

Exercise 3: Correlation filter tracking

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I. INTRODUCTION

In this paper, we present two implementations of Correlation filter tracking. We also present results we obtained when testing both method. We tried different parameters and report performance changes. The best results were obtained using the actual mosse correlation filter tracker.

II. EXPERIMENTS

In the first part, we tested the simplified MOSSE correlation filter tracker. For evaluation and comparison, we integrated the Tracking toolkit (lite), available on GitHub page [1]. Overlap and number of failures for each sequence are shown in Table I. Parameters were $\alpha = 0,15$ and $\sigma = 3,3$.

Table I

sequence	overlap	failures	fps
ball	0,44	1	1142
basketball	0,47	6	428
bicycle	0,33	0	1875
bolt	0,57	9	758
car	0,40	0	1924
david	0,50	0	195
diving	0,39	5	220
drunk	0,41	3	178
fernando	0,32	6	102
fish1	0,30	9	1034
fish2	0,33	9	613
gymnastics	0,62	4	354
hand1	0,49	9	833
han2	0,46	16	932
jogging	0,53	2	386
motocross	0,40	2	164
polarbear	0,43	0	396
skating	0,43	1	399
sphere	0,27	4	265
sunshade	0,68	3	756
surfing	0,75	0	1569
torus	0,45	6	757
trellis	0,55	3	1346
tunnel	0,30	0	382
woman	0,67	3	520
average	0,46	101	701

After that, we experimented with α (update speed) and σ (parameter of a Gaussian G) values. Increasing the σ value made tracking better on sequences, where simple tracker was already successful, but worse on others, while lowering (to some extent) gave us better results overall. Increasing the α value did not improve performance, the best results were obtained with $\alpha = 0,1$ and $\sigma = 2$. Results are shown in TableIII.

Next, we tried different enlarge factors, to see how the background affects performance. Results are shown in Table III. We can see, that the performance drops when increasing enlarge factor.

For each sequence, we timed the initialization frame processing and other frames processing. Result are shown in Table IV. We can see that for the most sequences, initialization processing was faster than other frames.

Lastly, we implemented an actual MOSSE tracker, which improved the performance. The best results were obtained

Table II

sequence	overlap	failures	fps
ball	0,44	2	1379
basketball	0,57	2	181
bicycle	0,37	0	1651
bolt	0,51	1	739
car	0,50	1	522
david	0,63	0	193
diving	0,40	4	194
drunk	0,43	2	215
fernando	0,32	4	90
fish1	0,34	6	1405
fish2	0,27	7	576
gymnastics	0,60	3	418
hand1	0,41	7	726
han2	0,36	12	1090
jogging	0,35	1	571
motocross	0,51	2	220
polarbear	0,43	0	400
skating	0,41	0	417
sphere	0,51	1	441
sunshade	0,68	2	669
surfing	0,72	0	1701
torus	0,35	6	1018
trellis	0,51	2	1329
tunnel	0,31	0	420
woman	0,67	1	586
average	0,46	66	654

Table III

enlarge factor	overlap	failures	fps
1,25	0,47	79	422
1,5	0,47	77	256
1,75	0,46	86	264
2	0,44	109	220

using $\alpha = 0,06$ (learning rate) and $\sigma = 3,3$. Comparison between simplified and the actual mosse tracker is shown in Figure 1. We got 50% accuracy and 0.63% robustness. Also, a slight speed increase was achieved - 688 fps.

III. CONCLUSION

We made a simple, but visible performance boost when using the mosse filter tracker in comparison with the previous mean-shift tracker. Overall results may not differ significantly, but we must also take in to a count, that some sequences are really hard to perform well on. If we compare only easy/moderate sequences (by difficulty), the performance boost is quite big.

REFERENCES

- [1] <https://github.com/alanlukezc/pytracking-toolkit-lite>

Table IV

sequence	init speed	tracking speed
ball	0,0007	0,0007
basketball	0,0036	0,0055
bicycle	0,0006	0,0006
bolt	0,0010	0,0013
car	0,0024	0,0019
david	0,0040	0,0072
diving	0,0038	0,0052
drunk	0,0057	0,0047
fernando	0,0081	0,0111
fish1	0,0010	0,0007
fish2	0,0017	0,0017
gymnastics	0,0024	0,0024
hand1	0,0013	0,0014
han2	0,0010	0,0009
jogging	0,0017	0,0018
motocross	0,0040	0,0046
polarbear	0,0018	0,0025
skating	0,0019	0,0024
sphere	0,0015	0,0023
sunshade	0,0011	0,0015
surfing	0,0005	0,0006
torus	0,0009	0,0010
trellis	0,0008	0,0008
tunnel	0,0017	0,0024
woman	0,0014	0,0017

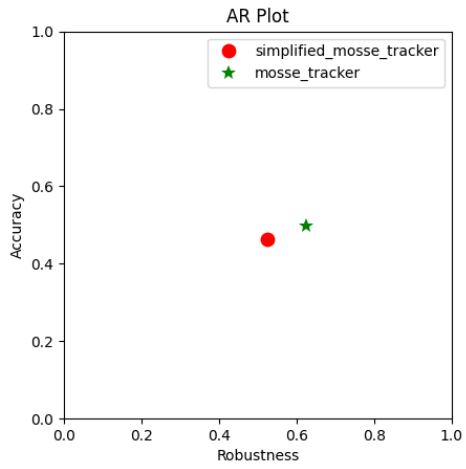


Figure 1. Comparison between trackers.