SIMPLE ONLINE AND REALTIME TRACKING

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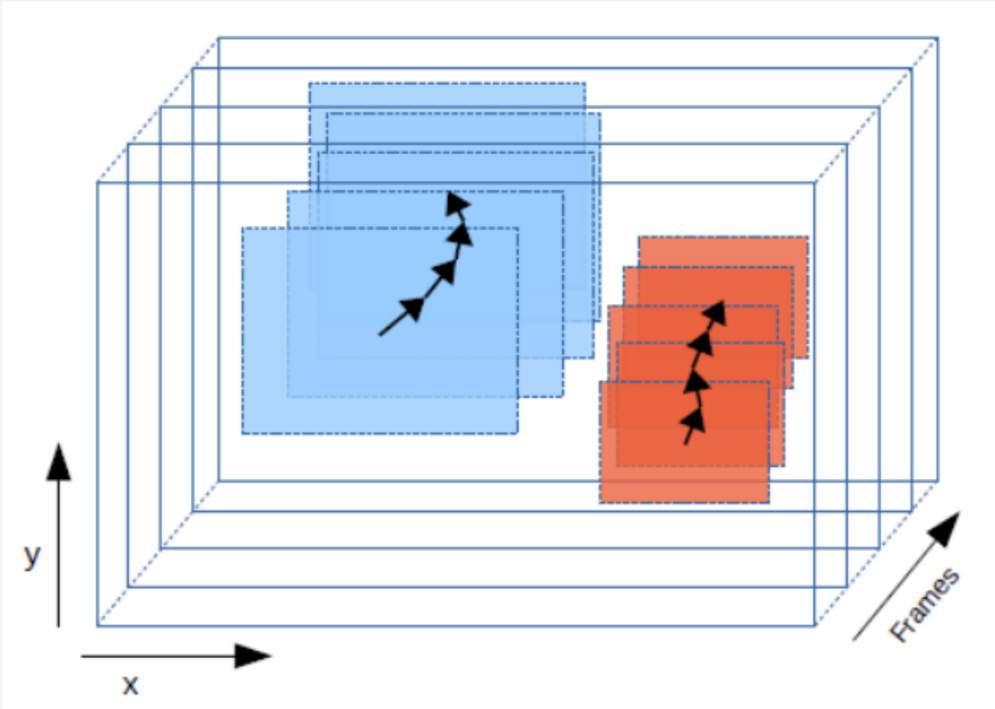
신우정

Multiple Object Tracking (MOT)

Tracking

Detection-Free-Tracking

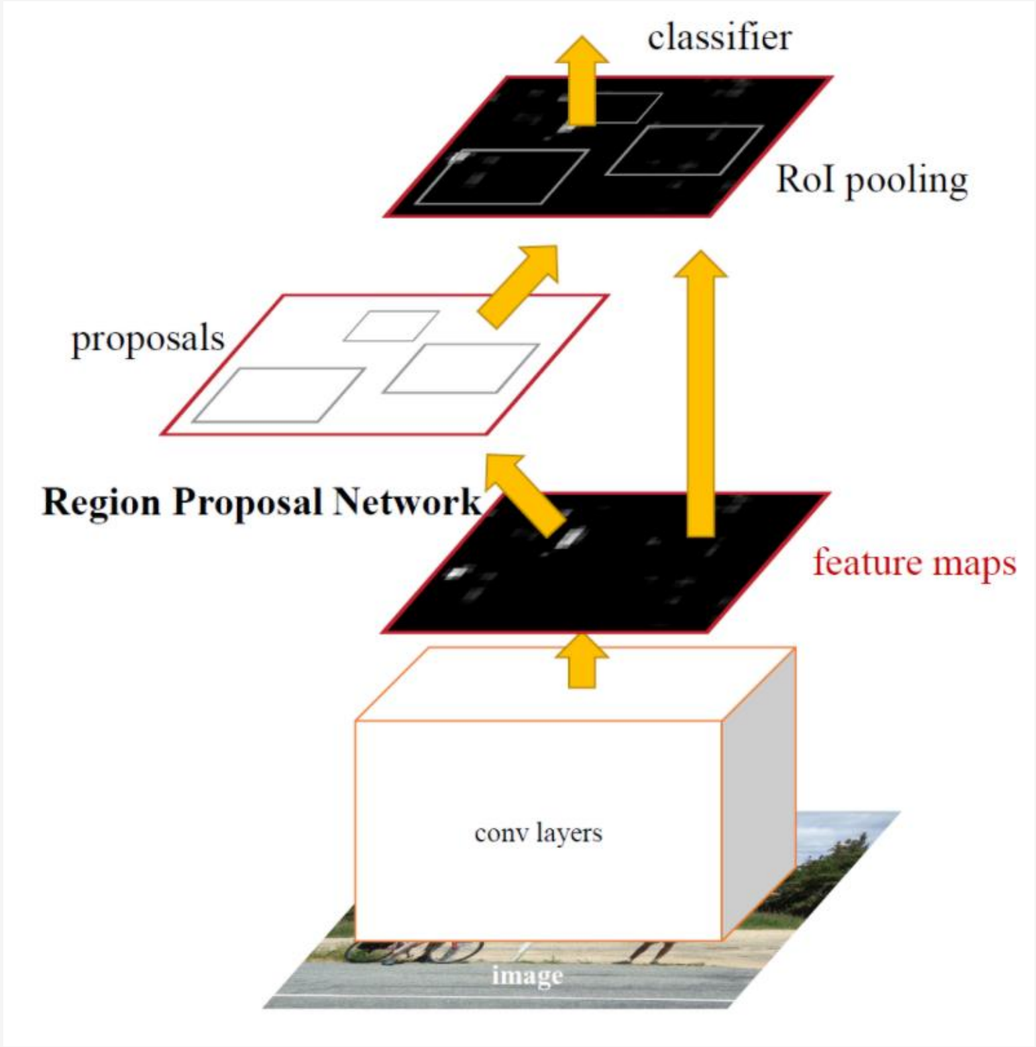
- 전체 프레임의 모든 객체 정보
- 좋은 tracking 성능
- 실시간에 적합하지 X



Tracking-by-Detection

- 과거와 현재 프레임
- 실시간에 적합

Faster RCNN



2. 영역 제안

1. 특징 추출

https://arxiv.org/pdf/1506.01497.pdf

Performance Evaluation

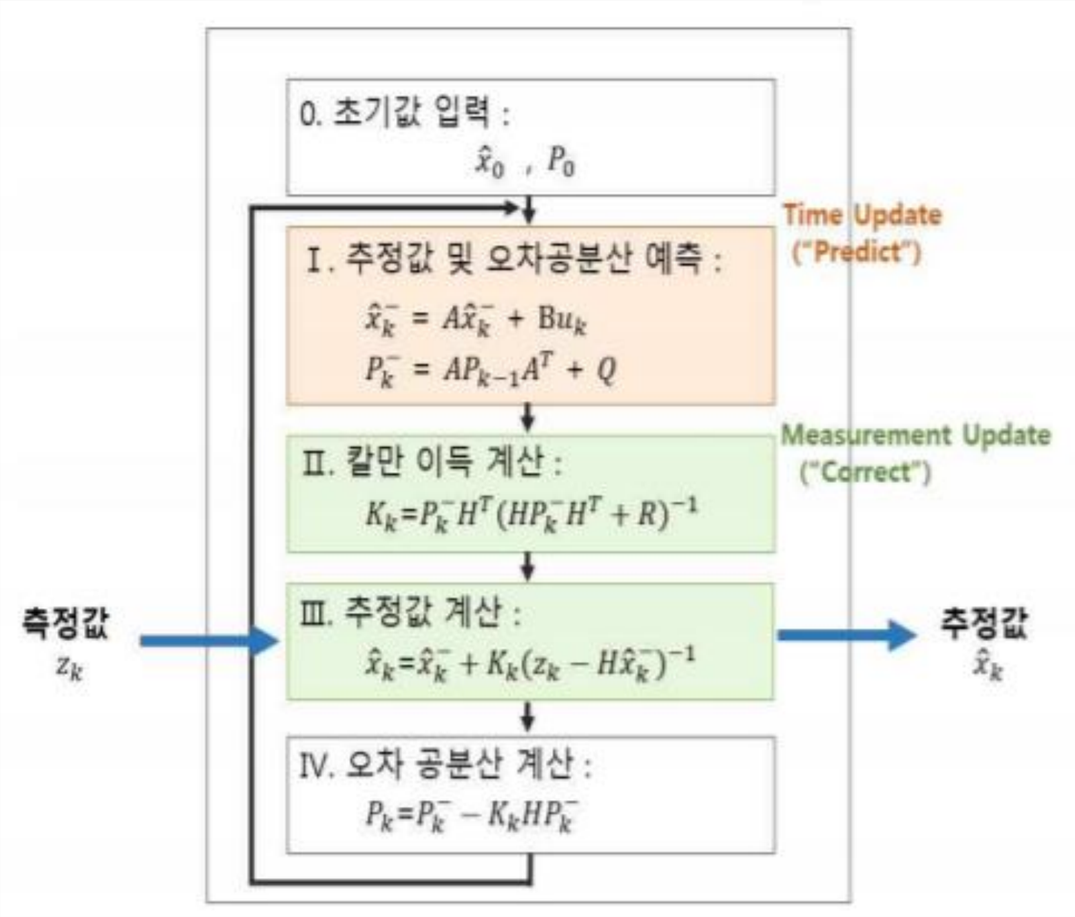
Table 1. Comparison of tracking performance by switching the detector component. Evaluated on Validation sequences as listed in [12].

Tracker	Detector	Detection		Tracking	
		Recall	Precision	ID Sw	MOTA
MDP [12]	ACF	36.6	75.8	222	24.0
	FrRCNN(ZF)	46.2	67.2	245	22.6
	FrRCNN(VGG16)	50.1	76.0	178	33.5
Proposed	ACF	33.6	65.7	224	15.1
	FrRCNN(ZF)	41.3	72.4	347	24.0
	FrRCNN(VGG16)	49.5	77.5	274	34.0

Estimation Model

- 예측 단계

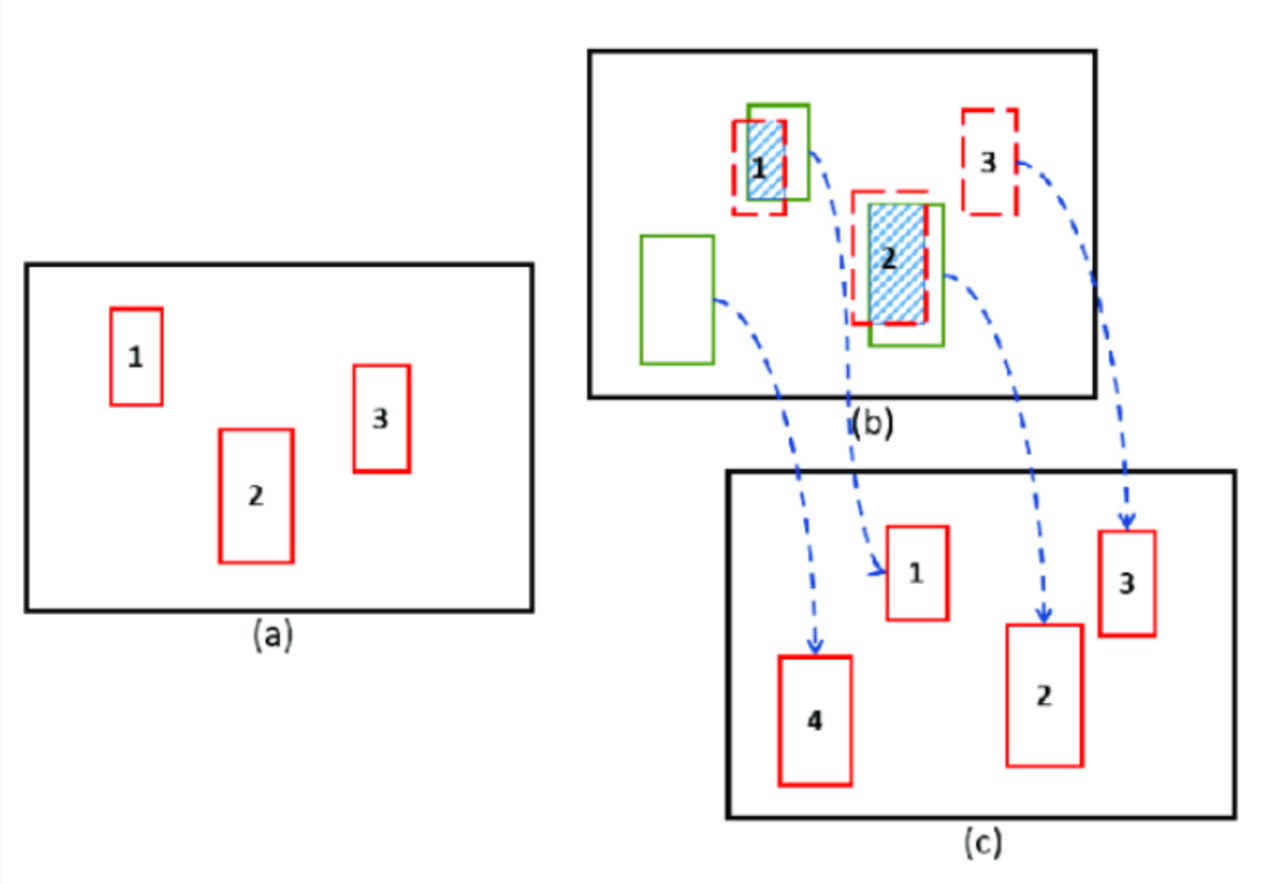
- 보정 단계



<Kalman Filter>

http://conf2019s.kipe.or.kr:8080/pdfs/output/OS15.4.pdf

Data Association



<Hungarian Algorithm>

Benchmark performance

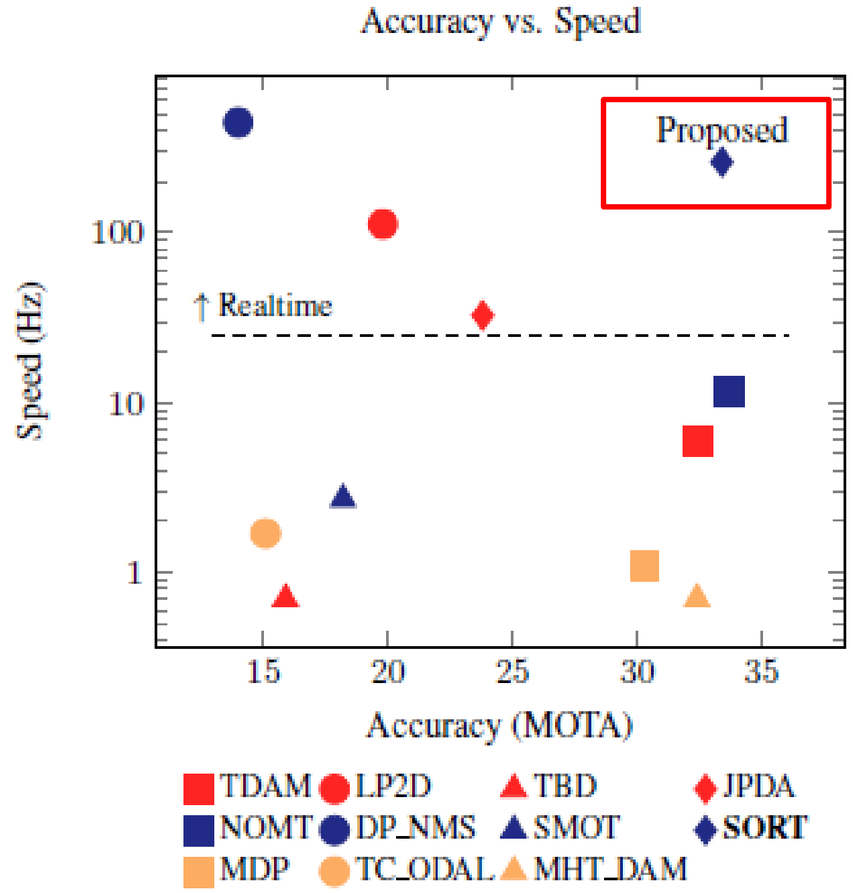


Fig. 1. Benchmark performance of the proposed method (**SORT**) in relation to several baseline trackers [6]. Each marker indicates a trackers accuracy and speed measured in frames per second (FPS) [Hz], i.e. higher and more right is better.

Performance Evaluation

Table 2. Performance of the proposed approach on MOT benchmark sequences [6].

Method	Type	MOTA↑	MOTP↑	FAF↓	MT↑	ML↓	FP↓	FN↓	ID sw↓	Frag↓
TBD [20]	Batch	15.9	70.9	2.6%	6.4%	47.9%	14943	34777	1939	1963
ALExTRAC [5]	Batch	17.0	71.2	1.6%	3.9%	52.4%	9233	39933	1859	1872
DP_NMS [23]	Batch	14.5	70.8	2.3%	6.0%	40.8%	13171	34814	4537	3090
SMOT [1]	Batch	18.2	71.2	1.5%	2.8%	54.8%	8780	40310	1148	2132
NOMT [11]	Batch	33.7	71.9	1.3%	12.2%	44.0%	7762	32547	442	823
RMOT [4]	Online	18.6	69.6	2.2%	5.3%	53.3%	12473	36835	684	1282
TC_ODAL [17]	Online	15.1	70.5	2.2%	3.2%	55.8%	12970	38538	637	1716
TDAM [18]	Online	33.0	72.8	1.7%	13.3%	39.1%	10064	30617	464	1506
MDP [12]	Online	30.3	71.3	1.7%	13.0%	38.4%	9717	32422	680	1500
SORT (Proposed)	Online	33.4	72.1	1.3%	11.7%	30.9%	7318	32615	1001	1764

- MOTA (↑) : 다중 객체 트래킹 accuracy.
- MOTP (↑) : 다중 객체 추적 precision.
- FAF (↓) : 프레임 당 오경보 수.
- MT (↑) : 주로 추적되는 궤적의 수. 즉, 타겟은 수명의 최소 80%에 대해 동일한 레이블을 가지고 있음.
- ML (↓) : 대부분 손실된 궤적의 수. 즉, 타겟은 수명의 최소 20% 동안 추적되지 않음.
- FP (↓) : false detections 수.
- FN (↓) : missed detection 수.
- ID SW (↓) : ID가 이전에 추적된 다른 객체로 전환된 횟수.

Frag (↓) : miss detection으로 인해 추적이 중단된 fragmentations 수.

Conclusion

- Detection 성능이 Tracking에 많은 영향
- Kalman filter와 Hungarian algorithm 사용
- Prediction과 Association에 중점을 둔 SORT
- 속도와 정확성 측면에서 가장 좋은 성능
- 다른 detection 프레임워크도 사용 가능

감사합니다