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Robust object tracking with RGBD-based sparse learning

Key words: Object tracking; Sparse learning; Depth view; Occlusion

templates; Occlusion detection

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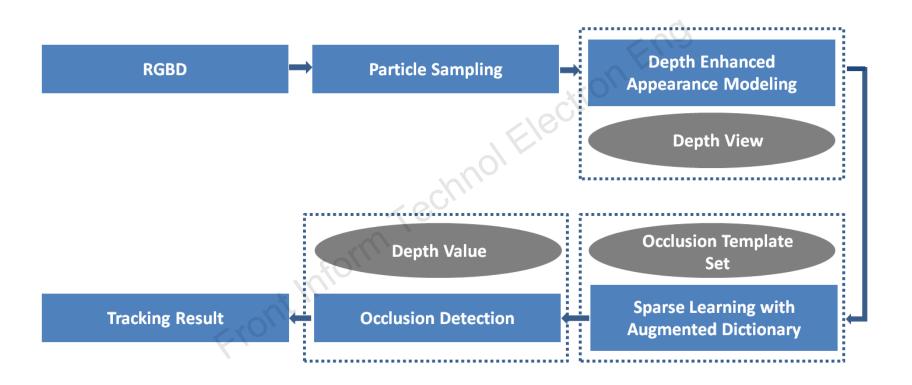
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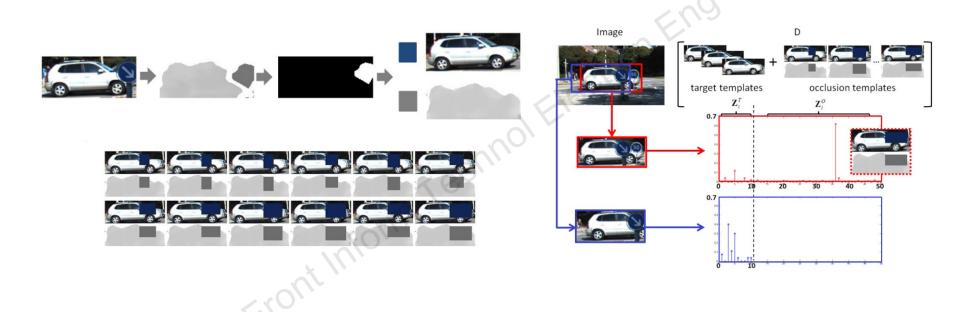
Introduction

- Sparse tracking remains a challenging task, especially under conditions of varying illumination and extensive occlusions.
- With the increasing popularity of affordable depth sensors, range data is widely used in visual tracking for its ability to provide robustness to varying illumination and occlusions.
- To improve tracking performance under conditions of varying illumination and heavy occlusions, a novel RGBD and sparse learning-based tracker is proposed.

Framework of the proposed tracker



Occlusion template set



Tracking results (1)

L1T

СТ

MIL

MTMVT

MTT

MTMVT+Depth

Our Tracker





Tracking results (2)

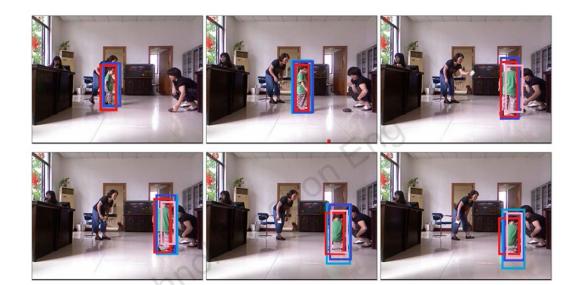
RGBD+OF

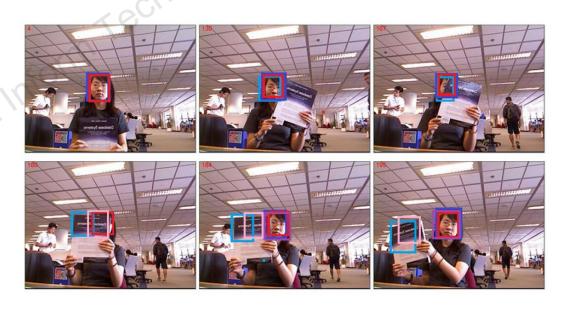
CT

MIL

Our Tracker

RGBDOcc+OF





Performance comparison

Table 1 Quantitative comparisons on the KITTI Vision Benchmark in terms of center position error and success rate

Sequence	Center position error (pixel)						Success rate					
	CT	MIL	L1T	MTT	MTMVT	Our Tracker	CT	MIL	L1T	MTT	MTMVT	Our Tracker
Training00	62.17	84.62	79.42	38.56	35.96	7.86	0.69	0.58	0.68	0.70	0.72	0.94
Training01	227.41	186.12	331.11	76.74	84.46	6.18	0.26	0.32	0.17	0.74	0.62	0.96
Training13	99.84	98.72	152.08	97.70	49.33	12.26	0.49	0.52	0.26	0.32	0.54	0.92
Training15	24.08	32.29	117.59	33.62	31.26	11.80	1.00	0.76	0.41	0.73	0.77	1.00
Training18	13.81	9.82	4.68	5.10	5.24	3.96	1.00	0.98	1.00	1.00	1.00	1.00
Training20	29.53	17.64	3.12	3.43	2.16	2.76	0.76	0.86	0.98	0.98	0.99	0.98
Average	78.31	71.54	114.67	42.53	34.70	7.48	0.70	0.68	0.58	0.75	0.77	0.96

Conclusions

- The existing color image-based features enhanced with an extra depth view will provide a more comprehensive appearance model.
- By augmenting the existing dictionary with an occlusion template set, the proposed tracker facilitates accurate tracking under various extreme occlusion conditions.
- Qualitative and quantitative evaluations of various challenging sequences show that the proposed tracker outperforms the state-of-the-art tracking algorithms, including the sparse and the RGBD-based methods.