	Number of ImageID	0	1	2	3	4	5	6	7	8	9	Sum	Avg	St
	Detector	0		2	3			Keypoint		8	<u> </u>	Juili	Avg	
	AKAZE	166	157	161	155	163	164	173	175	177	179	1670	303.64	
	BRISK	264	282	282	277	297	279	289	272	266	254	2762	502.18	1
	FAST	121	129	121	124	126	121	142	140	147	146	1317	239.45	1
	HARRIS	45	58	74	88	124	99	72	188	115	94	957	174.00	3
	ORB	92	102	106	113	109	125	130	129	127	128	1161	211.09	1
	SHITOMASI	125	118	123	120	120	113	114	123	111	112	1179	214.36	
	SIFT	138	132	124	137	134	140	137	148	159	137	1386	252.00	
	•		•	•	•	•	•	•	•	•	•	-	•	
MP8 Task	Matching ra	ate %												
Detector/	Descr.	BRISK	1	2	3	4	5	6	7	8	9	Avg	Std	
	AKAZE		80.3%	71.3%	78.1%	75.5%	69.9%	72.6%	77.5%	80.0%	71.8%	75.2%	3.5%	
	BRISK		52.3%	51.1%	48.0%	52.0%	49.8%	55.6%	50.4%	56.4%	62.2%	53.1%	3.9%	
	FAST		48.8%	44.6%	50.4%	53.2%	51.2%	43.8%	55.0%	55.7%	58.9%	51.3%	4.5%	
	HARRIS		55.6%	48.3%	48.6%	48.9%	48.5%	59.7%	41.7%	73.9%	71.3%	55.2%	9.9%	
	ORB		65.2%	63.7%	61.3%	69.7%	66.1%	66.4%	64.3%	57.5%	56.7%	63.4%	3.8%	
	SHITOMASI		71.2%	67.8%	60.8%	64.2%	65.5%	61.9%	69.3%	73.0%	64.9%	66.5%	3.7%	
	SIFT		43.2%	50.8%	46.8%	45.5%	41.0%	38.0%	39.4%	42.6%	53.3%	44.5%	4.6%	
D /	<u> </u>	DDIEE					- 1	<u> </u>		<u> </u>	• 1		6.1	
Detector/	Descr.	BRIEF	1	72.00/	3 74.00/	70.20/	5 74 20/	6 70.70/	7	8 77.10/	9 74 00/	Avg	Std	
	AKAZE BRISK		68.8%	73.9%	71.0%	70.3% 50.9%	71.2% 53.0%	78.7%	76.9%	77.1%	74.0%	73.5%	3.1%	
	FAST		52.3%	58.9%	46.6%			55.6%	58.1%	60.5%	58.3%	54.9% 50.3%	4.1%	
			48.8%	51.2%	47.9%	55.6%	47.9%	46.3%	55.7%	57.1%	42.5%		4.4%	
	HARRIS ORB		55.6% 40.2%	46.6%	51.4%	52.3%	44.4%	61.1%	47.2%	56.5%	61.7%	53.0%	5.6%	
	SHITOMASI		40.2% 81.4%	37.3% 78.8%	34.9% 76.7%	48.6% 74.2%	38.5% 81.4%	51.2% 82.3%	45.0% 74.6%	48.8% 82.0%	46.5%	43.4% 78.6%	5.2%	
											76.6%		2.9%	
	SIFT		47.7%	58.1%	51.6%	49.3%	38.8%	41.6%	52.6%	45.3%	61.3%	49.6%	6.5%	
Detector/	Descr.	ORB	1	2	3	4	5	6	7	8	9	Avg	Std	
/	AKAZE		65.0%	61.1%	61.9%	54.2%	55.2%	70.7%	59.5%	64.6%	66.7%	62.1%	4.8%	
	BRISK		35.6%	37.9%	31.8%	35.0%	30.5%	40.9%	41.2%	42.9%	48.0%	38.2%	5.0%	

	FAST		47.1%	56.2%	57.9%	58.9%	52.9%	55.4%	57.9%	57.9%	50.7%	55.0%	3.6%
	HARRIS		51.1%	53.4%	52.7%	39.8%	43.4%	69.4%	45.8%	72.2%	64.9%	54.8%	10.4%
	ORB		43.5%	55.9%	46.2%	49.5%	52.3%	54.4%	55.0%	48.8%	56.7%	51.4%	4.1%
	SHITOMASI		72.9%	71.2%	72.5%	75.8%	77.0%	67.3%	71.1%	79.3%	79.3%	74.0%	3.7%
	SIFT		-	-	-	-	-	-	-	-	-	-	-
	<b>5</b> 1										I		
Detector/	Descr.	FREAK	1	2	3	4	5	6	7	8	9	Avg	Std
	AKAZE	-	65.6%	66.9%	60.0%	63.9%	59.5%	70.1%	72.8%	67.4%	66.1%	65.8%	3.9%
	BRISK		43.2%	42.9%	40.8%	42.6%	36.9%	46.2%	49.6%	48.5%	51.6%	44.7%	4.2%
	FAST		47.1%	33.9%	42.1%	46.8%	46.3%	41.3%	49.3%	40.7%	48.6%	44.0%	4.4%
	HARRIS		40.0%	55.2%	37.8%	37.5%	44.4%	52.8%	31.9%	58.3%	56.4%	46.0%	8.7%
	ORB		42.4%	32.4%	34.9%	36.7%	30.3%	32.0%	31.8%	30.7%	34.6%	34.0%	3.4%
	SHITOMASI		55.9%	55.9%	53.3%	52.5%	54.9%	56.6%	53.5%	58.6%	56.8%	55.3%	1.7%
	SIFT		44.7%	50.8%	43.5%	47.8%	38.1%	36.5%	34.3%	35.8%	47.4%	42.1%	5.4%
											_		
Detector/	Descr.	AKAZE	1	2	3	4	5	6	7	8	9	Avg	Std
	AKAZE		81.5%	81.5%	80.6%	75.5%	74.2%	80.5%	79.2%	80.0%	81.4%	79.4%	2.4%
	BRISK		-	-	-	-	-	-	-	-	-	-	-
	FAST		-	-	-	-	-	-	-	-	-	-	-
	HARRIS		-	-	-	-	-	-	-	-	-	-	-
	ORB												
			-	-	-	-	-	-	-	-	-	-	-
	SHITOMASI		-	-	-	-	-	-	-	-	-	- -	-
	SHITOMASI SIFT		- - -	- - -									
			- - -	- - -									
Detector/	SIFT Descr.	SIFT	- - - 1	- - -	- - -	- - -	- - -	- - -	- - - 7		- - -	- - - Avg	- - - Std
Detector/	SIFT Descr. AKAZE	SIFT	85.4%	85.4%	83.9%	87.7%	84.0%	89.6%	85.0%	88.0%	85.3%	86.0%	1.8%
Detector/	Descr.  AKAZE  BRISK	SIFT	85.4% 68.9%	85.4% 68.4%	83.9% 61.0%	87.7% 66.1%	84.0% 61.3%	89.6% 69.9%	85.0% 71.3%	88.0% 66.2%	85.3% 72.0%	86.0% 67.2%	1.8% 3.6%
Detector/	SIFT  Descr.  AKAZE  BRISK  FAST	SIFT	85.4% 68.9% 53.7%	85.4% 68.4% 48.8%	83.9% 61.0% 44.6%	87.7% 66.1% 59.7%	84.0% 61.3% 56.2%	89.6% 69.9% 61.2%	85.0% 71.3% 69.3%	88.0% 66.2% 59.3%	85.3% 72.0% 52.1%	86.0% 67.2% 56.1%	1.8% 3.6% 6.6%
Detector/	Descr.  AKAZE  BRISK  FAST  HARRIS	SIFT	85.4% 68.9% 53.7% 44.4%	85.4% 68.4% 48.8% 58.6%	83.9% 61.0% 44.6% 63.5%	87.7% 66.1% 59.7% 55.7%	84.0% 61.3% 56.2% 49.5%	89.6% 69.9% 61.2% 91.7%	85.0% 71.3% 69.3% 59.7%	88.0% 66.2% 59.3% 91.3%	85.3% 72.0% 52.1% 83.0%	86.0% 67.2% 56.1% 66.4%	1.8% 3.6% 6.6% 15.9%
Detector/	Descr.  AKAZE  BRISK  FAST  HARRIS  ORB	SIFT	85.4% 68.9% 53.7% 44.4% 72.8%	85.4% 68.4% 48.8% 58.6% 77.5%	83.9% 61.0% 44.6% 63.5% 73.6%	87.7% 66.1% 59.7% 55.7% 72.5%	84.0% 61.3% 56.2% 49.5% 75.2%	89.6% 69.9% 61.2% 91.7% 76.0%	85.0% 71.3% 69.3% 59.7% 73.6%	88.0% 66.2% 59.3% 91.3% 74.0%	85.3% 72.0% 52.1% 83.0% 74.0%	86.0% 67.2% 56.1% 66.4% 74.4%	1.8% 3.6% 6.6% 15.9% 1.4%
Detector/	Descr.  AKAZE  BRISK  FAST  HARRIS	SIFT	85.4% 68.9% 53.7% 44.4%	85.4% 68.4% 48.8% 58.6%	83.9% 61.0% 44.6% 63.5%	87.7% 66.1% 59.7% 55.7%	84.0% 61.3% 56.2% 49.5%	89.6% 69.9% 61.2% 91.7%	85.0% 71.3% 69.3% 59.7%	88.0% 66.2% 59.3% 91.3%	85.3% 72.0% 52.1% 83.0%	86.0% 67.2% 56.1% 66.4%	1.8% 3.6% 6.6% 15.9%

MP9 Task	Descriptors	extractio	n time in r	ns									
Descriptor:	BRISK					Time in	ms of Des	criptors Ex	traction				
	Detector	0	1	2	3	4	5	6	7	8	9	Avg	Std
	AKAZE	2.06	2.09	2.54	2.44	2.01	2.83	2.08	2.10	2.15	2.16	2.25	0.24
	BRISK	2.96	3.45	3.19	3.21	3.61	3.26	3.49	3.12	3.21	2.99	3.25	0.19
	FAST	2.39	1.90	2.44	1.49	2.33	2.02	1.67	2.75	2.26	2.39	2.16	0.35
	HARRIS	0.86	1.63	1.83	1.88	2.16	2.13	1.98	3.10	2.15	1.93	1.97	0.50
	ORB	1.25	1.38	1.34	1.58	1.41	1.67	1.66	1.59	1.60	1.93	1.54	0.18
	SHITOMASI	1.56	2.50	1.84	1.57	2.40	2.31	2.37	2.18	2.17	2.29	2.12	0.31
	SIFT	1.61	1.69	1.49	1.76	1.62	1.64	1.73	1.82	1.84	1.71	1.69	0.10
Descriptor:	BRIEF		7	7			criptors Ex					2.14	
	Detector	0	1	2	3	4	5	6	7	8	9	Avg	Std
	AKAZE	1.23	1.12	1.14	1.25	1.22	1.12	1.73	1.22	1.66	1.92	1.36	0.26
	BRISK	1.41	2.29	1.45	1.40	1.53	1.40	1.40	1.29	1.17	1.21	1.45	0.28
	FAST	1.12	1.37	0.77	1.81	0.92	0.90	1.40	0.87	0.88	1.01	1.10	0.30
	HARRIS	0.58	1.15	1.23	1.24	1.32	1.27	1.32	1.68	1.51	1.16	1.25	0.26
	ORB	0.60	0.73	0.72	0.82	0.72	0.69	0.77	0.76	0.86	0.75	0.74	0.06
	SHITOMASI	0.74	1.34	0.80	0.79	1.35	0.75	0.67	1.22	1.25	0.68	0.96	0.26
	SIFT	1.08	1.02	0.91	0.94	0.92	1.05	1.08	0.89	1.02	0.92	0.98	0.07
Descriptor:	ORB		ı	ı			criptors Ex		1	ī	1	1.12	
	Detector	0	1	2	3	4	5	6	7	8	9	Avg	Std
	AKAZE	3.23	3.05	3.08	2.98	3.12	3.38	3.14	3.04	3.12	3.00	3.11	0.11
	BRISK	4.53	4.56	4.68	4.72	4.63	4.47	4.49	4.61	4.36	4.45	4.55	0.10
	FAST	1.06	1.10	1.17	1.03	1.03	1.12	1.12	1.09	1.20	1.15	1.11	0.05
	HARRIS	0.83	1.03	1.04	1.05	1.05	1.03	1.09	1.24	1.16	1.11	1.06	0.09
	ORB	4.75	4.65	4.54	4.96	4.40	4.79	4.62	4.89	4.86	4.67	4.71	0.15
	SHITOMASI	1.11	1.08	1.14	1.04	1.05	0.99	1.09	1.04	1.07	1.13	1.07	0.04
	SIFT	-	-	-		-		-	-	-	-	-	-
Descriptor:	FREAK		1 .	1 _			criptors Ex					2.60	
	Detector	0	1	2	3	4	5	6	7	8	9	Avg	Std
	AKAZE	43.13	43.16	40.39	41.64	41.57	41.61	41.32	40.74	40.57	40.10	41.42	0.96
	BRISK	44.44	41.65	40.32	40.93	41.24	40.15	41.35	41.16	40.15	41.25	41.26	1.12
	FAST	38.96	38.40	39.05	38.23	39.31	38.00	39.00	39.47	39.49	39.61	38.95	0.51

	HARRIS	38.38	38.78	39.39	39.30	38.65	39.10	39.23	40.44	40.49	38.68	39.24	0.65
	ORB	38.73	38.59	39.53	38.99	38.86	39.24	38.38	38.95	39.65	39.39	39.03	0.37
	SHITOMASI	39.40	39.50	39.04	38.88	38.56	40.14	39.10	38.77	39.33	39.64	39.24	0.42
	SIFT	39.52	40.29	40.65	40.34	41.08	40.90	39.89	40.73	39.49	39.85	40.27	0.51
Descriptor:	AKAZE	Time in ms of Descriptors Extraction								39.92 avg			
	Detector	0	1	2	3	4	5	6	7	8	9	Avg	Std
	AKAZE	66.67	66.14	68.05	64.46	65.67	64.35	66.14	67.78	64.67	68.87	66.28	1.43
	BRISK	-	-	-	-	-	-	-	-	-	-	-	-
	FAST	-	-	-	-	-	-	-	-	-	-	-	-
	HARRIS	-	-	-	-	-	-	-	-	-	-	-	-
	ORB	-	-	-	-	-	-	-	-	-	-	-	-
	SHITOMASI	-	-	-	-	-	-	-	-	-	-	-	-
	SIFT	-	-	-	-	-	-	-	-	-	-	-	-
Descriptor:	SIFT				Time in	ms of Des	criptors Ex	traction				66.28	avg
	Detector	0	1	2	3	4	5	6	7	8	9	Avg	Std
	AKAZE	23.61	26.28	24.00	23.90	23.29	23.51	24.91	23.94	25.00	25.31	24.37	0.87
	BRISK	47.65	38.76	42.28	41.66	43.68	41.62	42.16	42.02	41.93	41.61	42.34	2.01
	BRISK FAST	47.65 24.38	38.76 17.48	42.28 18.56	41.66 23.31	43.68 22.80	41.62 20.98	42.16 23.67	42.02 22.83	41.93 18.39	41.61 23.49	42.34 21.59	2.30
	FAST HARRIS												
	FAST	24.38	17.48	18.56	23.31	22.80	20.98	23.67	22.83	18.39	23.49	21.59	2.30
	FAST HARRIS	24.38 17.60	17.48 20.02	18.56 19.53	23.31 18.37	22.80 19.13	20.98 18.84	23.67 17.46	22.83 19.88	18.39 19.40	23.49 18.64	21.59 18.89	2.30 0.80
	FAST HARRIS ORB	24.38 17.60 44.78	17.48 20.02 42.71	18.56 19.53 45.10	23.31 18.37 46.09	22.80 19.13 43.96	20.98 18.84 45.09	23.67 17.46 48.21	22.83 19.88 49.19	18.39 19.40 50.07	23.49 18.64 50.96	21.59 18.89 46.62 19.17 81.71	2.30 0.80 2.53 1.30 7.58
	FAST HARRIS ORB SHITOMASI SIFT	24.38 17.60 44.78 16.05 104.52	17.48 20.02 42.71 19.53 78.03	18.56 19.53 45.10 21.72 76.43	23.31 18.37 46.09 19.28 79.60	22.80 19.13 43.96 18.33 83.87	20.98 18.84 45.09 19.04 79.33	23.67 17.46 48.21 19.58	22.83 19.88 49.19 18.73	18.39 19.40 50.07 20.21	23.49 18.64 50.96 19.19	21.59 18.89 46.62 19.17	2.30 0.80 2.53 1.30 7.58
MP9 Task	FAST HARRIS ORB SHITOMASI SIFT	24.38 17.60 44.78 16.05 104.52	17.48 20.02 42.71 19.53 78.03	18.56 19.53 45.10 21.72 76.43	23.31 18.37 46.09 19.28 79.60	22.80 19.13 43.96 18.33 83.87	20.98 18.84 45.09 19.04 79.33	23.67 17.46 48.21 19.58 77.31	22.83 19.88 49.19 18.73 77.84	18.39 19.40 50.07 20.21 82.96	23.49 18.64 50.96 19.19 77.25	21.59 18.89 46.62 19.17 81.71 36.38	2.30 0.80 2.53 1.30 7.58 avg
MP9 Task	FAST HARRIS ORB SHITOMASI SIFT  Keypoints of Detector	24.38 17.60 44.78 16.05 104.52	17.48 20.02 42.71 19.53 78.03	18.56 19.53 45.10 21.72 76.43 n ms for tl	23.31 18.37 46.09 19.28 79.60	22.80 19.13 43.96 18.33 83.87 riptor extr	20.98 18.84 45.09 19.04 79.33	23.67 17.46 48.21 19.58 77.31	22.83 19.88 49.19 18.73 77.84	18.39 19.40 50.07 20.21 82.96	23.49 18.64 50.96 19.19 77.25	21.59 18.89 46.62 19.17 81.71 36.38	2.30 0.80 2.53 1.30 7.58 avg
MP9 Task	FAST HARRIS ORB SHITOMASI SIFT  Keypoints of Detector AKAZE	24.38 17.60 44.78 16.05 104.52 detection a <b>0</b> 86.70	17.48 20.02 42.71 19.53 78.03  avg. time i  1 77.58	18.56 19.53 45.10 21.72 76.43 n ms for the 2 79.10	23.31 18.37 46.09 19.28 79.60 ne all desc 3 77.54	22.80 19.13 43.96 18.33 83.87 riptor extr	20.98 18.84 45.09 19.04 79.33 actors <b>5</b> 77.74	23.67 17.46 48.21 19.58 77.31 <b>6</b> 76.72	22.83 19.88 49.19 18.73 77.84 <b>7</b> 78.13	18.39 19.40 50.07 20.21 82.96 <b>8</b> 76.36	23.49 18.64 50.96 19.19 77.25 <b>9</b> 76.16	21.59 18.89 46.62 19.17 81.71 36.38 Avg 78.29	2.30 0.80 2.53 1.30 7.58 avg Std 2.79
MP9 Task	FAST HARRIS ORB SHITOMASI SIFT  Keypoints of Detector AKAZE BRISK	24.38 17.60 44.78 16.05 104.52 detection a 0 86.70 41.98	17.48 20.02 42.71 19.53 78.03 evg. time i 1 77.58 41.20	18.56 19.53 45.10 21.72 76.43 n ms for th 2 79.10 40.96	23.31 18.37 46.09 19.28 79.60 ne all desc 3 77.54 40.53	22.80 19.13 43.96 18.33 83.87 riptor extr 4 76.87 40.55	20.98 18.84 45.09 19.04 79.33 actors <b>5</b> 77.74 40.96	23.67 17.46 48.21 19.58 77.31 <b>6</b> 76.72 40.69	22.83 19.88 49.19 18.73 77.84 <b>7</b> 78.13 39.63	18.39 19.40 50.07 20.21 82.96 <b>8</b> 76.36 40.52	23.49 18.64 50.96 19.19 77.25 <b>9</b> 76.16 40.32	21.59 18.89 46.62 19.17 81.71 36.38  Avg 78.29 40.74	2.30 0.80 2.53 1.30 7.58 avg Std 2.79 0.55
MP9 Task	FAST HARRIS ORB SHITOMASI SIFT  Keypoints of Detector AKAZE BRISK FAST	24.38 17.60 44.78 16.05 104.52 detection a 0 86.70 41.98 0.44	17.48 20.02 42.71 19.53 78.03 evg. time i 1 77.58 41.20 0.37	18.56 19.53 45.10 21.72 76.43 n ms for tl 2 79.10 40.96 0.37	23.31 18.37 46.09 19.28 79.60 ne all desc 3 77.54 40.53 0.35	22.80 19.13 43.96 18.33 83.87 riptor extr 4 76.87 40.55 0.37	20.98 18.84 45.09 19.04 79.33 Factors <b>5</b> 77.74 40.96 0.37	23.67 17.46 48.21 19.58 77.31 <b>6</b> 76.72 40.69 0.37	22.83 19.88 49.19 18.73 77.84 <b>7</b> 78.13 39.63 0.37	18.39 19.40 50.07 20.21 82.96 <b>8</b> 76.36 40.52 0.37	23.49 18.64 50.96 19.19 77.25 <b>9</b> 76.16 40.32 0.37	21.59 18.89 46.62 19.17 81.71 36.38  Avg 78.29 40.74 0.37	2.30 0.80 2.53 1.30 7.58 avg Std 2.79 0.55 0.02
MP9 Task	FAST HARRIS ORB SHITOMASI SIFT  Keypoints of Detector AKAZE BRISK FAST HARRIS	24.38 17.60 44.78 16.05 104.52 detection a 0 86.70 41.98 0.44 13.98	17.48 20.02 42.71 19.53 78.03  avg. time i  77.58 41.20 0.37 12.57	18.56 19.53 45.10 21.72 76.43 n ms for th 2 79.10 40.96 0.37 12.93	23.31 18.37 46.09 19.28 79.60 ne all desc 3 77.54 40.53 0.35 12.83	22.80 19.13 43.96 18.33 83.87  riptor extr  4 76.87 40.55 0.37 12.90	20.98 18.84 45.09 19.04 79.33 actors 5 77.74 40.96 0.37 12.94	23.67 17.46 48.21 19.58 77.31 <b>6</b> 76.72 40.69 0.37 12.87	22.83 19.88 49.19 18.73 77.84 <b>7</b> 78.13 39.63 0.37 13.23	18.39 19.40 50.07 20.21 82.96 <b>8</b> 76.36 40.52 0.37 12.72	23.49 18.64 50.96 19.19 77.25 <b>9</b> 76.16 40.32 0.37 12.88	21.59 18.89 46.62 19.17 81.71 36.38  Avg 78.29 40.74 0.37 12.99	2.30 0.80 2.53 1.30 7.58 avg Std 2.79 0.55 0.02 0.35
MP9 Task	FAST HARRIS ORB SHITOMASI SIFT  Keypoints of Detector AKAZE BRISK FAST HARRIS ORB	24.38 17.60 44.78 16.05 104.52 detection a 0 86.70 41.98 0.44 13.98 7.73	17.48 20.02 42.71 19.53 78.03 avg. time i 77.58 41.20 0.37 12.57 7.59	18.56 19.53 45.10 21.72 76.43 n ms for tl 2 79.10 40.96 0.37 12.93 7.36	23.31 18.37 46.09 19.28 79.60 ne all desc 3 77.54 40.53 0.35 12.83 7.28	22.80 19.13 43.96 18.33 83.87 riptor extr 4 76.87 40.55 0.37 12.90 7.34	20.98 18.84 45.09 19.04 79.33 eactors 5 77.74 40.96 0.37 12.94 7.23	23.67 17.46 48.21 19.58 77.31 6 76.72 40.69 0.37 12.87 7.25	22.83 19.88 49.19 18.73 77.84 7 78.13 39.63 0.37 13.23 7.24	18.39 19.40 50.07 20.21 82.96 8 76.36 40.52 0.37 12.72 7.64	23.49 18.64 50.96 19.19 77.25 <b>9</b> 76.16 40.32 0.37 12.88 7.30	21.59 18.89 46.62 19.17 81.71 36.38  Avg 78.29 40.74 0.37 12.99 7.40	2.30 0.80 2.53 1.30 7.58 avg Std 2.79 0.55 0.02 0.35 0.17
MP9 Task	FAST HARRIS ORB SHITOMASI SIFT  Keypoints of Detector AKAZE BRISK FAST HARRIS	24.38 17.60 44.78 16.05 104.52 detection a 0 86.70 41.98 0.44 13.98	17.48 20.02 42.71 19.53 78.03  avg. time i  77.58 41.20 0.37 12.57	18.56 19.53 45.10 21.72 76.43 n ms for th 2 79.10 40.96 0.37 12.93	23.31 18.37 46.09 19.28 79.60 ne all desc 3 77.54 40.53 0.35 12.83	22.80 19.13 43.96 18.33 83.87  riptor extr  4 76.87 40.55 0.37 12.90	20.98 18.84 45.09 19.04 79.33 actors 5 77.74 40.96 0.37 12.94	23.67 17.46 48.21 19.58 77.31 <b>6</b> 76.72 40.69 0.37 12.87	22.83 19.88 49.19 18.73 77.84 <b>7</b> 78.13 39.63 0.37 13.23	18.39 19.40 50.07 20.21 82.96 <b>8</b> 76.36 40.52 0.37 12.72	23.49 18.64 50.96 19.19 77.25 <b>9</b> 76.16 40.32 0.37 12.88	21.59 18.89 46.62 19.17 81.71 36.38  Avg 78.29 40.74 0.37 12.99	2.30 0.80 2.53 1.30 7.58 avg Std 2.79 0.55 0.02 0.35

### TOP3 keypoint detection and descriptor extraction

Detector	Desc.	Percent.	Desc.Ext.	KeyP.Ext.	TotalTime	Visual An	alysis
AKAZE	BRISK	75.2%	2.25	78.29	80.54	Have a lot	of errors
SHITOMAS	BRIEF	78.6%	0.96	13.28	14.24	Have erro	rs
SHITOMAS	ORB	74.0%	1.07	13.28	14.35	Have som	e errors
AKAZE	FREAK	65.8%	41.42	78.29	119.71	Have som	e errors
AKAZE	AKAZE	79.4%	66.28	78.29	144.57	Good	
SHITOMAS	SIFT	89.3%	19.17	13.28	32.44	Good	
AKAZE	SIFT	86.0%	24.37	78.29	102.66	Good	

#### Summary:

The TOP3 keypoint detector and extractor pairs were provided accordingly to keypoints matching rate for all keypoint detectors and descriptor extractors combinations. The results also were provided by comparison of time utilized in keypoints and descriptors extraction. Finally, the TOP3 pairs also were suggested by involving visual analysis of pairs candidates.

The matching rate of the keypoints of two pairs of frames is the main quality criteria for the preceding vehicle detection and threshold 75% was considered a good choice. At the same time, we should take into account the time used for the keypoints detection and the descriptors extraction. Also, we should consider standard deviation of the number of detected keypoints which is stability criteria of a keypoint detector.

From the best combination matching rate and utilized time view of point Shi-Tomasi keypoint detector and SIFT descriptor extractor are best choice, where matching rate is 89.3% and the total time is 32.44 ms. The second one is AKAZE keypoint detector and SIFT descriptor extractor, where matching rate is 86.3% and the total time 102.66. Finally, the last one is the AKAZE-AKAZE pair.