



ObjectTracker

Performance Report

2017-02-07

OPEN AI LAB

Revision Record

Date	Rev	Change Description	Author
2017-12-28	0.1.0	Initial version	Joy
2018-01-02	0.1.1	Add average frame ratio.	Joy
2018-01-28	0.1.2	Add accuracy benchmark	WangYu
2018-02-07	0.1.3	QA Test	Shulian Shen

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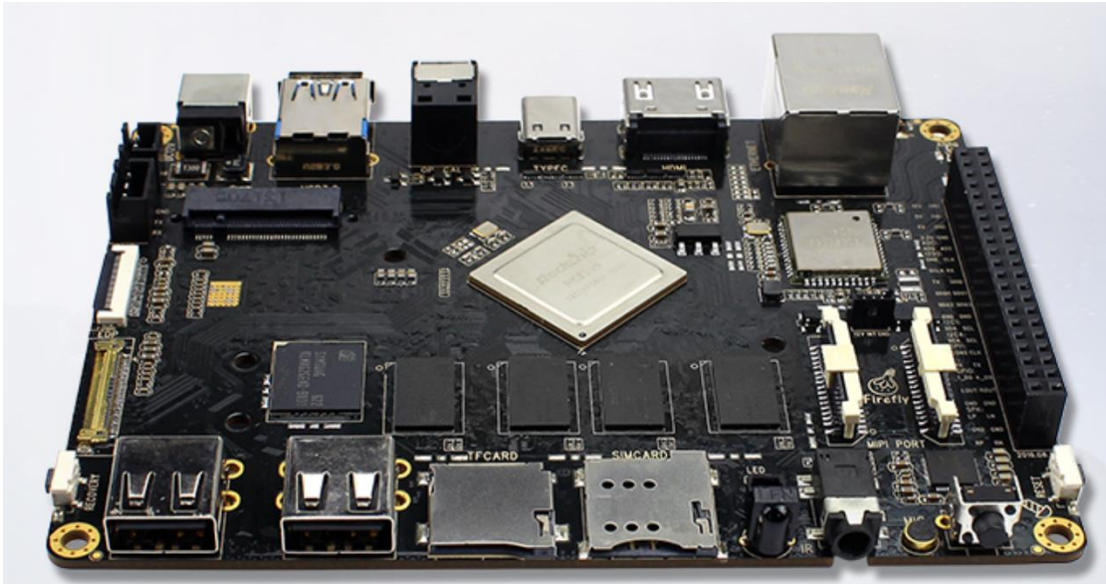
1 Purpose

ObjectTracker is a visual tracker app released by Heterogeneous Computing Library. This Report is ObjectTracker algorithm performance report on RK3399.

2 Test Environment

2.1 Hardware SoC: firefly

- <http://www.t-firefly.com/product/rk3399.html>
- GPU: Mali T864 (800MHz)
- RAM: 2G
- CPU: Dual-core Cortex-A72 up to 2.0GHz (real frequency is 1.8GHz); Quad-core Cortex-A53 up to 1.5GHz (real frequency is 1.4GHz)
- Camera: 1080P USB Camera



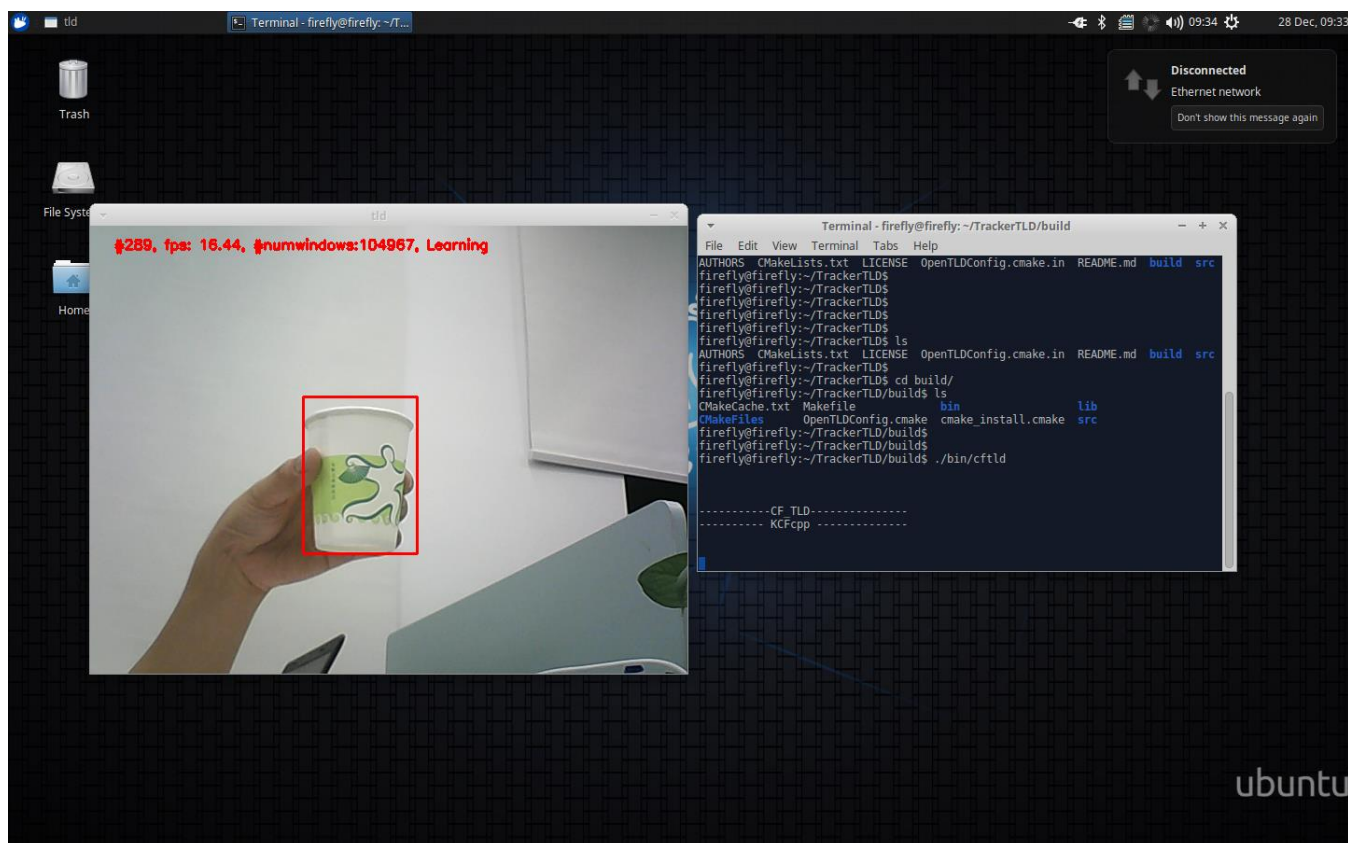
2.2 Software Environment:

- Operating System: Ubuntu 16.04
- OpenCV: 3.3.0

3 Performance

The result of ObjectTracker running on RK3399 is shown as following picture:

ObjectTracker Performance Report



NOTE:

- Test object: This distance from a paper cup to the camera is about 0.5m.
- Different object size, distance and background may lead to the small change in performance data

3.1 Multi-CPU performance

The input video is 480P(640x480), format is YUYV(YUV422), the CPU performance following table.

3.1.1 2X A72 CPU performance

The average FPS (Frames Per Second) on TWO A72 cores is shown as follows:

	ObjectTracker-KCF	ObjectTracker-DSST
On TWO A72@1.80GHZ 480P	17 fps	14 fps

3.1.2 4X A53 CPU performance

The average FPS (Frames Per Second) on FOUR A53 cores is shown as follows:

	ObjectTracker-KCF	ObjectTracker-DSST
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On FOUR A53@1.42GHz 480P	6 fps	5 fps
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3.2 Single CPU performance

3.2.1 Single A72 CPU performance

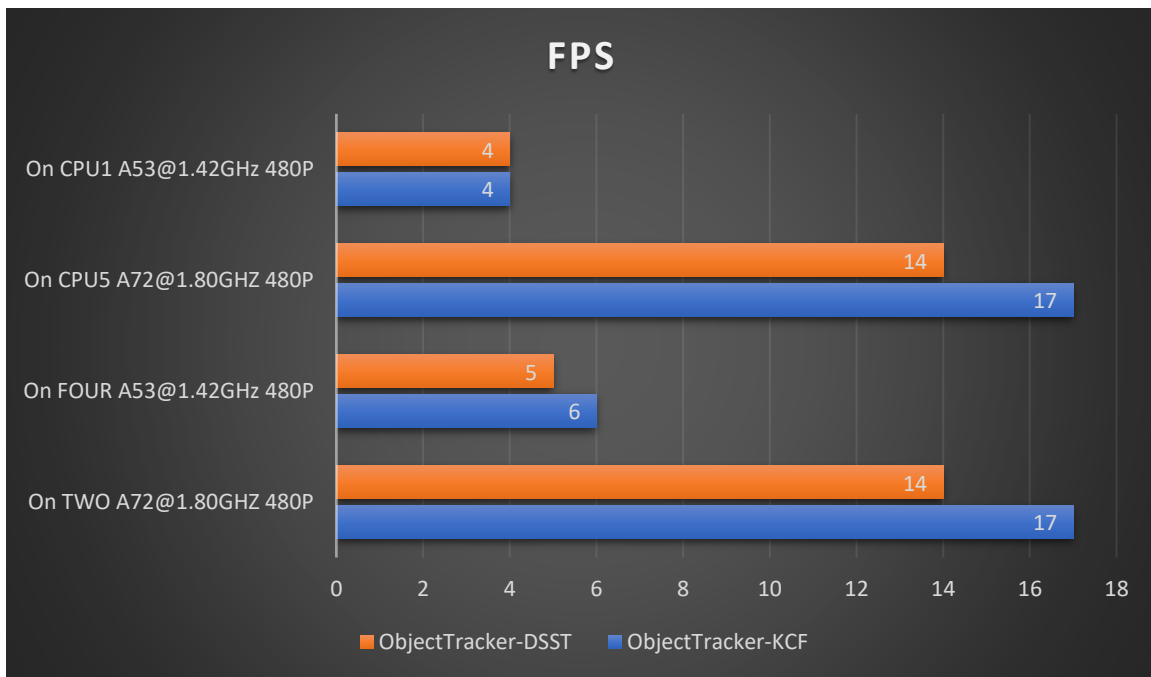
The average FPS (Frames Per Second) on ONE A72 core is shown as follows:

	ObjectTracker-KCF	ObjectTracker-DSST
On CPU5 A72@1.80GHZ 480P	17 fps	14 fps

3.2.2 Single A53 CPU performance

The average FPS (Frames Per Second) on ONE A53 core is shown as follows:

	ObjectTracker-KCF	ObjectTracker-DSST
On CPU1 A53@1.42GHz 480P	4 fps	4 fps



3.3 Accuracy test

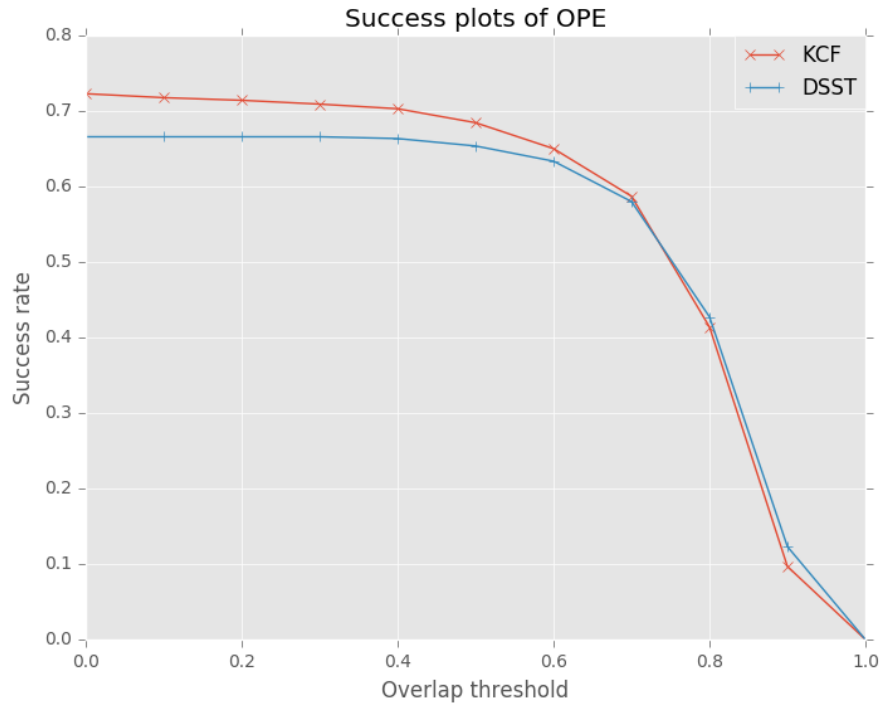
An important evaluation metric of tracker is the bounding box overlap. Given the tracked bounding box r_t and the ground truth bounding box r_a , the Overlap Score(OS) is defined as following:

$$S = \frac{|r_t \cap r_a|}{|r_t \cup r_a|},$$

where \cap and \cup represent the intersection and union of two regions, and $|\cdot|$ denotes the number of pixels in the corresponding area. Afterwards, a frame whose OS is larger than a threshold is termed as a successful frame, and the ratios of successful frames at the thresholds ranged from 0 to 1 are plotted in success plots.

The conventional way to evaluate trackers is to run them throughout a test sequence with initialization from the ground truth position in the first frame and report the average precision or success rate. We refer this as one-pass evaluation (OPE).

ObjectTracker consists of KCFTracker and DSSTTracker, you can choose either to test. This performance report has run a total of 36 test sets, each test set contains a different number of pictures. The results are shown below.



3.4 Stress test

The ObjectTracker passed over night (about 40 hours) test with a static object in simple background.

3.5 Conclusion

Based on the results, the KCFTracker's performance is better than DSSTTracker when the threshold is less than 0.7. And the DSSTTracker's performance is better than KCFTracker when the threshold is greater than 0.7.