



FaceDemo

Performance Report

2017-10-24

OPEN AI LAB

Revision Record

Date	Rev	Change Description	Author
2017-10-24	0.1.0	Initial version	
2018-1-2	0.1.1	Update average_time and Conclusion based on v0.1.1	Jason Li

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1 Purpose

This Report is tested on RK3399 platform and the CaffeOnACL version is 0.4.0 with Arm Compute Library(ACL) 17.10/OpenBLAS. The report only includes CPU data.

2 Test Environment

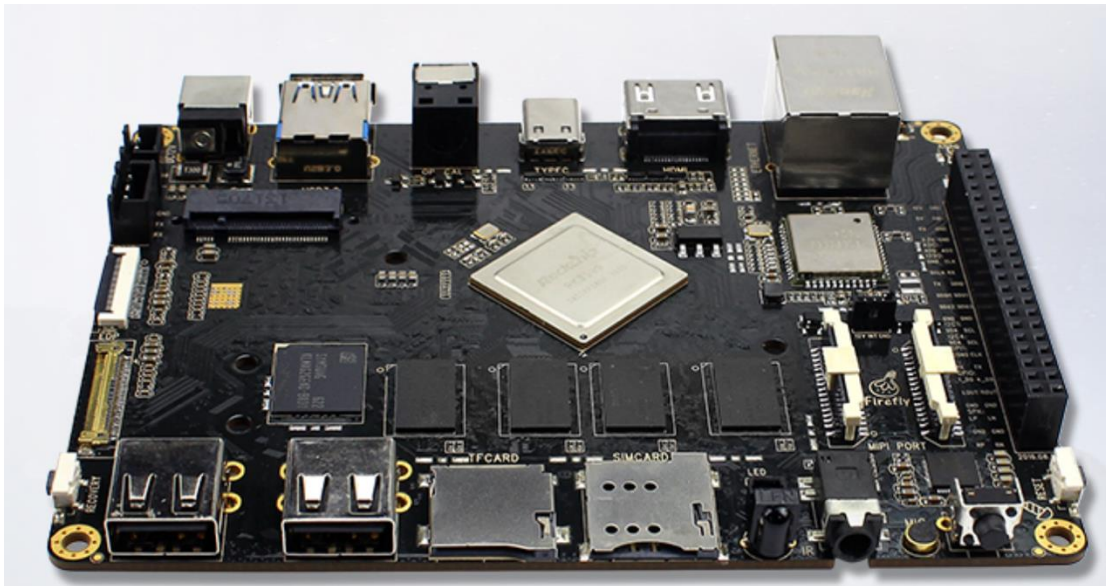
Hardware SoC : Rockchip RK3399

- GPU: Mali T864 (800MHz)
- 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)

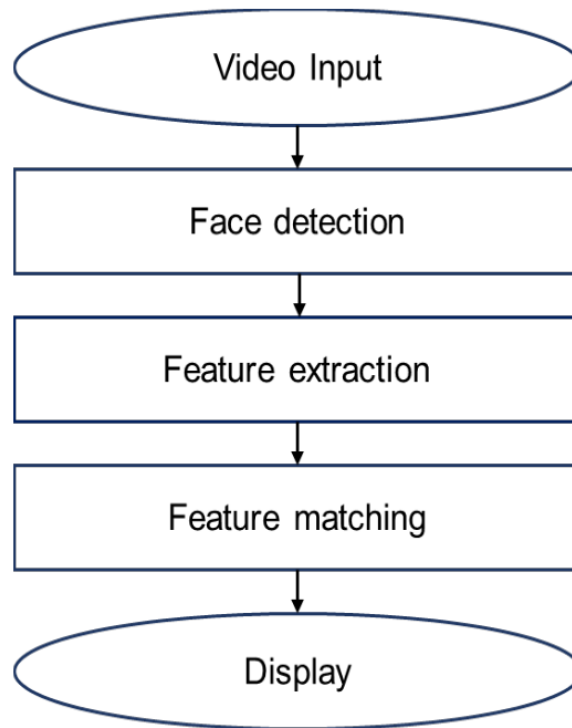
Operating System : Ubuntu 16.04

Face_demo vision: 0.1.1

The “avg_time(us) /frame” data is calculated by 100 frames processing time after the algorithm is stabilized.



3 Face Recognition Flow



Face detection : Detect the face from input frame

Feature extraction : Extrace features from detected face

Feature matching : search the Database according the extracted feature, find the matching face

Fig 3.1 The process of face recognition

4 Performance with Arm Compute Library(ACL)

Face recognition performance is influenced by many factors, only faces, cores, minimum size of face are test. Note: the alignment is included in extraction. The performances with ACL are as fellow.

4.1 Single A53 CPU @1.42GHz

Table 4.1 Performance of different part on Single A53

Test Case	Detection (ms/frame)	Extraction (ms/frame)	Verification (ms/frame)	Total (ms/frame)	Total (avg_time(us) /frame)
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480P 32*32 single face	482	1176	0.002	1658	1844
480P 48*48 single face	257	1287	0.002	1544	1638
480P 64*64 single face	189	1166	0.003	1355	1665
480P 32*32 two faces	500	2348	0.005	2848	2873
480P 48*48 two faces	335	2574	0.006	2909	2541
480P 64*64 two faces	199	2332	0.006	2531	2650

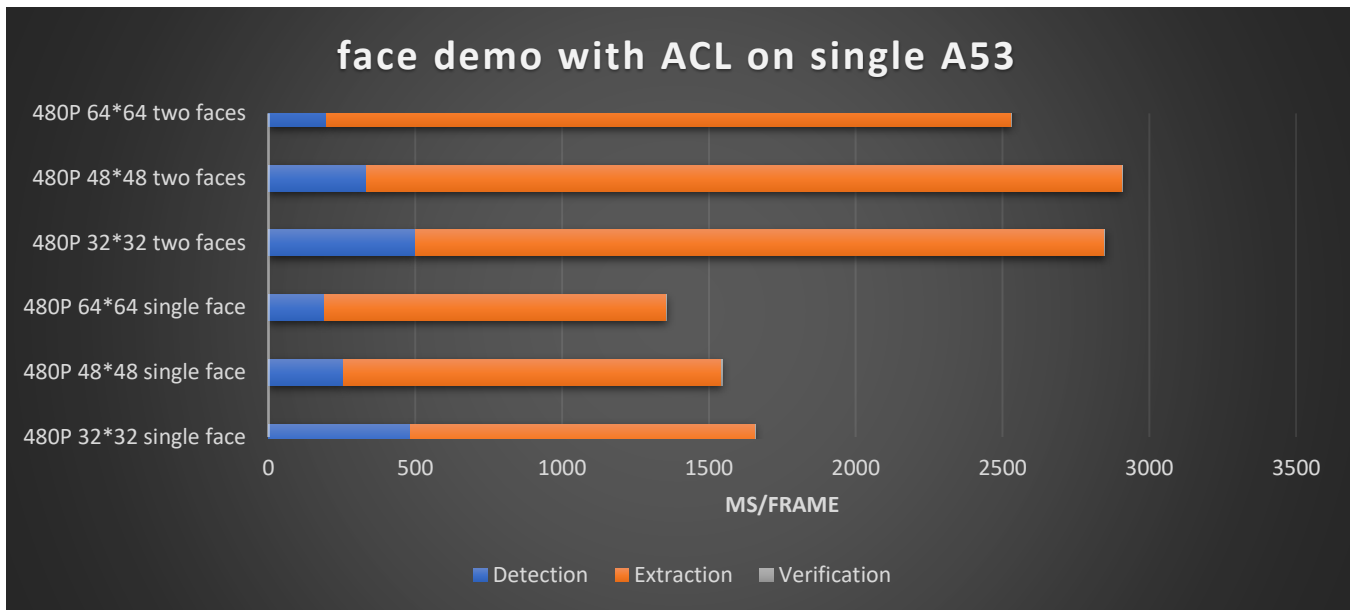


Fig 4.1 Performance Compare on Single A53

4.2 Single A72 CPU @1.8GHz

Table 4.2 Performance of different part on Single A72

Test Case	Detection (ms/frame)	Extraction (ms/frame)	Verification (ms/frame)	Total (ms/frame)	Total (avg_time(us) /frame)
480P 32*32	262	721	0.002	983	1116

single face					
480P 48*48 single face	132	717	0.002	849	994
480P 64*64 single face	82	691	0.001	773	938
480P 32*32 two faces	309	1360	0.003	1669	1500
480P 48*48 two faces	163	1430	0.003	1593	1369
480P 64*64 two faces	100	1384	0.003	1484	1747

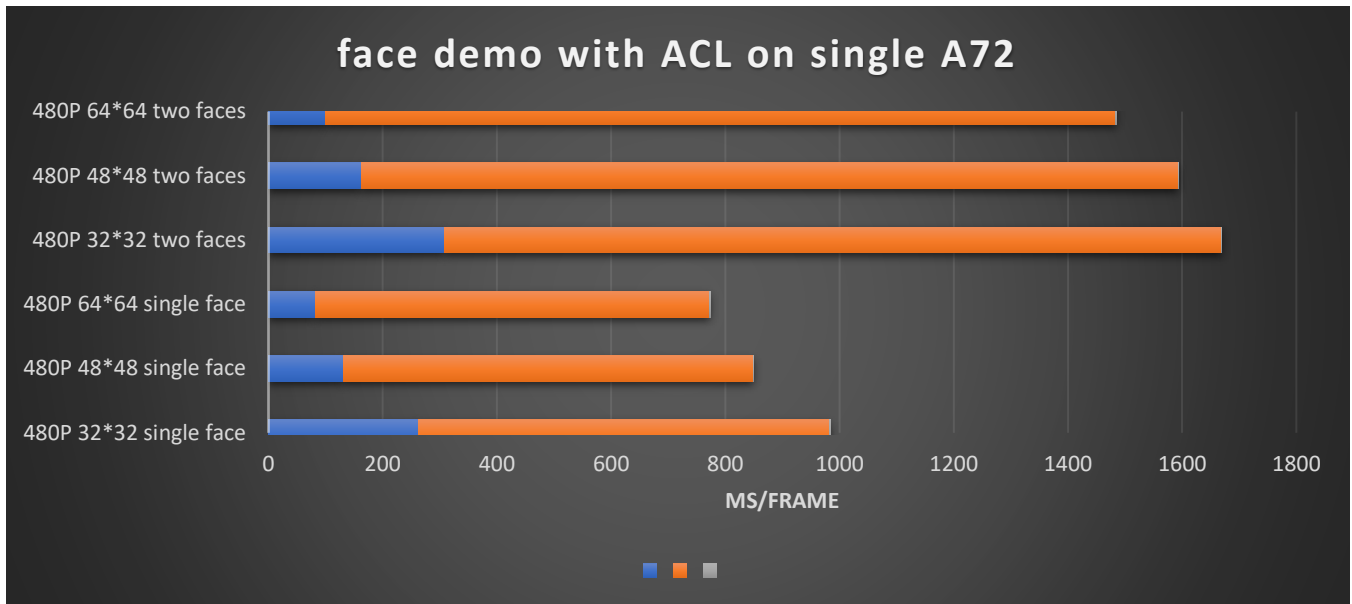


Fig 4.2 Performance Compare on Single A72

4.3 Multi CPUs(4xA53@1.42GHz+2xA72@1.8GHz)

Table 4.3 Performance of different part on Multi CPUs

Test Case	Detection (ms/frame)	Extraction (ms/frame)	Verification (ms/frame)	Total (ms/frame)	Total (avg_time(us) /frame)
480P 32*32 single face	314	417	0.001	731	964

480P 48*48 single face	176	446	0.005	622	982
480P 64*64 single face	117	399	0.002	516	1087
480P 32*32 two faces	354	769	0.005	1123	1585
480P 48*48 two faces	231	836	0.005	1067	1493
480P 64*64 two faces	123	773	0.004	896	1736

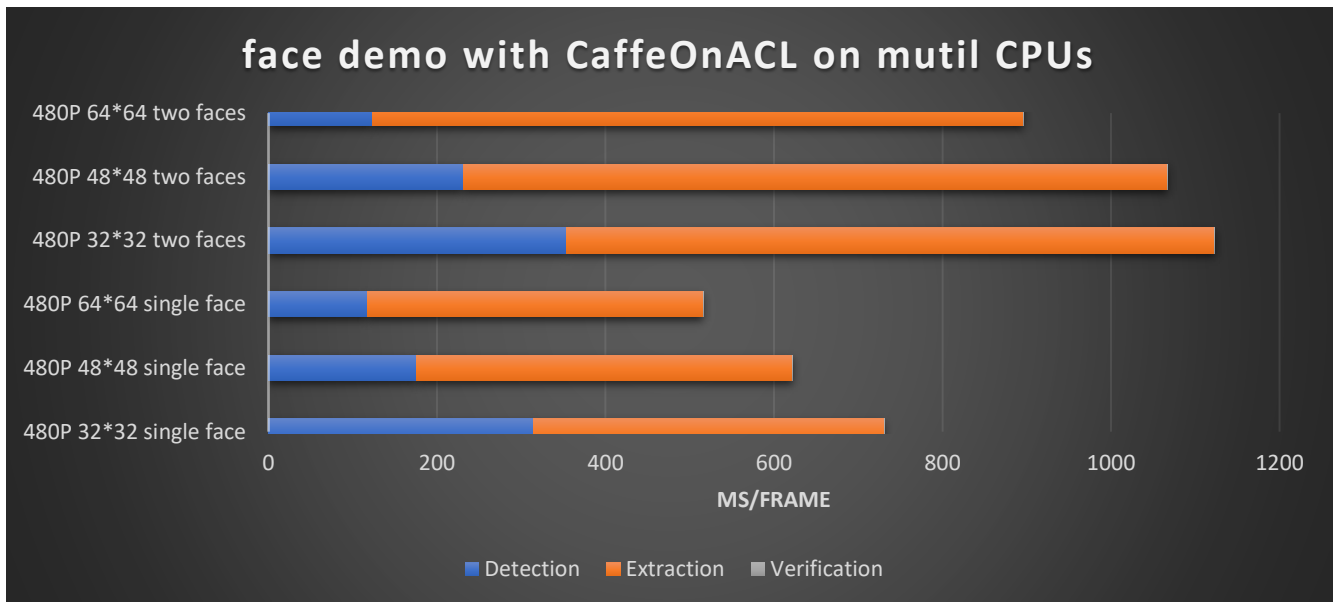


Fig 4.3 Performance Compare on Multi CPUs

5 Performance with OpenBLAS

Face recognition performance is influenced by many factors, only faces, cores, minimum size of face are test. Note: the alignment is included in extraction. The performances with OpenBLAS are as fellow.

5.1 Single A53 CPU @1.42GHz

Table 5.1 Performance of different part on Single A53

Test Case	Detection	Extraction	Verification	Total	Total
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	(ms/frame)	(ms/frame)	(ms/frame)	(ms/frame)	(avg_time(us)/frame)
480P 32*32 single face	285	775	0.002	1060	1119
480P 48*48 single face	163	776	0.002	939	1012
480P 64*64 single face	134	777	0.003	911	999
480P 32*32 two faces	327	1397	0.006	1724	1899
480P 48*48 two faces	200	1549	0.004	1749	1763
480P 64*64 two faces	156	1556	0.005	1712	1753

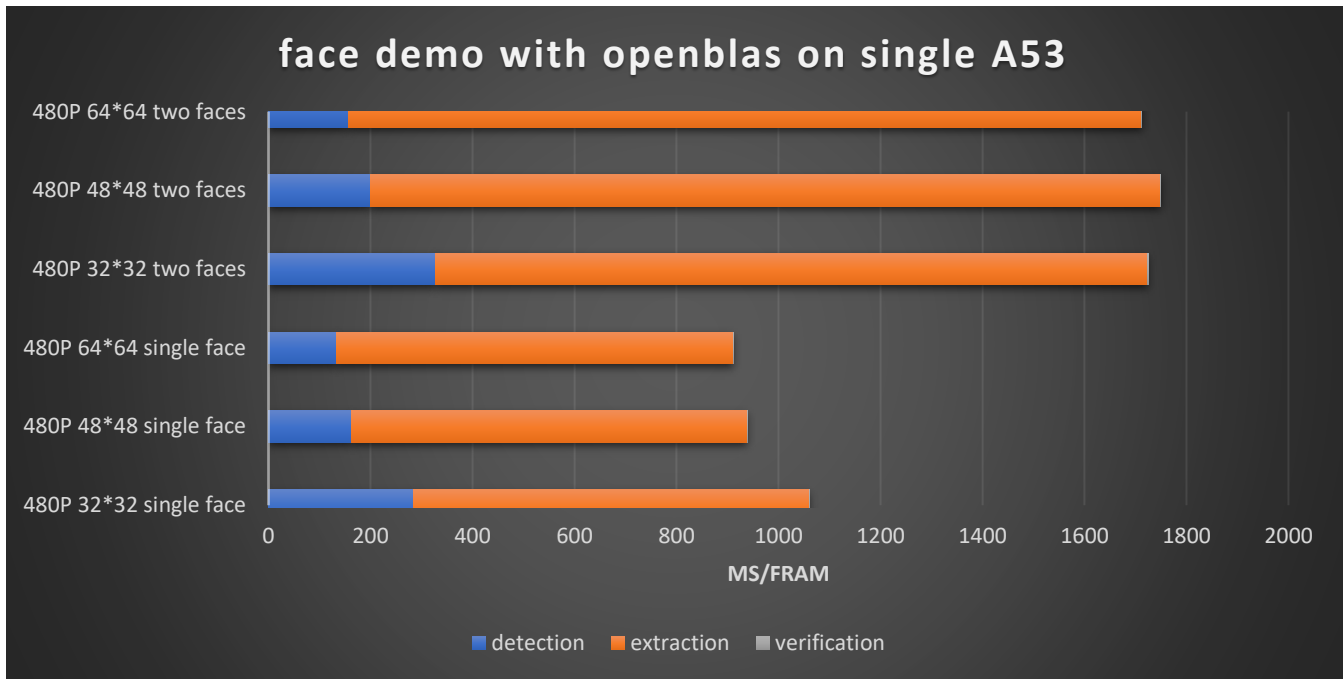


Fig 5.1 Performance Compare on Single A53

5.2 Single A72 CPU @1.8GHz

Table 5.2 Performance of different part on Single A72

Test Case	Detection	Extraction	Verification	Total	Total
-----------	-----------	------------	--------------	-------	-------

	(ms/frame)	(ms/frame)	(ms/frame)	(ms/frame)	(avg_time(us)/frame)
480P 32*32 single face	113	298	0.002	411	493
480P 48*48 single face	58	295	0.002	353	415
480P 64*64 single face	46	303	0.001	349	421
480P 32*32 two faces	128	596	0.003	724	775
480P 48*48 two faces	90	587	0.003	677	718
480P 64*64 two faces	61	599	0.002	660	729

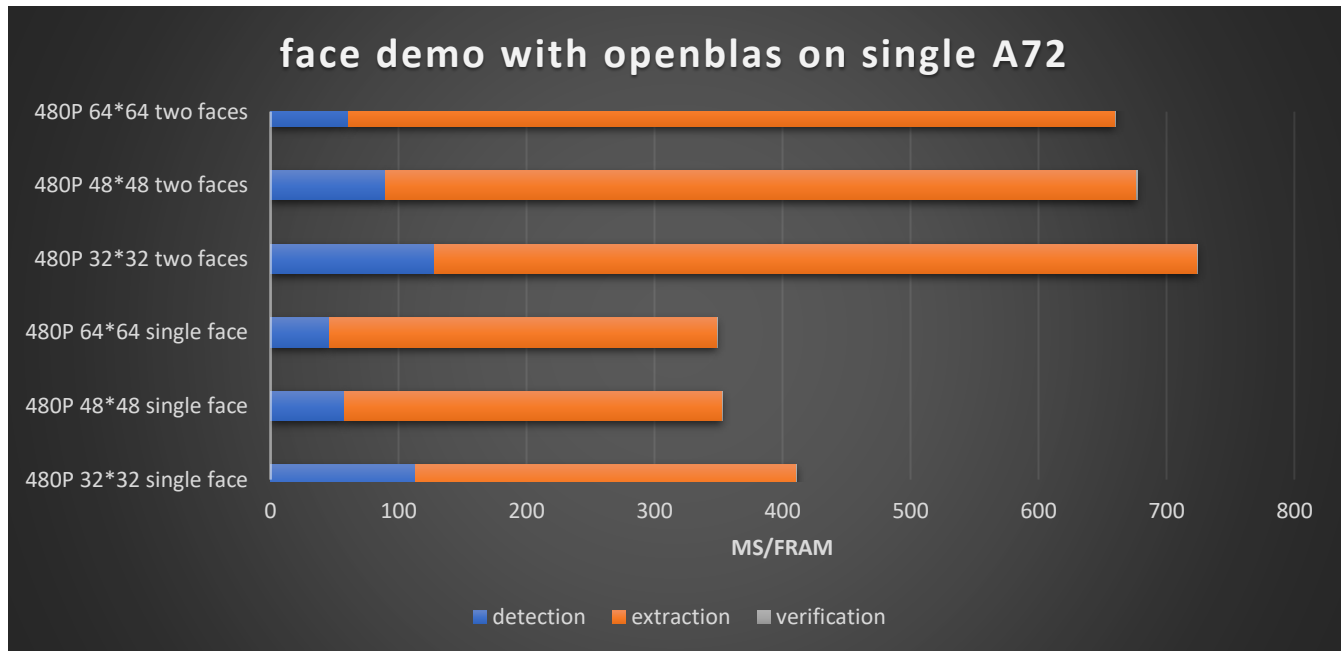


Fig 5.2 Performance Compare on Single A72

5.3 Multi CPUs(4xA53@1.42GHz+2xA72@1.8GHz)

Table 5.3 Performance of different part on Multi CPUs

Test Case	Detection	Extraction	Verification	Total	Total
-----------	-----------	------------	--------------	-------	-------

	(ms/frame)	(ms/frame)	(ms/frame)	(ms/frame)	(avg_time(us)/frame)
480P 32*32 single face	162	243	0.002	405	455
480P 48*48 single face	124	228	0.002	352	359
480P 64*64 single face	100	270	0.002	370	362
480P 32*32 two faces	199	455	0.004	654	614
480P 48*48 two faces	180	496	0.004	676	613
480P 64*64 two faces	104	433	0.002	537	553

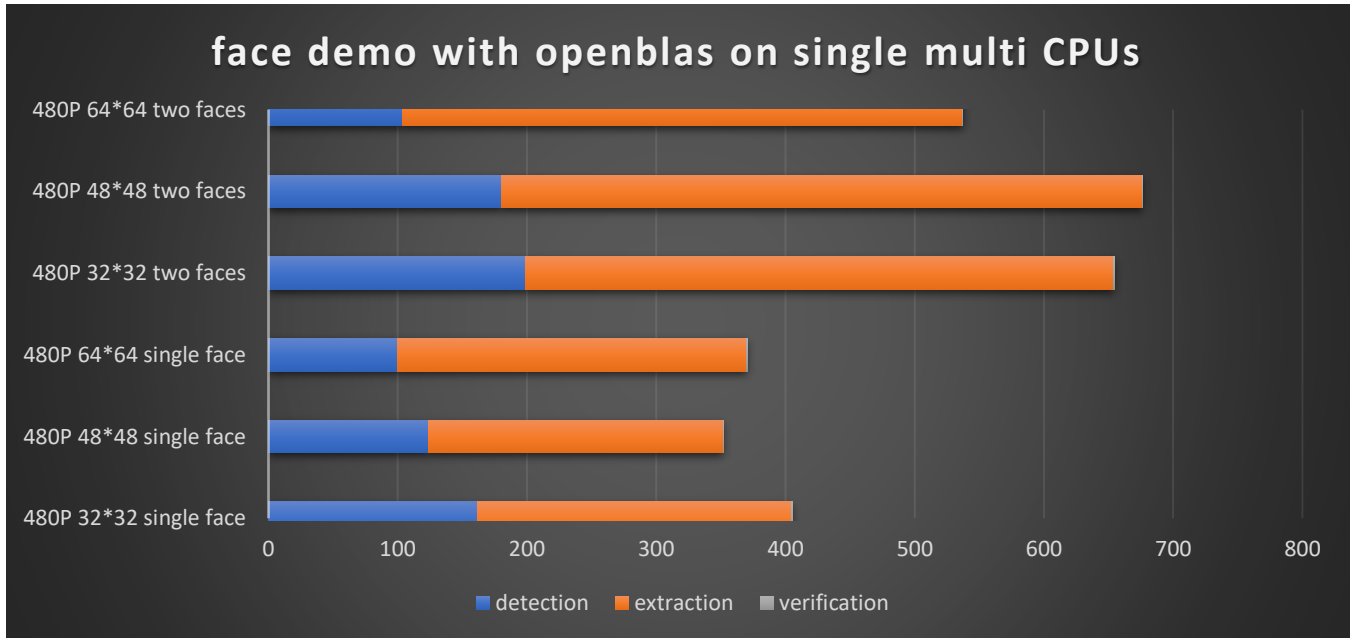


Fig 5.3 Performance Compare on Multi CPUs

6 Performance with Mixed Libraries

Face recognition performance is influenced by many factors, only faces, cores, minimum size of face are test. Note: the alignment is included in extraction. The performances are tested on mixed libraries mode, in which FC(full connecting)/pooling/LRN(local response

normalization) layers are computed on ACL and others layers are computed on OpenBLAS. The results are as fellow.

6.1 Single A53 CPU @1.42GHz

Table 6.1 Performance of different part on Single A53

Test Case	Detection (ms/frame)	Extraction (ms/frame)	Verification (ms/frame)	Total (ms/frame)	Total (avg_time(us)/frame)
480P 32*32 single face	291	851	0.002	1142	1126
480P 48*48 single face	160	879	0.003	1039	955
480P 64*64 single face	115	835	0.003	950	1061
480P 32*32 two faces	301	1702	0.005	2003	2109
480P 48*48 two faces	216	1766	0.005	1982	1951
480P 64*64 two faces	149	1670	0.006	1819	1920

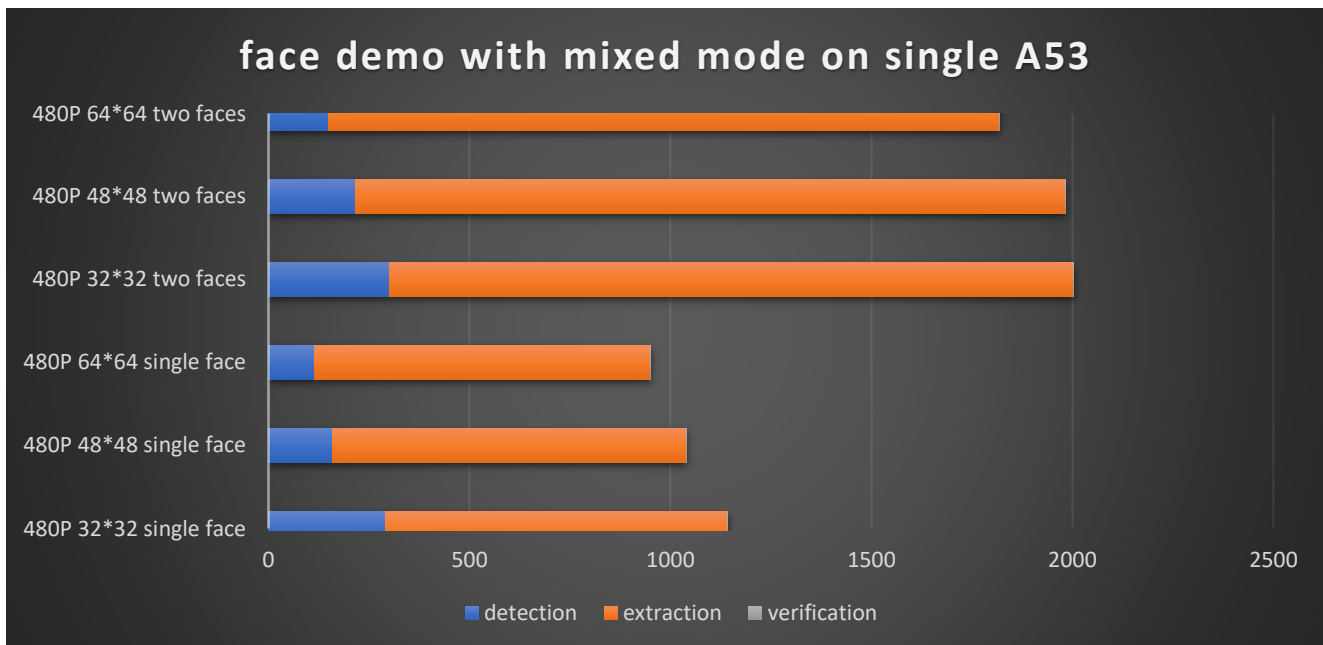


Fig 6.1 Performance Compare on Single A53

6.2 Single A72 CPU @1.8GHz

Table 6.2 Performance of different part on Single A72

Test Case	Detection (ms/frame)	Extraction (ms/frame)	Verification (ms/frame)	Total (ms/frame)	Total (avg_time(us)/frame)
480P 32*32 single face	97	288	0.002	385	429
480P 48*48 single face	58	290	0.002	348	369
480P 64*64 single face	41	286	0.001	327	404
480P 32*32 two faces	103	576	0.003	679	772
480P 48*48 two faces	69	548	0.003	617	710
480P 64*64 two faces	45	573	0.003	618	710

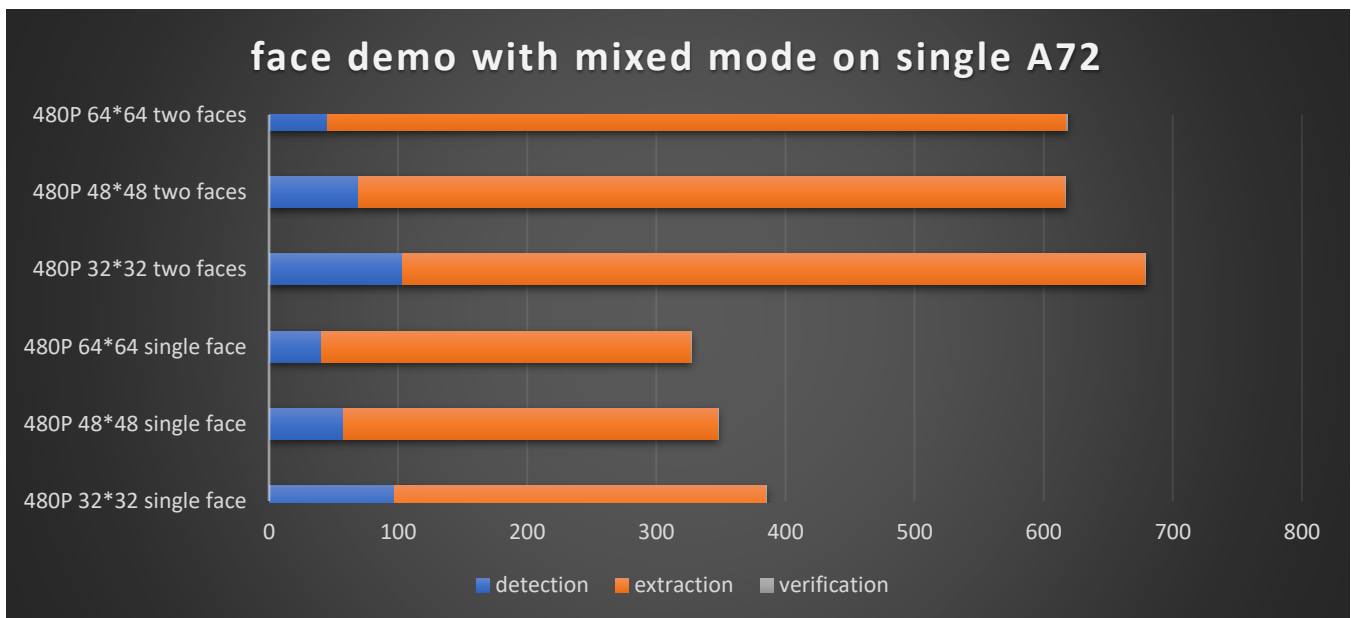


Fig 6.2 Performance Compare on Single A72

6.3 Multi CPUs(4xA53@1.42GHz+2xA72@1.8GHz)

Table 6.3 Performance of different part on Multi CPUs

Test Case	Detection (ms/frame)	Extraction (ms/frame)	Verification (ms/frame)	Total (ms/frame)	Total (avg_time(us) /frame)
480P 32*32 single face	143	216	0.001	359	398
480P 48*48 single face	80	204	0.001	284	322
480P 64*64 single face	71	167	0.001	238	332
480P 32*32 two faces	149	426	0.003	575	599
480P 48*48 two faces	99	428	0.004	527	548
480P 64*64 two faces	84	416	0.002	500	582

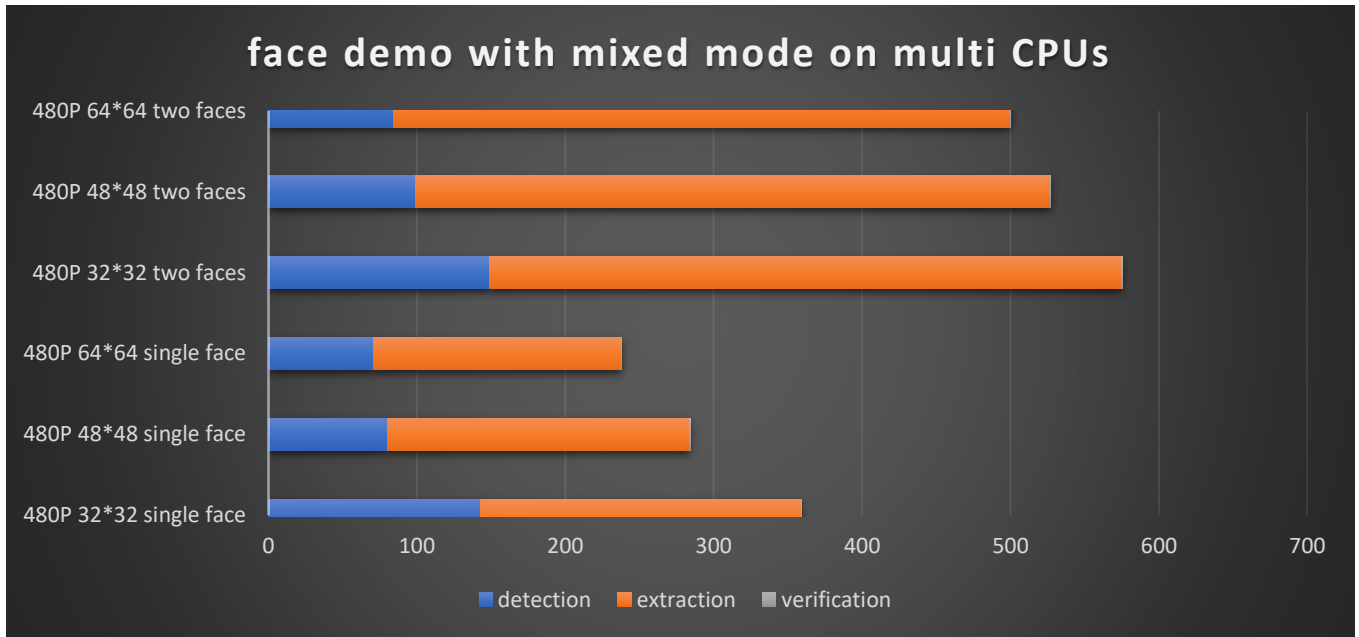


Fig 6.3 Performance Compare on Multi CPUs

7 Conclusion

From the above test cases, we can deduce that:

- Detection time is influenced by minimum face size, in general, detection speed of min face size set to 64x64 is faster than 32x32 and 48x48, but in some cases, 48x48 is better than 64x64;
- The feature extraction time increases with the number of faces, so is the total average time.
- The performance on A72 is better than on A53 but worse than on Multi CPUs.
- OpenBLAS have better performance than ACL.
- In some cases, the performance with mixed libraries mode is better than with OpenBLAS.