FaceDemo

Performance Report

2017-10-24

OPEN AI LAB

Revision Record

Date	Rev	Change Description	Author
2017-10-24	0.1.0	Initial version	

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1 Purpose

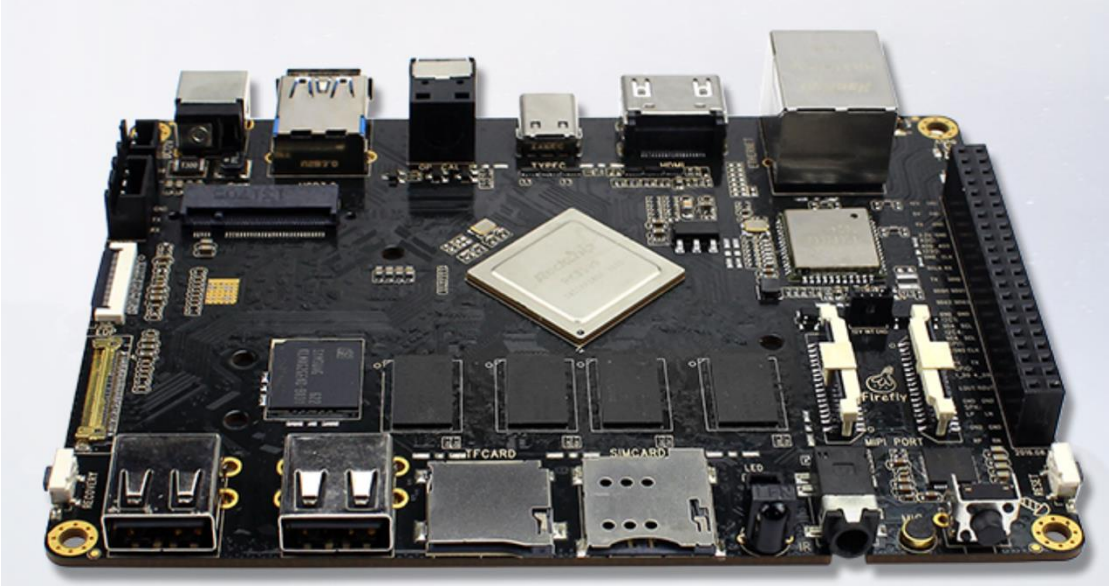
This Report is tested on RK3399 platform and the CaffeOnACL version is 0.4.0 with Arm Compute Library(ACL) 17.10/OpenBLAS. The report only includes CPU data.

2 Test Environment

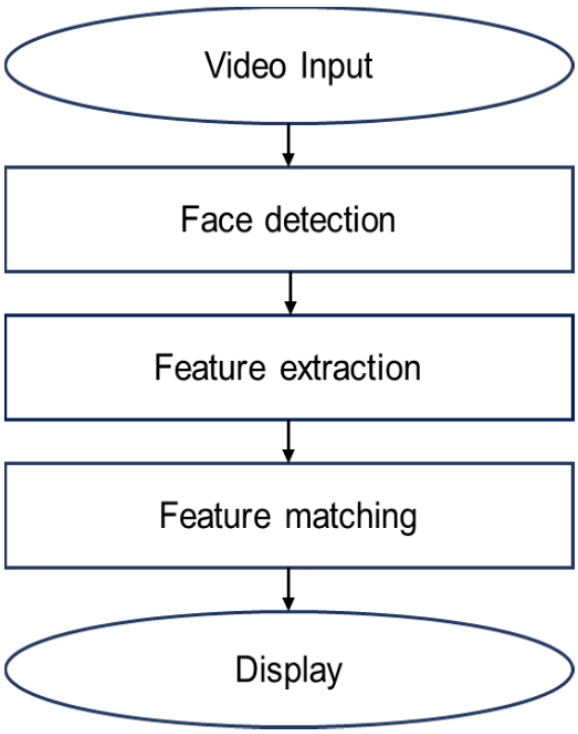
Hardware SoC : Rockchip RK3399

- 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



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)

480P 32*32 single face	482	1176	0.002	1658
480P 48*48 single face	257	1287	0.002	1544
480P 64*64 single face	189	1166	0.003	1355
480P 32*32 two faces	500	2348	0.005	2848
480P 48*48 two faces	335	2574	0.006	2909
480P 64*64 two faces	199	2332	0.006	2531

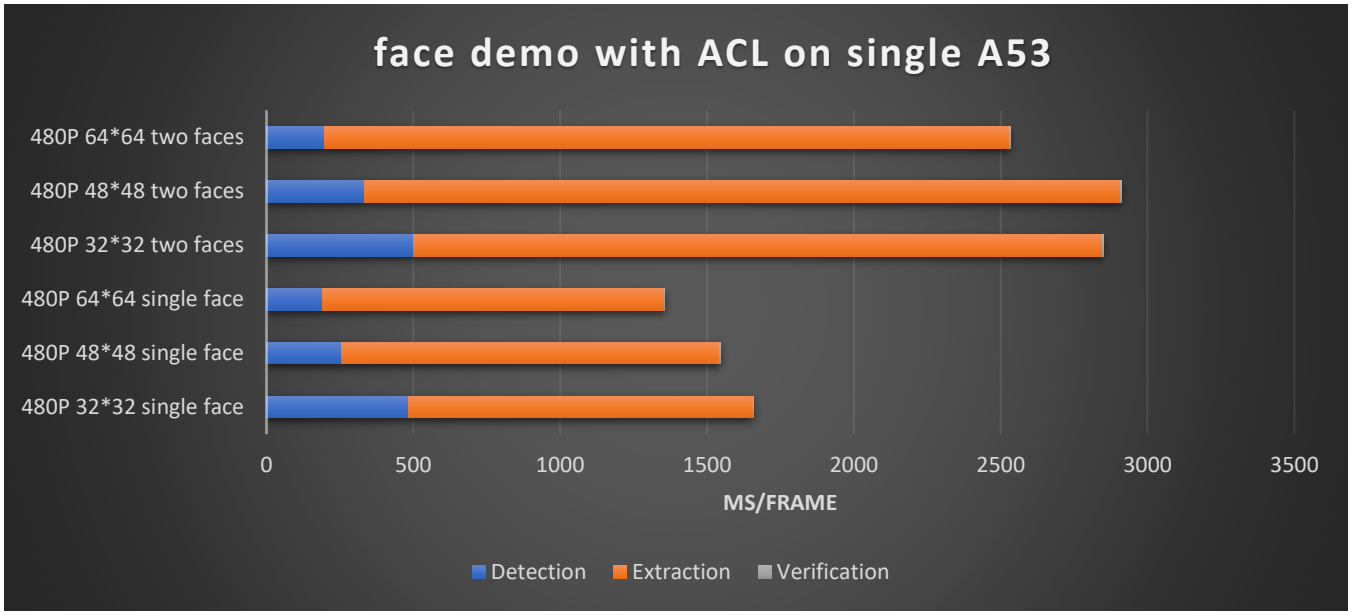


Fig 4.1 Performance Compare on Single A53

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)
480P 32*32 single face	262	721	0.002	983

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

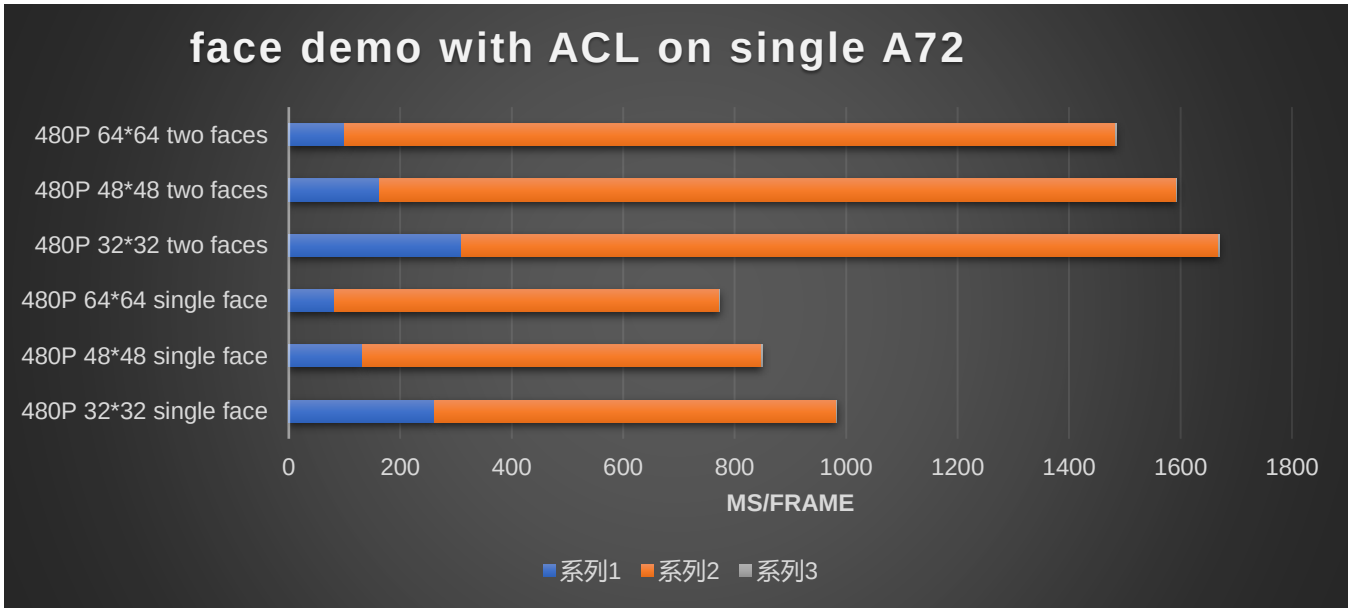


Fig 4.2 Performance Compare on Single A72

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)
480P 32*32 single face	314	417	0.001	731
480P 48*48 single face	176	446	0.005	622

480P 64*64 single face	117	399	0.002	516
480P 32*32 two faces	354	769	0.005	1123
480P 48*48 two faces	231	836	0.005	1067
480P 64*64 two faces	123	773	0.004	896

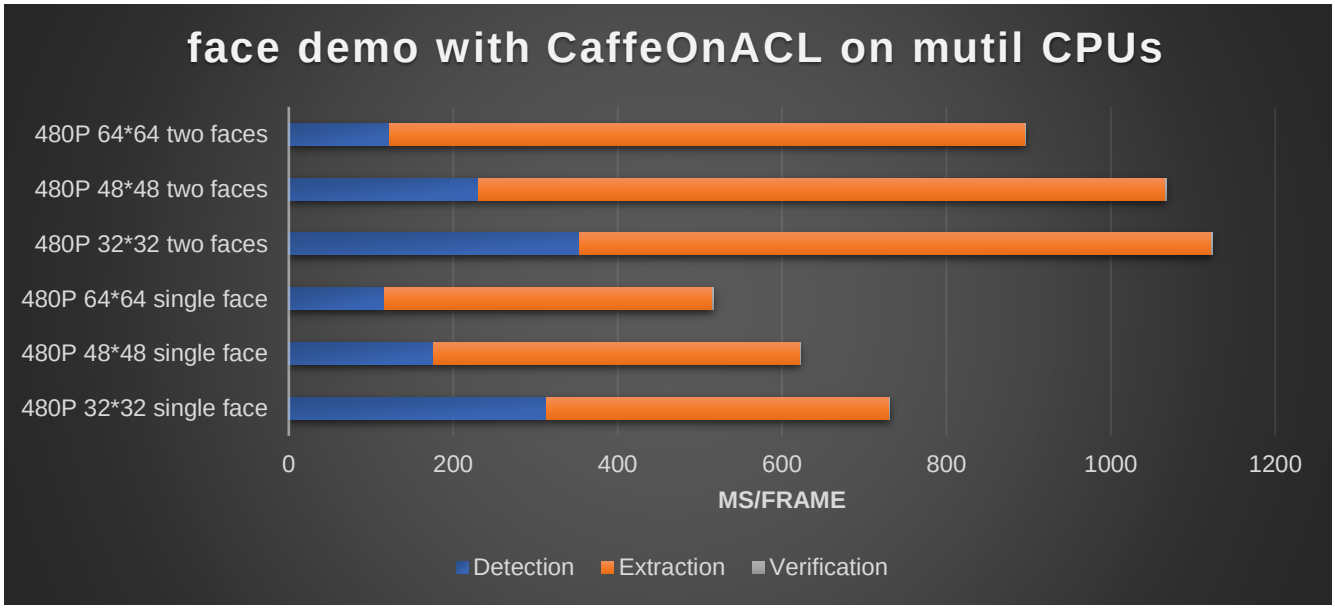


Fig 4.3 Performance Compare on Multi CPUs

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 (ms/frame)	Extraction (ms/frame)	Verification (ms/frame)	Total (ms/frame)

480P 32*32 single face	285	775	0.002	1060
480P 48*48 single face	163	776	0.002	939
480P 64*64 single face	134	777	0.003	911
480P 32*32 two faces	327	1397	0.006	1724
480P 48*48 two faces	200	1549	0.004	1749
480P 64*64 two faces	156	1556	0.005	1712

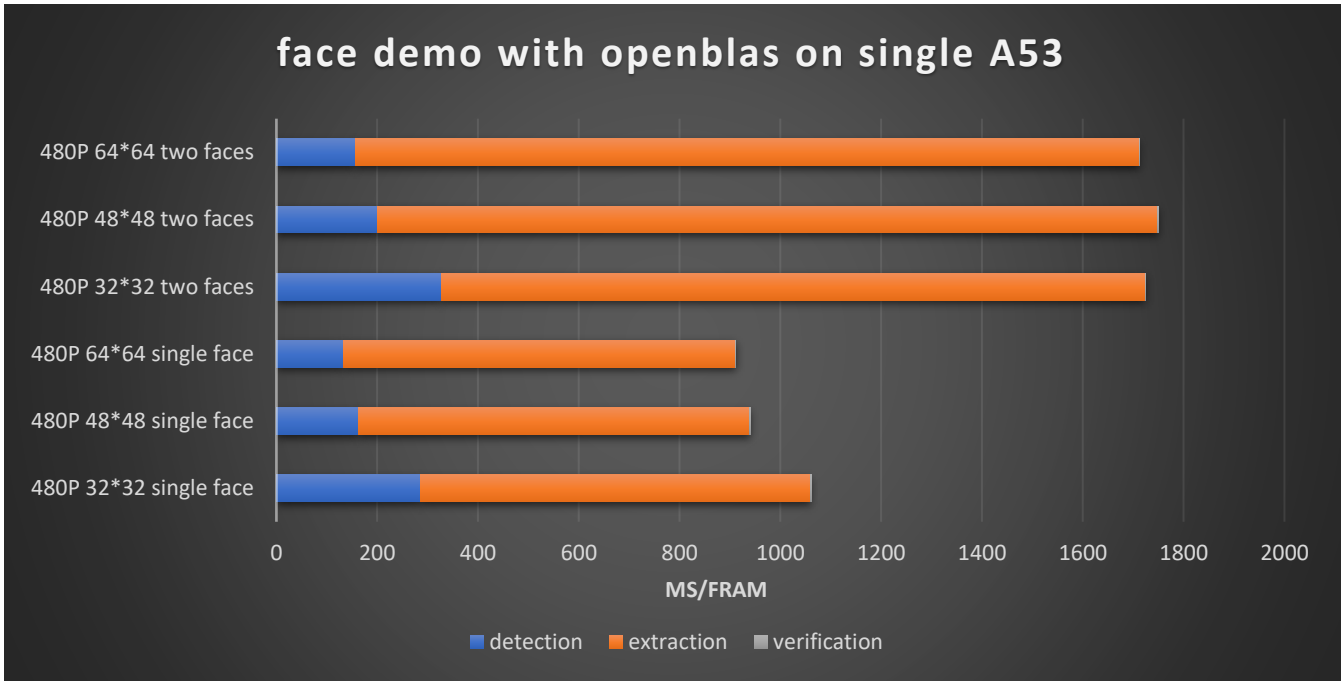


Fig 5.1 Performance Compare on Single A53

5.2 Single A72 CPU @1.8GHz

Table 5.2 Performance of different part on Single A72

Test Case	Detection (ms/frame)	Extraction (ms/frame)	Verification (ms/frame)	Total (ms/frame)

480P 32*32 single face	113	298	0.002	411
480P 48*48 single face	58	295	0.002	353
480P 64*64 single face	46	303	0.001	349
480P 32*32 two faces	128	596	0.003	724
480P 48*48 two faces	90	587	0.003	677
480P 64*64 two faces	61	599	0.002	660

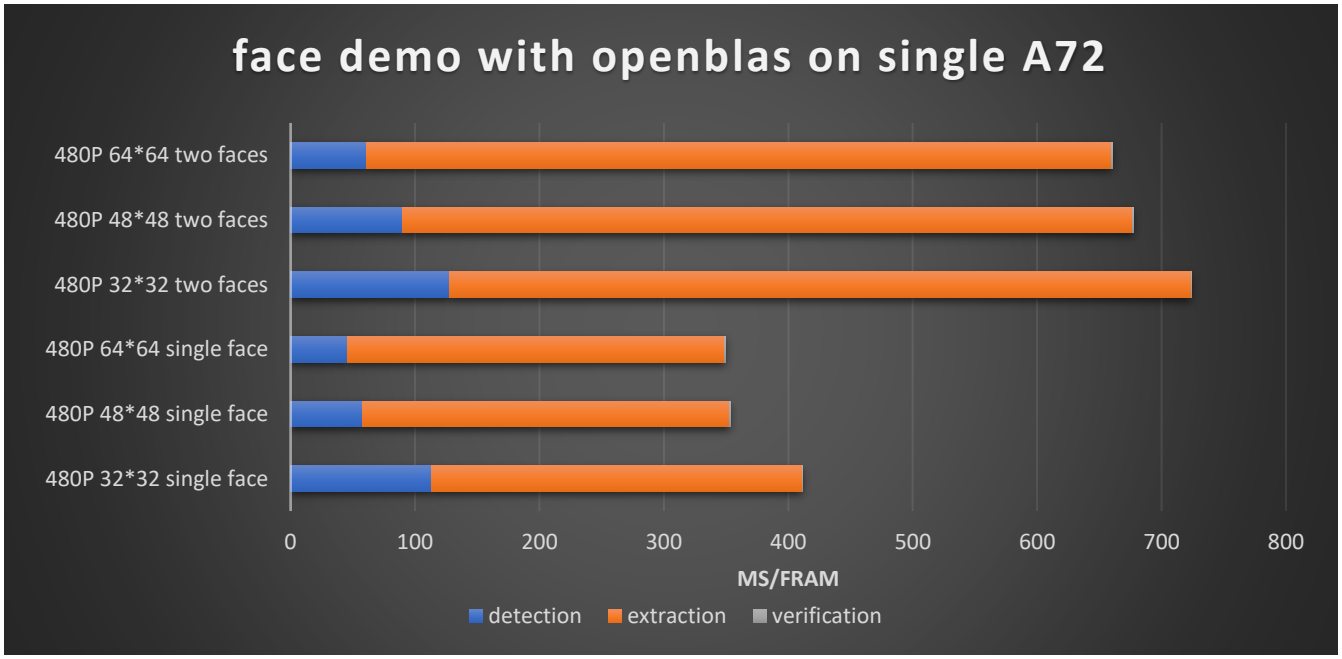


Fig 5.2 Performance Compare on Single A72

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

Table 5.3 Performance of different part on Multi CPUs

Test Case	Detection (ms/frame)	Extraction (ms/frame)	Verification (ms/frame)	Total (ms/frame)

480P 32*32 single face	162	243	0.002	405
480P 48*48 single face	124	228	0.002	352
480P 64*64 single face	100	270	0.002	370
480P 32*32 two faces	199	455	0.004	654
480P 48*48 two faces	180	496	0.004	676
480P 64*64 two faces	104	433	0.002	537

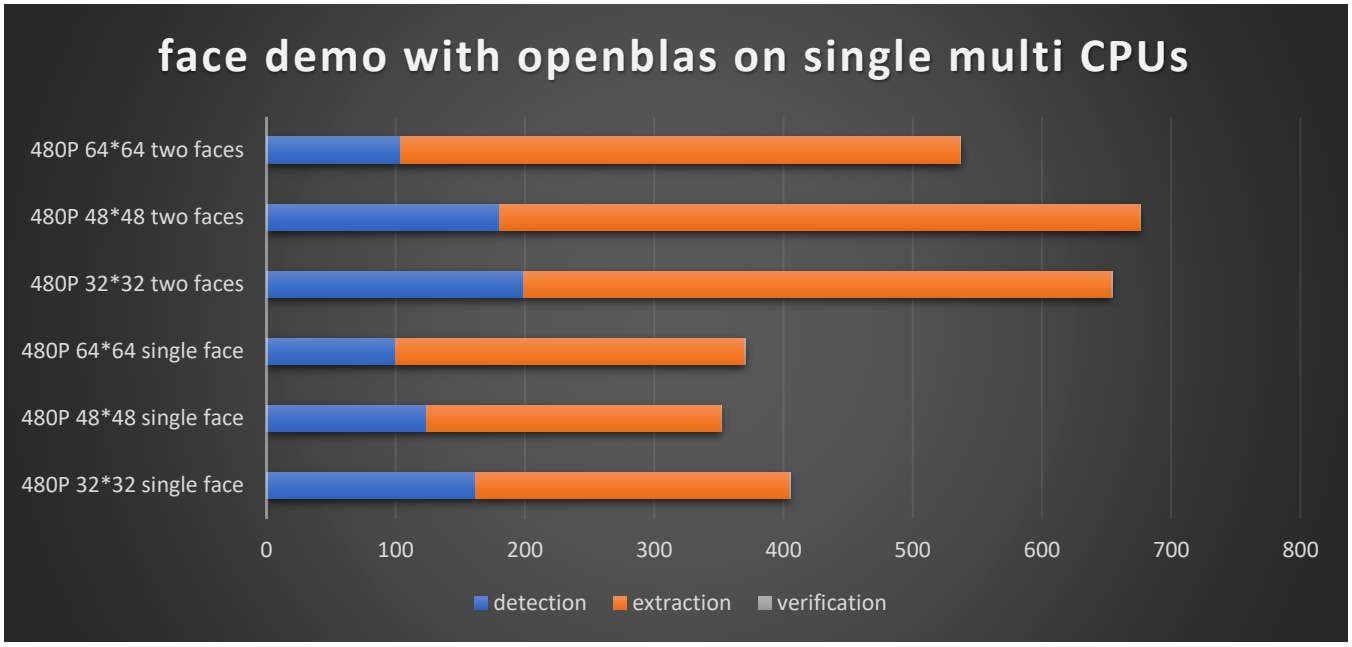


Fig 5.3 Performance Compare on Multi CPUs

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)
480P 32*32 single face	291	851	0.002	1142
480P 48*48 single face	160	879	0.003	1039
480P 64*64 single face	115	835	0.003	950
480P 32*32 two faces	301	1702	0.005	2003
480P 48*48 two faces	216	1766	0.005	1982
480P 64*64 two faces	149	1670	0.006	1819

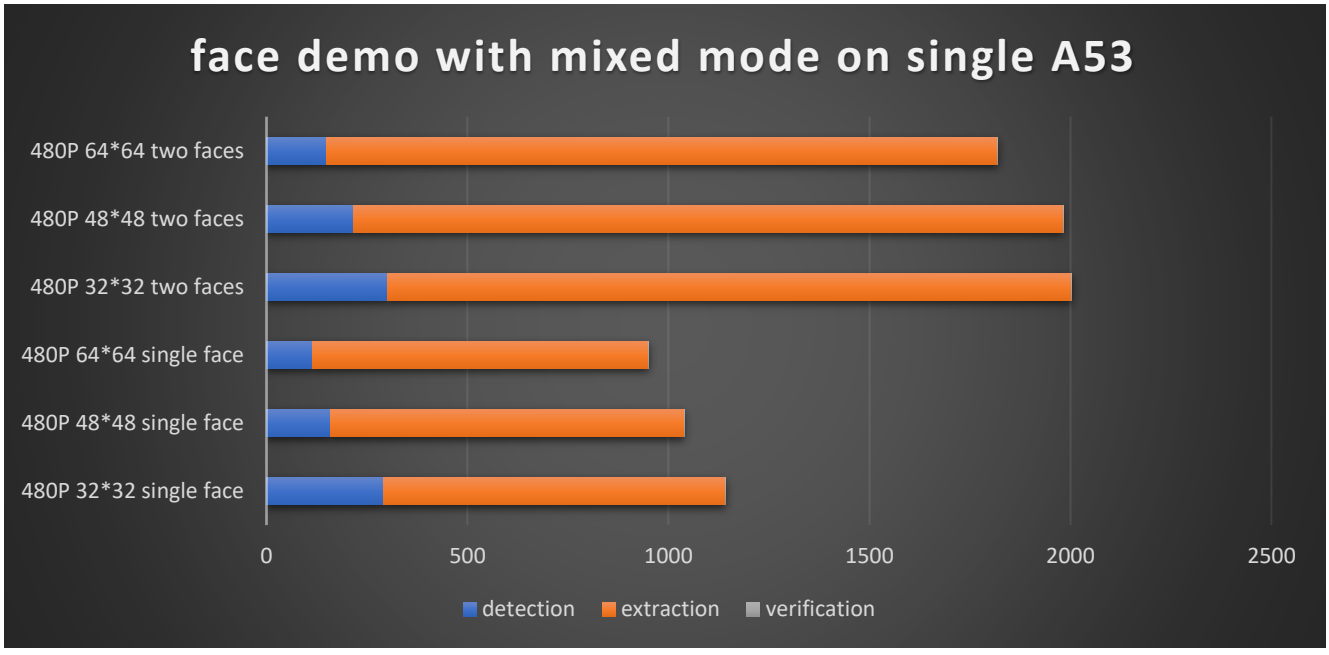


Fig 6.1 Performance Compare on Single A53

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)
480P 32*32 single face	97	288	0.002	385
480P 48*48 single face	58	290	0.002	348
480P 64*64 single face	41	286	0.001	327
480P 32*32 two faces	103	576	0.003	679
480P 48*48 two faces	69	548	0.003	617
480P 64*64 two faces	45	573	0.003	618

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)
480P 32*32 single face	143	216	0.001	359
480P 48*48 single face	80	204	0.001	284
480P 64*64 single face	71	167	0.001	238
480P 32*32 two faces	149	426	0.003	575
480P 48*48 two faces	99	428	0.004	527
480P 64*64 two faces	84	416	0.002	500

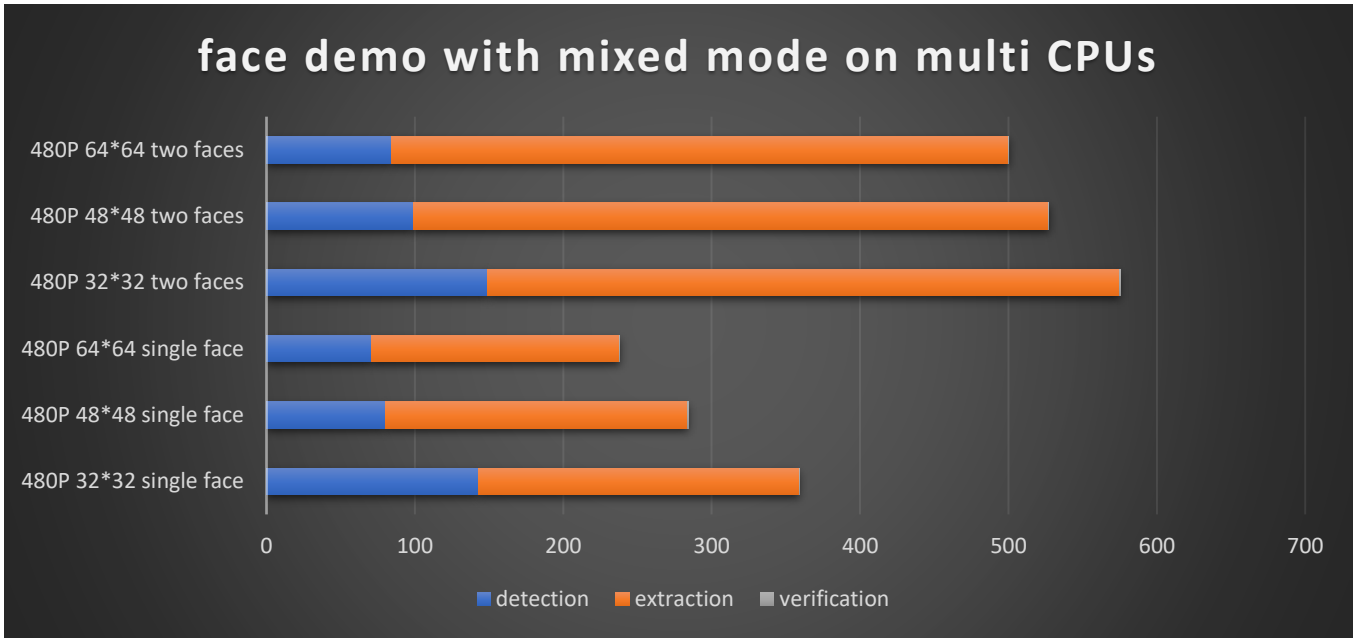


Fig 6.3 Performance Compare on Multi CPUs

7 Conclusion

From the above test cases, we can deduce that:

- Detection time is influenced by minimum face size, detection speed of 64x64 min face size is 3~5 time faster than 32x32 min face size's; but the number of faces has little influence;
- The feature extraction time increases with the number of faces;
- 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 mode is better than with OpenBLAS.