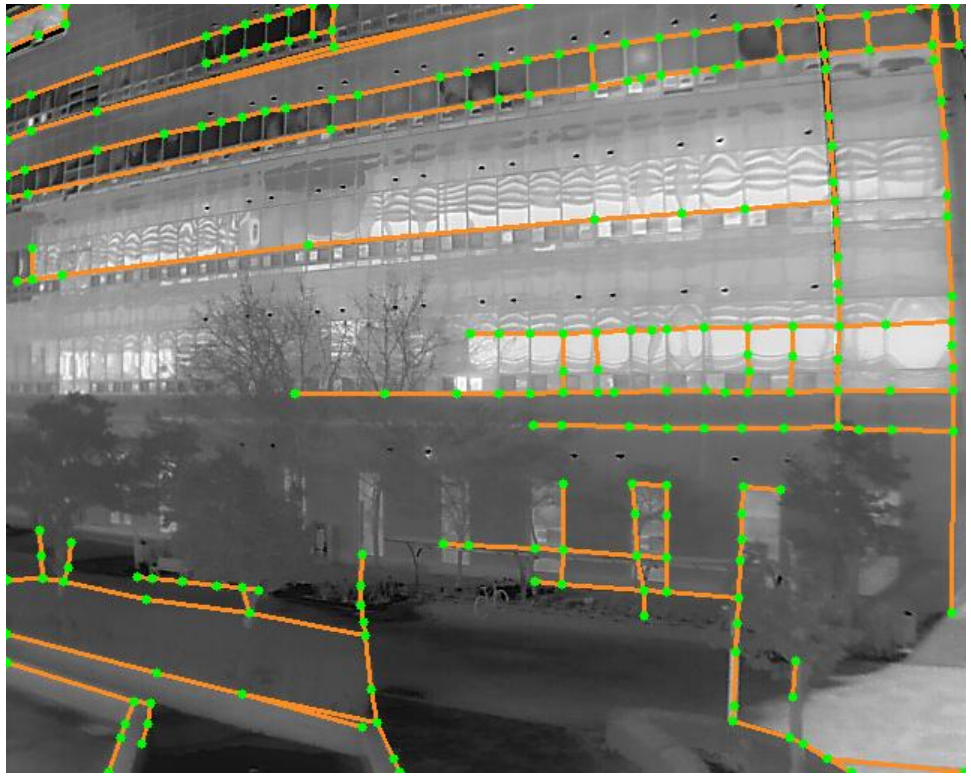


GIST MPIL Machine Perception and Intelligence Lab

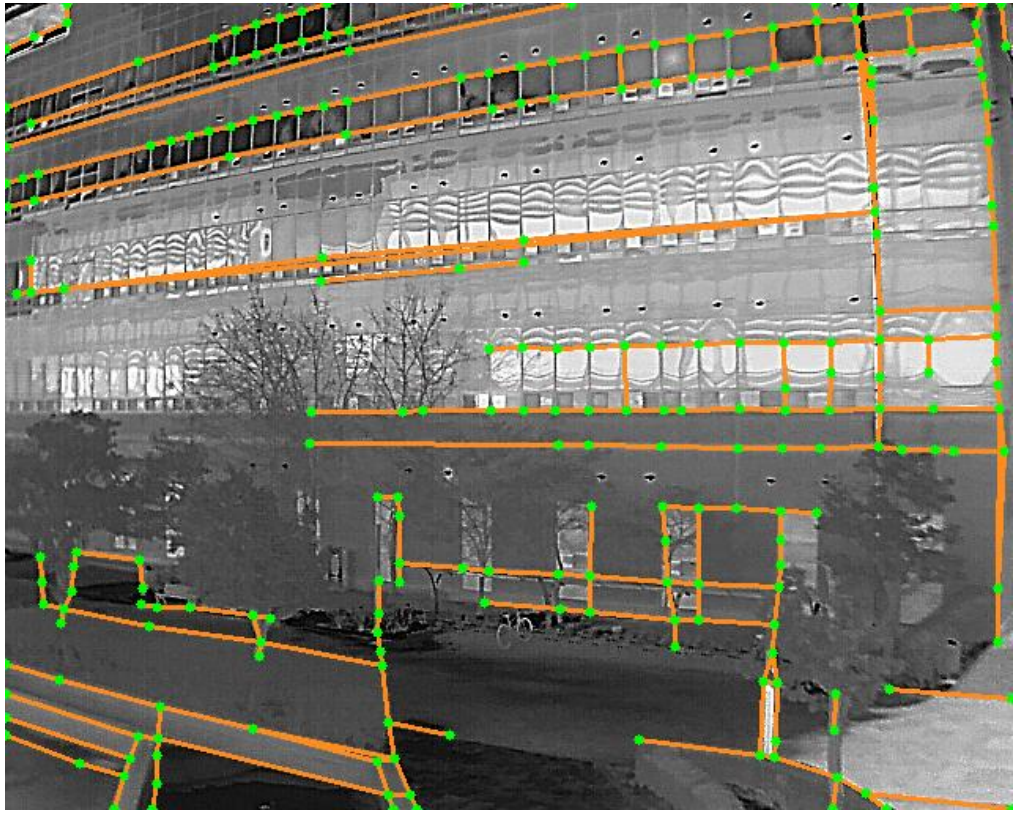
SOLD2 +Clahe

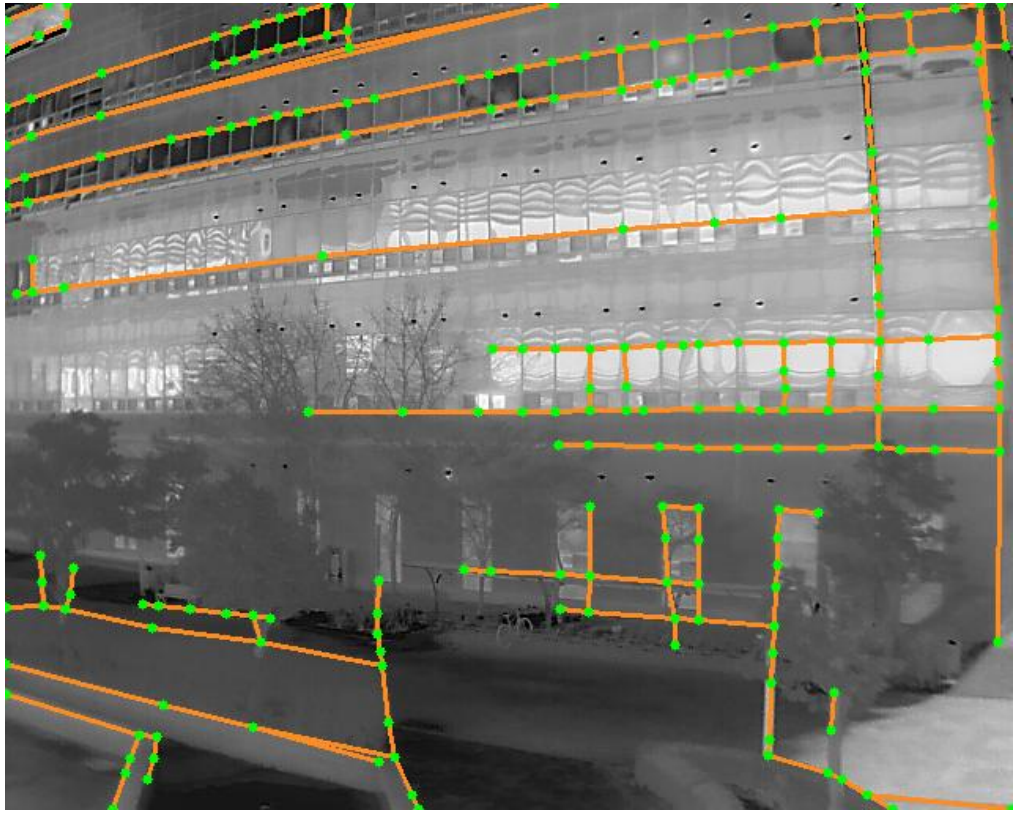
- Almost same with Original SOLD2



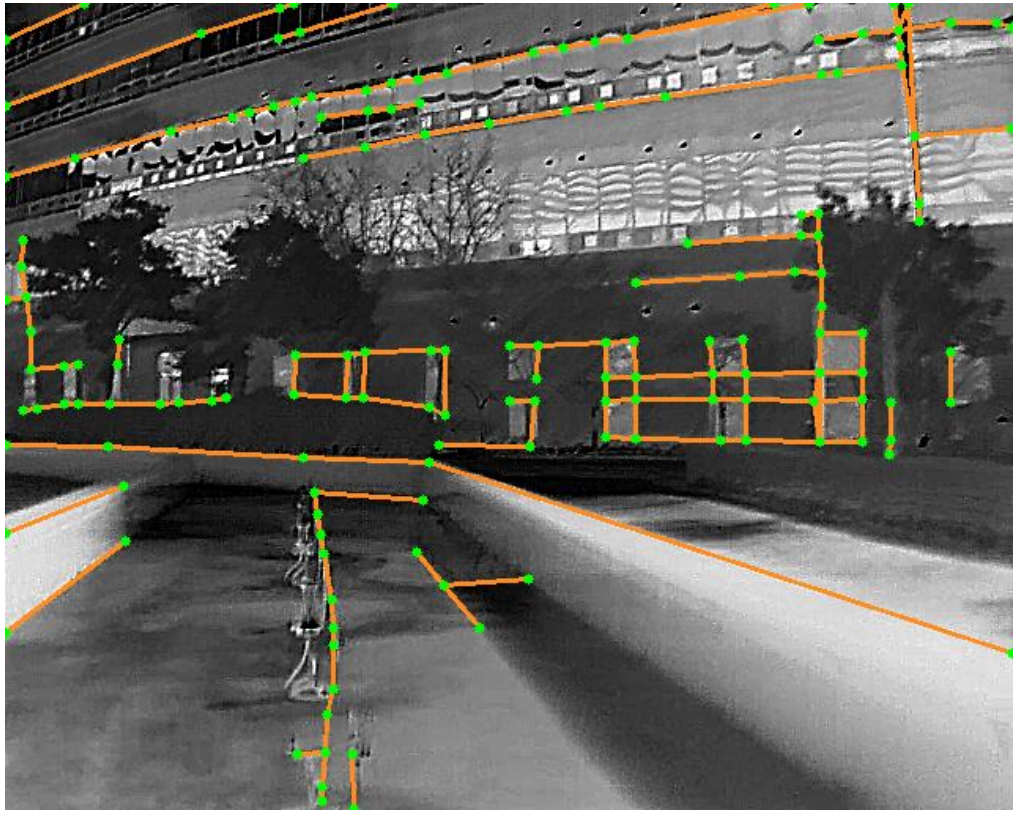


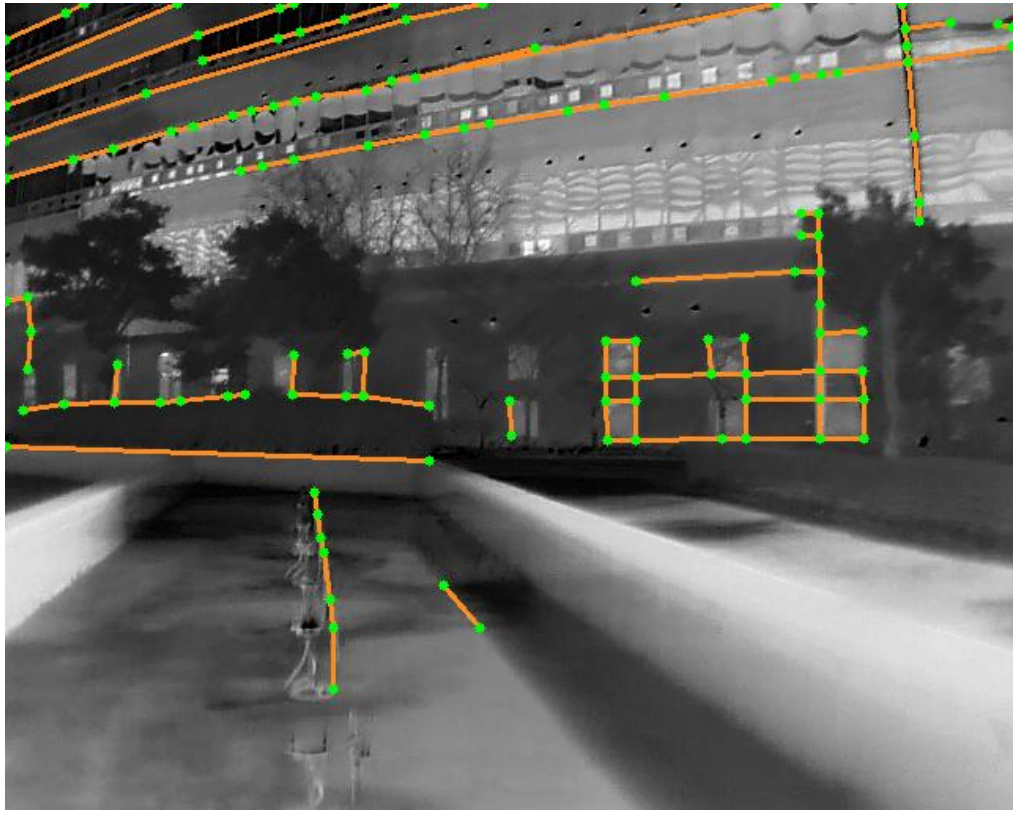
SOLD2 +Unsharp mask





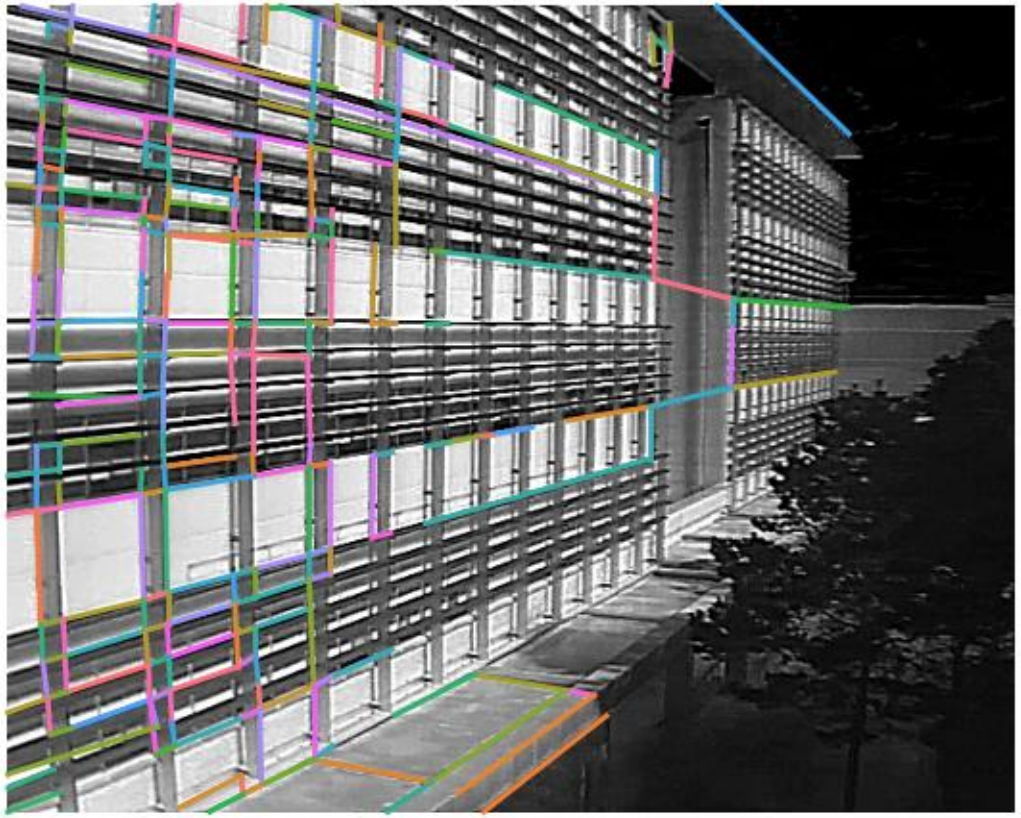
SOLD2 +Unsharp mask





SOLD2 (matching)

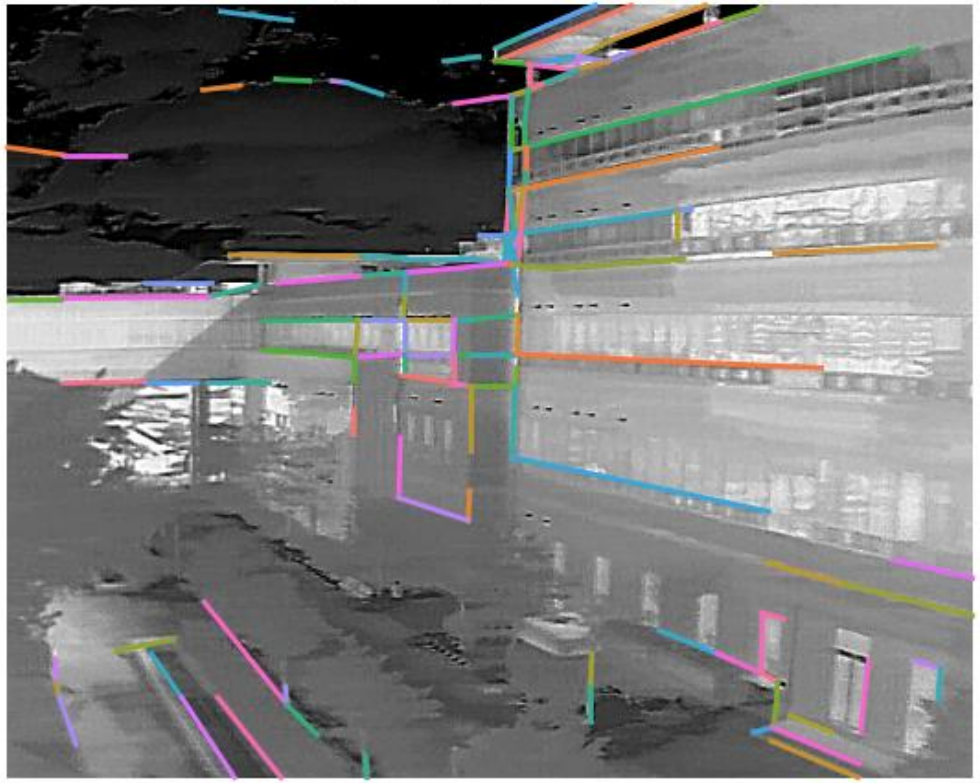
frame_0892.png- matched lines



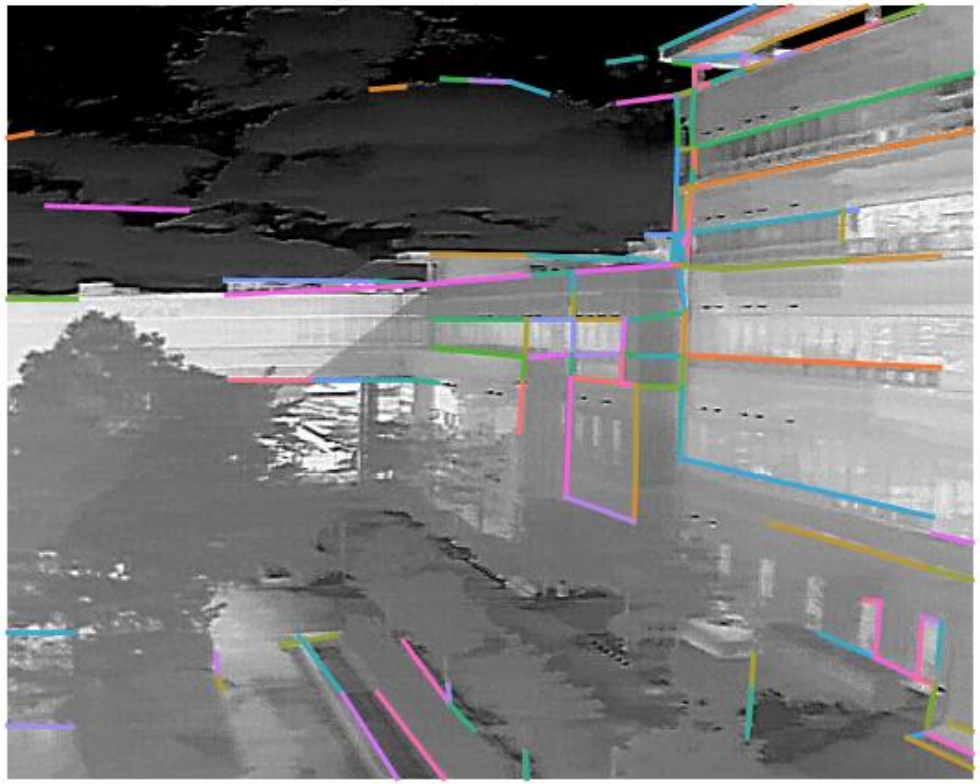
frame_0896.png- matched lines

SOLD2 (matching)

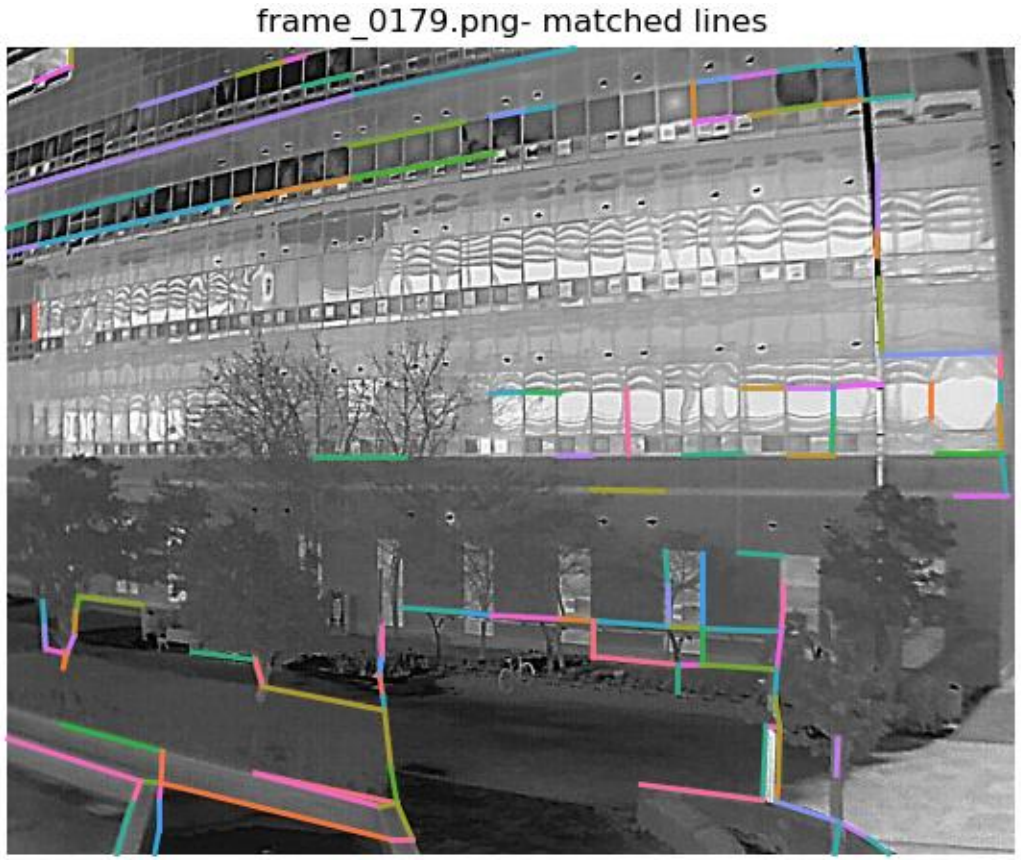
frame_1054.png- matched lines

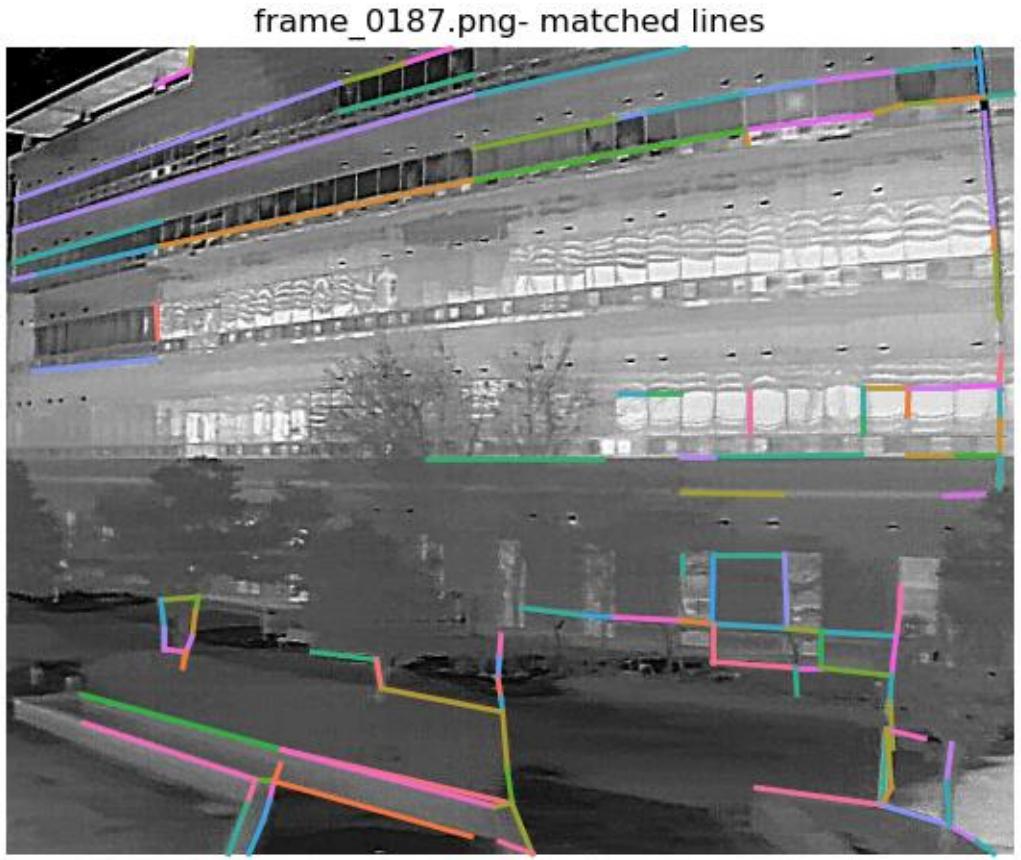


frame_1059.png- matched lines



SOLD2 (matching)

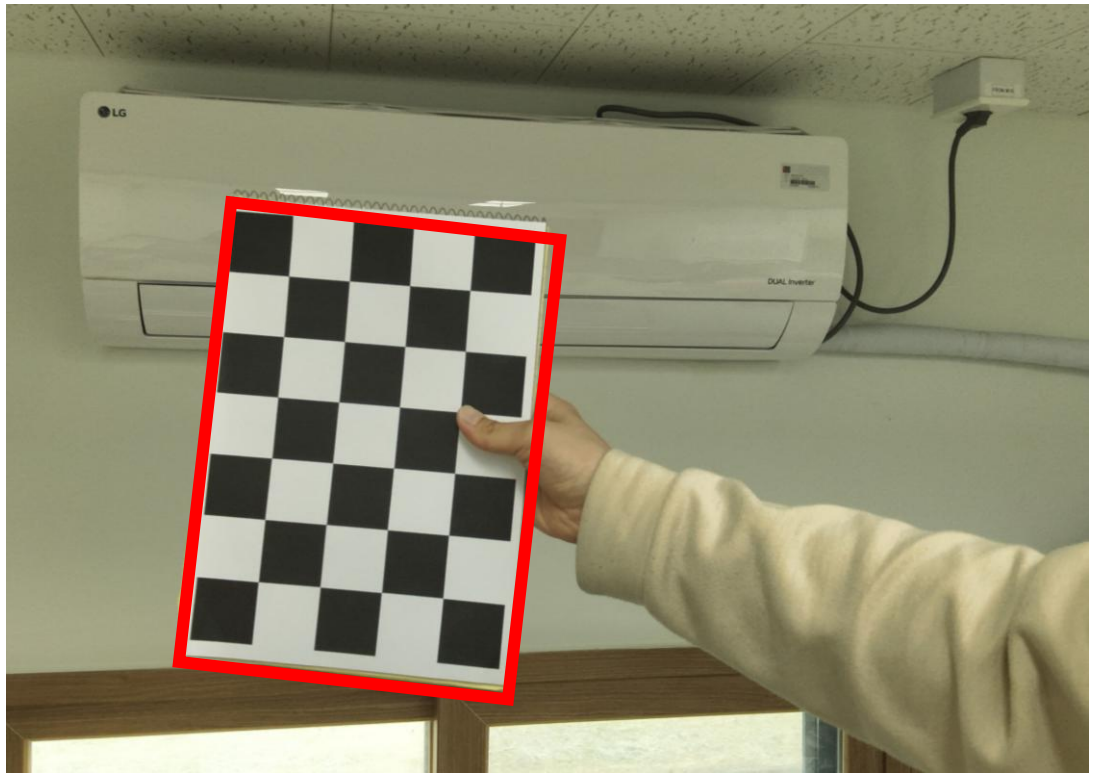


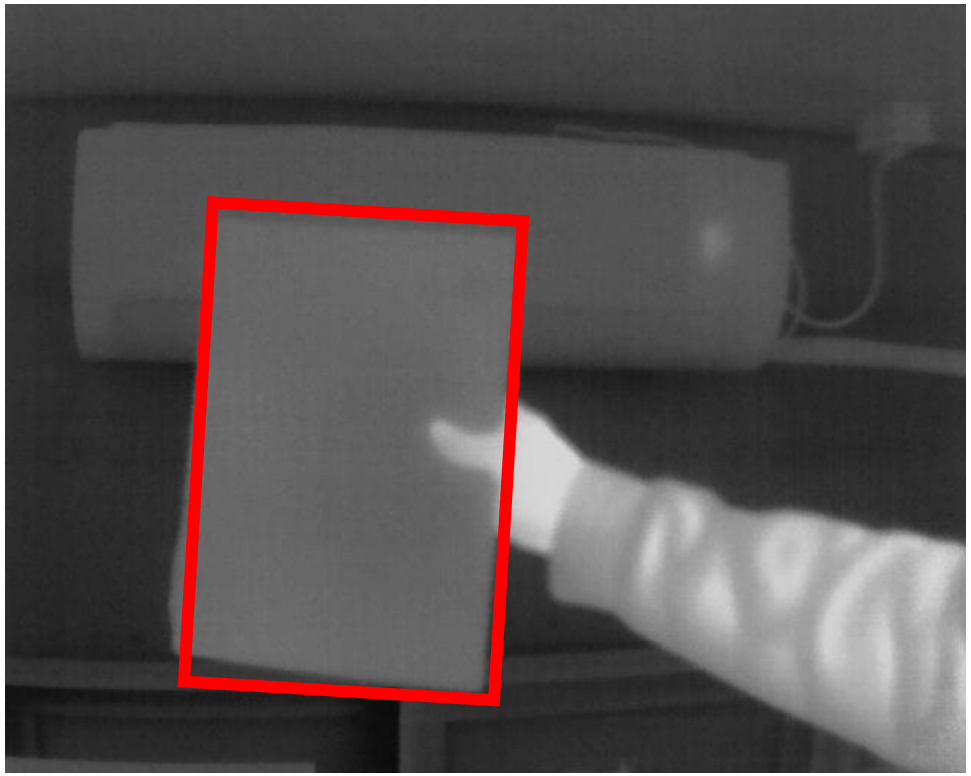


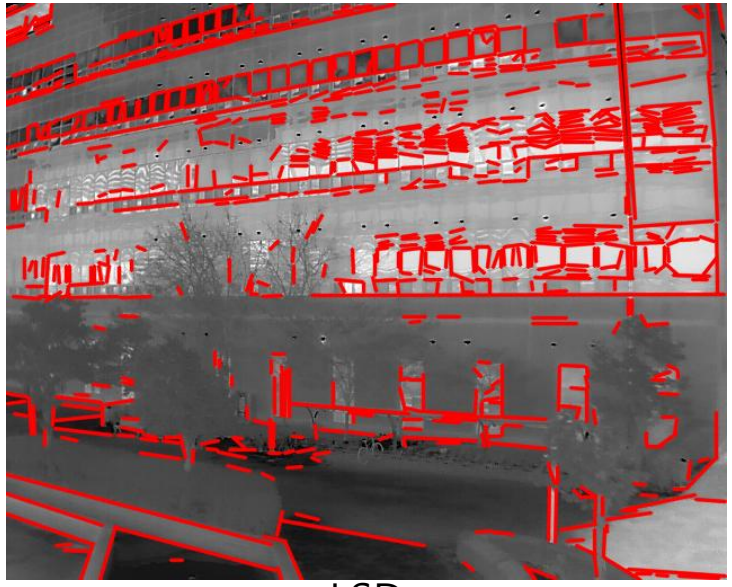
GIST MPIL Machine Perception and Intelligence Lab

SOLD2 (training)

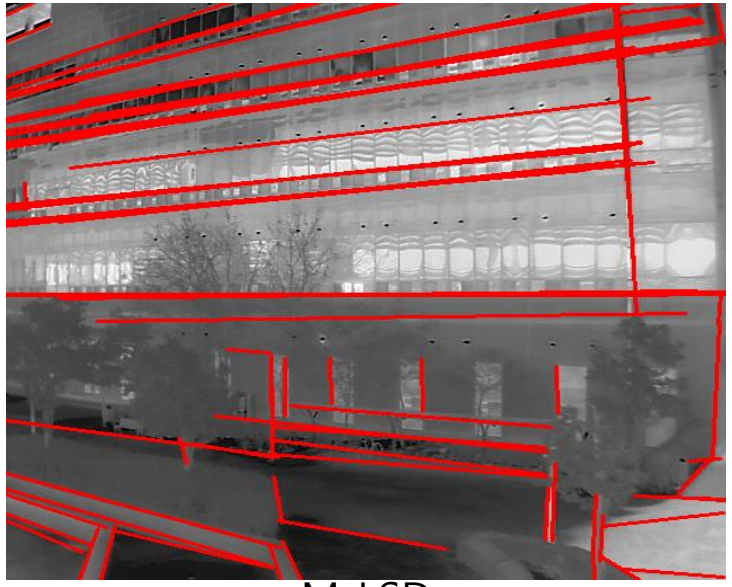
- Can’t recognize line in the thermal image



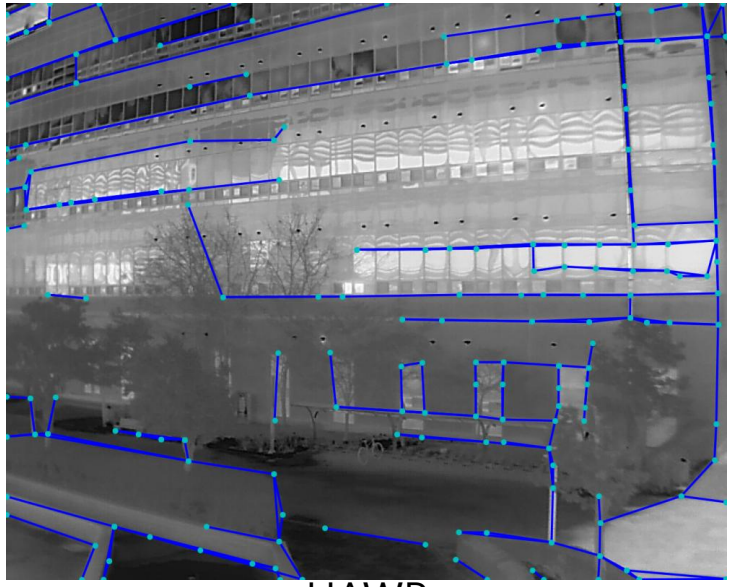




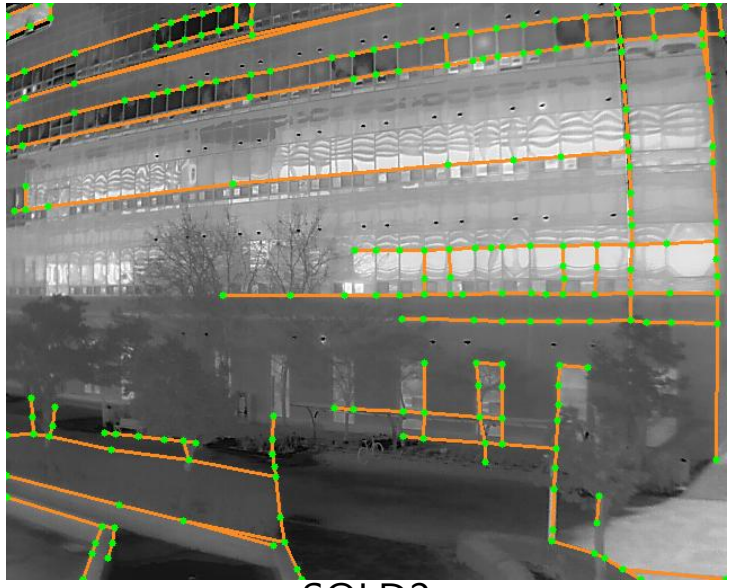
LSD



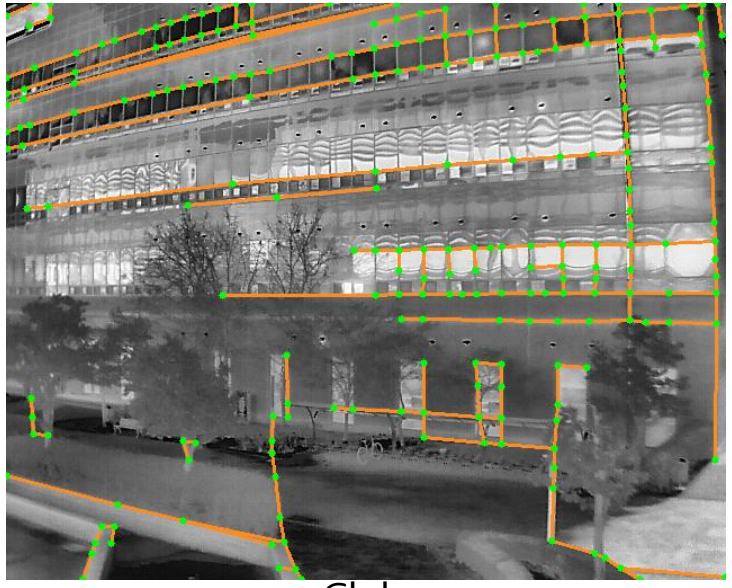
M-LSD



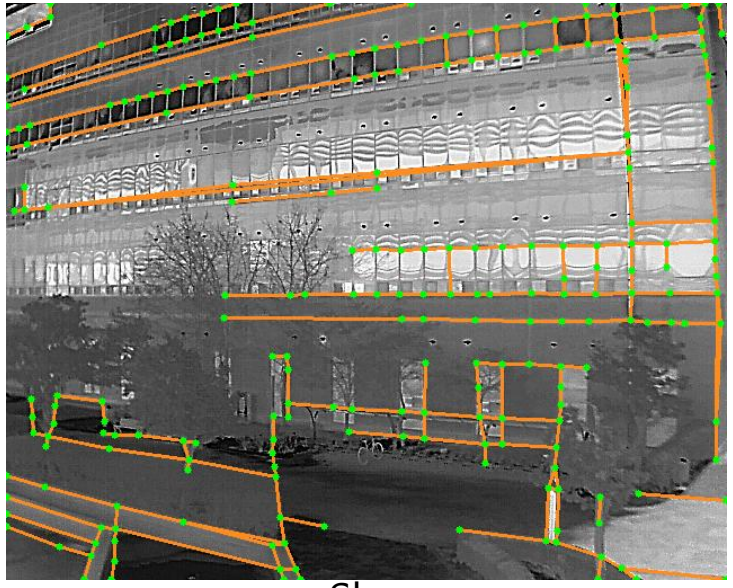
HAWP



SOLD2



Clahe



Sharpen

GIST MPIL Machine Perception and Intelligence Lab

https://henryzh47.github.io/assets/documents/multiple-methods-geometric.pdf

Future Tasks

- Using SOLD2 and Training with own dataset (using DJI Mavic 3T)
- Making artificial environment with distinct thermal divisions
- Training with patterned16-bit images

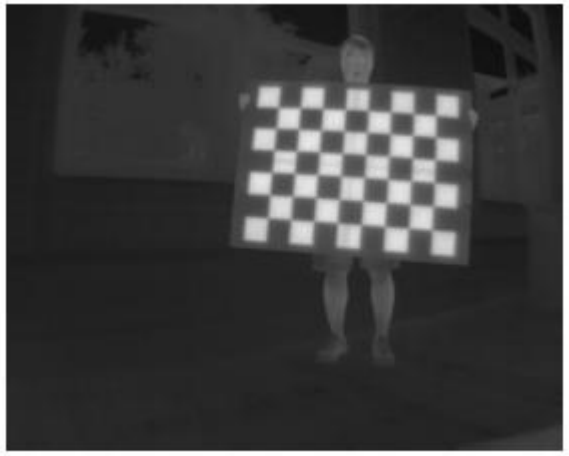


Fig. 3: Checkerboard Thermal Image

Training your own model

All training parameters are located in configuration files in the folder `config`. Training SOLD² from scratch requires several steps, some of which taking several days, depending on the size of your dataset.

- ▶ **Step 1: Train on a synthetic dataset**
- ▶ **Step 2: Export the raw pseudo ground truth on the Wireframe dataset with homography adaptation**
- ▶ **Step3: Compute the ground truth line segments from the raw data**
- ▶ **Step 4: Train the detector on the Wireframe dataset**
- ▶ **Step 5: Train the full pipeline on the Wireframe dataset**

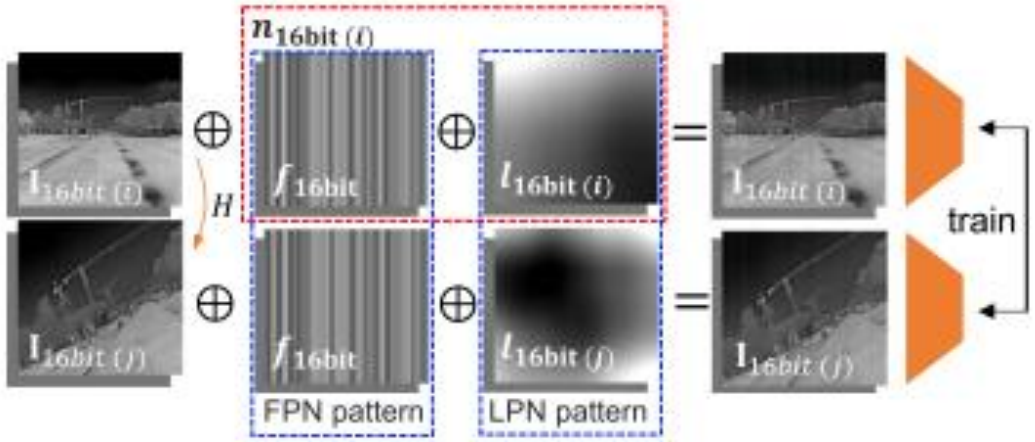
GIST MPIL Machine Perception and Intelligence Lab

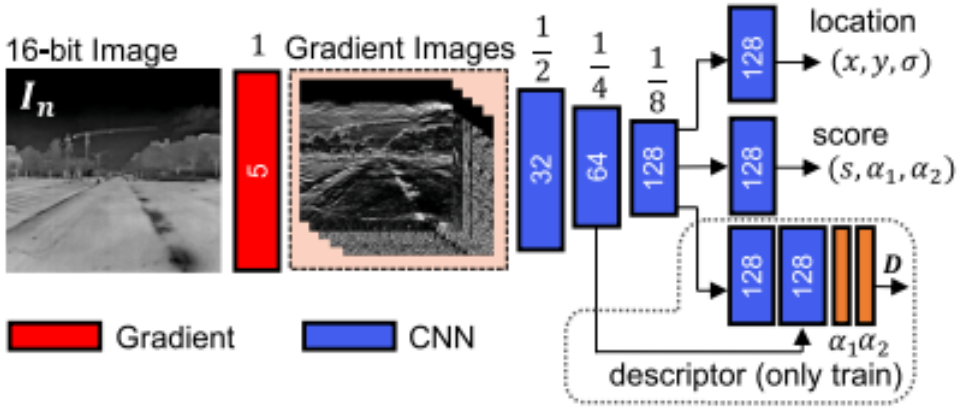
https://github.com/cvg/SOLD2

https://henryzh47.github.io/assets/documents/multiple-methods-geometric.pdf

Future Tasks

- Using SOLD2 and Training with own dataset (using DJI Mavic 3T)
- Making artificial environment with distinct thermal divisions
- Training with patterned 16-bit images





https://github.com/cvg/SOLD2

https://henryzh47.github.io/assets/documents/multiple-methods-geometric.pdf

Thank You

for Listening

GIST MPIL Machine Perception and Intelligence Lab