Mid Term Project writeup

MP1-6: You can refer to the codes I submitted along with this write up.

MP.7 Performance Evaluation 1:

Count the number of keypoints on the preceding vehicle for all 10 images and take note of the distribution of their neighborhood size. Do this for all the detectors you have implemented.

The table below shows the keypoints detected inside the ROI (target vehicle) by each detector for 10 frames provided. As we can see from this table: **BRISK**, **AKAZE** and **FAST** are the best candidates when it comes to the number of keypoints are detected.

	HARRIS	FAST	BRISK	ORB	AKAZE	SIFT
frame 1	17	149	264	92	166	138
frame 2	14	152	282	102	157	132
frame 3	18	150	282	106	161	124
frame 4	21	155	277	113	151	137
frame 5	26	149	297	109	163	134
frame 6	43	149	279	125	164	140
frame 7	18	156	289	130	173	137
frame 8	31	150	272	129	175	148
frame 9	26	138	266	127	177	159
frame 10	34	143	254	128	179	137

MP.8 Performance Evaluation 2:

Count the number of matched keypoints for all 10 images using all possible combinations of detectors and descriptors. In the matching step, the BF approach is used with the descriptor distance ratio set to 0.8.

The table below show the average matched descriptor with each combination of detector and descriptors:

As we can see from the table, the best performers are: **BRISK+ORB, AKAZE+ORB, FAST+ORB** when it comes to the number of matching descriptors detected.

Detector / Descriptor	HARRIS	FAST	BRISK	ORB	AKAZE	SIFT
BRIEF	16	36	29	24	36	23
ORB	16.11	96	102	59	102	out of memory
FREAK	14	28	28	24	31	19
AKAZE	N/A	N/A	N/A	N/A	44	N/A
SIFT	18	41	35	41	40	33

MP.9 Performance Evaluation 3

Log the time it takes for keypoints detection and descriptor extraction

The table below summaries the average time it takes for detecting keypoints on the second image + matching descriptors with the previous one (within the ROI). Based on it, the best performers are: **FAST+BRIEF, FAST+ORB, ORB+BRIEF**.

Detector / Descriptor	HARRIS	FAST	BRISK	ORB	AKAZE	SIFT
BRIEF	23.7	1.83	437	8.4	120	165
ORB	23	2	454	13.6	131	out of memory
FREAK	113	54.6	489	107	164	355
AKAZE	N/A	N/A	N/A	N/A	213	N/A
SIFT	52	27.9	480	72.7	153	224

Conclusion: Based on the 3 metrics, the best 3 configurations that I would pick are:

- FAST + ORB
- FAST +BRIEF
- ORB+BRIEF

I prefer the combination that can run fast and have a good amount of matching descriptor. The execution time is very important because we want to use it to calculate the TCC, a feature that need to run as fast as it can. Beside that, the combination that provide more matching can also good to make sure we calculate the changes between frames accurately.