Exercise 5: Long-Term Tracking

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I. Introduction

Many known trackers, also used in the previous experiments, work only for tracking whole-time visible objects. That kind of trackers are caled short-term trackers. On the other hand, the term long-term tracker stands for tracking (for long periods) disappearing objects. Such tracker has to be able to detect such disappearing events and to perform target re-detection when it becomes visible again. We are going to modify the existing SiamFC tracker into the long-term tracker and resport some results after testing and doing the experiments.

II. Experiments

Part A & B.

We modified the existing SiamFC tracker into the long-term tracker and the tracking performance of both trackers, evaluated on sequence `car9`, is shown in the Table I.

Tracker	Precision	Recall	F-score
SiamFC	0.639	0.271	0.381
SiamFC long-term	0.603	0.589	0.596

Table I
Tracking performca on sequence `car9`.

We can quickly notice that with long-term tracker, we get better results in terms of recall and F-score.

Part C.

We defined the confidence as the maximum response of the frame over all scales. We set the value for failure threshold to be 5 as it seemed optimal.

Part D.

We try to calibrate the number of samples for re-detecting the target. The tracker seems to work ratherly the same for all tried sample numbers, the results can be seen in the Table II. Since the larger number of samples slows down the detection and the larger number of samples does not improve the performance, we should not choose the number of samples to be too large.

# samples	Precision	Recall	F-score
3	0.605	0.581	0.593
5	0.603	0.584	0.594
10	0.603	0.589	0.596
20	0.601	0.589	0.595

Table II
Performance depending on number of samples.

Part E.

We now observe how the tracker re-detection looks like – by visualizing tracking result. In Figures 1, 2 and 3 we can see the tracking sequence – before the tracker looses the target, between re-detecting the target and when the tracker finds the target again.

Figure 1. Before the tracket object dissapear.

Figure 2. During re-detecting (sample) process.

Figure 3. After successed re-detection.

Part F.

We implement Gaussian sampling and compare it to uniform sampling which was used for previous experiments. Fot the sequence `car9` Gaussian sampling turned out better, since the car becomes visible again almost at the same position as it disappeared. However, in general, we would choose random sampling to be our number one method.

III. Conclusion

In this exercise we modyfied the existing SiamFC tracker som that it is able to perform a long-term tracking. We tested the tracker on `car9` sequence and found out that, surprisingly, the low number of samples is needed to perform a good results. We then also tried how the tracker performs if we, instead of uniform sampling, use Gaussian sampling. We found out that, for this particular sequence, Gaussian sampling performs better and is also faster. We conclude that the Gaussian sampling is probably not overall a better choice, since it probably depends on the sequence, that is, depends on the way the object disappears and then reappears again.