Simple Re-Identification feature Association for Robust Multi-Object Tracking and Segmentation

Jeongwon Ryu, Kwangjin Yoon
SI Analytics, Daejeon, Korea

RVSU Workshop

Abstract

Though tremendous progress have been made in multiple-object tracking and segmentation (MOTS), which jointly perform multiple object tracking (MOT) and instance segmentation, designing a robust tracker for various domains remains an open challenge. In this work, we present a pragmatic approach, the Simple re-Identification feature Association framework (SIA). We designed a re-ID feature extractor based on IBN-Net50-a with batch normalization neck and trained it with pre-defined detection and segmentation results. We also applied various effective tricks for training the network. In the tracking stage, robust appearance feature extraction and simple measurement-to-track associations are applied. Our method achieves 3rd place on the RobMOTS Challenge workshop of CVPR 2021.

Methodology

• Re-ID Feature Extraction

We take object Re-ID works to get the appearance features of the pre-defined bounding box and segmentation mask. IBN-Net50-a [9] pre-trained on ImageNet [4] is used as our backbone model.

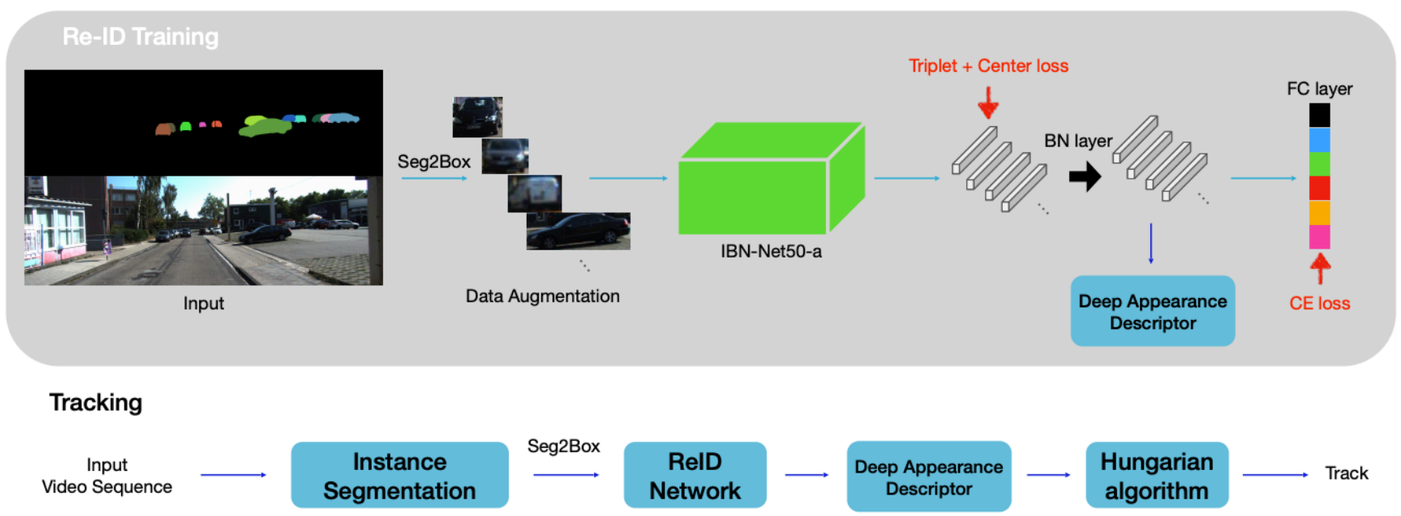
$$L = L_{CE} + L_{Triplet} + \beta L_{Center}$$

• Online Object Tracking

we acquire the appearance features from the Re-ID model and compute the appearance affinity matrix Ae between all observations and the tracklet of the pool for the incoming frame. The appearance affinity is computed using cosine similarity. Then we solve the linear assignment problem by Hungarian algorithm with cost matrix.

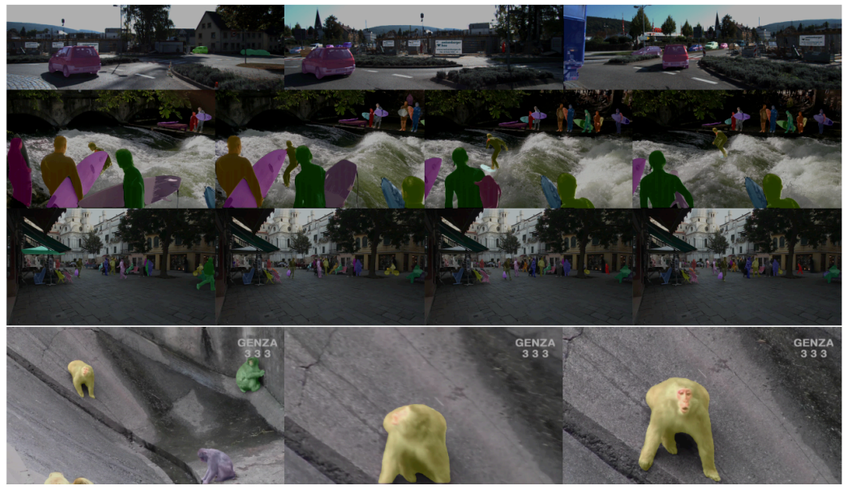
$$C = A_e$$

- ***Figure 1. An overview of the proposed simple re-identification feature association approach***



Experiments

- ***Figure 2. Qualitative results of our proposed method***



- ***Table 1. RobMOTS Challenge results***

HOTA Scores

Rank	Name	Overall	KITTI	BDD	DAVIS	YT-VIS	TAO	MOTSCha.	OVIS	Waymo
1st	RobTrack	**61.20%**	71.64%	**57.86%**	**56.90%**	**68.32%**	**54.99%**	61.04%	**61.62%**	**57.21%**
2nd	SBT	58.59%	**74.01%**	53.05%	50.26%	64.41%	51.76%	**64.43%**	55.61%	55.23%
3rd	SIA	56.87%	70.76%	53.42%	47.42%	62.70%	49.60%	62.18%	54.76%	54.09%
4th	MeNToS	55.52%	69.71%	52.33%	49.60%	64.19%	39.23%	60.15%	55.56%	53.42%
Baseline	STP	54.35%	66.35%	49.35%	48.21%	62.27%	43.76%	60.35%	52.79%	51.75%

DetA Scores

Rank	Name	Overall	KITTI	BDD	DAVIS	YT-VIS	TAO	MOTSCha.	OVIS	Waymo
1st	RobTrack	**59.43%**	**75.94%**	**48.70%**	**56.84%**	**61.10%**	**52.24%**	68.86%	**59.39%**	**52.35%**
2nd	SBT	55.92%	75.52%	45.57%	49.71%	56.38%	48.54%	**68.91%**	52.86%	49.84%
3rd	SIA	55.83%	75.48%	44.81%	49.75%	55.79%	49.00%	68.89%	52.89%	50.02%
4th	MeNToS	52.38%	71.67%	42.81%	47.68%	56.86%	39.39%	62.88%	53.62%	44.11%
Baseline	STP	55.78%	75.44%	44.81%	49.77%	55.81%	48.90%	68.90%	52.90%	49.73%

AssA Scores

Rank	Name	Overall	KITTI	BDD	DAVIS	YT-VIS	TAO	MOTSCha.	OVIS	Waymo
1st	RobTrack	**64.76%**	68.50%	**70.33%**	**58.04%**	**78.16%**	**59.21%**	54.99%	**65.13%**	**63.76%**
2nd	SBT	63.07%	**73.41%**	63.58%	51.91%	75.42%	56.71%	**61.06%**	60.05%	62.43%
3rd	SIA	59.81%	67.17%	65.59%	46.31%	72.58%	51.75%	57.08%	58.27%	59.70%
4th	MeNToS	60.80%	68.63%	66.73%	52.69%	74.37%	40.86%	58.43%	59.01%	65.67%
Baseline	STP	55.04%	59.24%	56.87%	47.81%	71.63%	41.47%	53.95%	54.17%	55.18%