



CE4 Subset2.2: Results for up-sampling large size quantization matrices based on JCTVC-G152

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JCTVC-G152

- Support 4x4, 8x8, 16x4, 4x16, 16x16, 32x8, 8x32, 32x32 matrices in HEVC.
 - Explicit signaling (encoding) of 4x4 and 8x8 quantization matrices
 - Derivation of 16x4, 4x16, 32x8 and 8x32 matrices from 4x4 and 8x8 quantization matrices (adopted)
 - Derivation of 16x16 and 32x32 matrices from 8x8 quantization matrices (CE4 subset 2)
- Related in SPS, PPS and APS

CE4 Subset 2.2

- Derivation of 16x16 and 32x32 quantization matrices by linear interpolation.

6	10	13	16	18	23	25	27
10	11	16	18	23	25	27	29
13	16	18	23	25	27	29	31
16	18	23	25	27	29	31	33
18	23	25	27	29	31	33	36
23	25	27	29	31	33	36	38
25	27	29	31	33	36	38	40
27	29	31	33	36	38	40	42



6	8	10	12	13	15	16	17	18	21	23	24	25	26	27	27
8	10	11	13	15	16	17	19	21	23	24	25	26	27	28	28
10	11	11	14	16	17	18	21	23	24	25	26	27	28	29	29
12	13	14	16	17	19	21	23	24	25	26	27	28	29	30	30
13	15	16	17	18	21	23	24	25	26	27	28	29	30	31	31
15	16	17	19	21	23	24	25	26	27	28	29	30	31	32	32
16	17	18	21	23	24	25	26	27	28	29	30	31	32	33	33
17	19	21	23	24	25	26	27	28	29	30	31	32	34	35	35
18	21	23	24	25	26	27	28	29	30	31	32	33	35	36	36
21	23	24	25	26	27	28	29	30	31	32	34	35	36	37	37
23	24	25	26	27	28	29	30	31	32	33	35	36	37	38	38
24	25	26	27	28	29	30	31	32	34	35	36	37	38	39	39
25	26	27	28	29	30	31	32	33	35	36	37	38	39	40	40
26	27	28	29	30	31	32	34	35	36	37	38	39	40	41	41
27	28	29	30	31	32	33	35	36	37	38	39	40	41	42	42
27	28	29	30	31	32	33	35	36	37	38	39	40	41	42	42

Example: Generate16X16 from 8x8

Result (1)

	symmetry						asymmetry					
	1	2	3	4	5	6	1	2	3	4	5	6
Header Bit	1	1	1	1	1	1	1	1	1	1	1	1
Matrix [0][0] Bit	79	59	97	91	79	97	89	65	101	117	89	101
Matrix [0][1] Bit	79	59	97	91	79	97	89	65	101	117	89	101
Matrix [0][2] Bit	79	59	97	91	79	97	89	65	101	117	89	101
Matrix [0][3] Bit	81	45	91	89	81	91	107	55	105	135	107	105
Matrix [0][4] Bit	81	45	91	89	81	91	107	55	105	135	107	105
Matrix [0][5] Bit	81	45	91	89	81	91	107	55	105	135	107	105
Matrix [1][0] Bit	335	261	427	385	261	335	381	281	473	621	281	381
Matrix [1][1] Bit	2	2	2	2	2	2	2	2	2	2	2	2
Matrix [1][2] Bit	335	261	427	385	261	335	381	281	473	621	281	381
Matrix [1][3] Bit	291	141	385	413	141	291	349	177	431	571	177	349
Matrix [1][4] Bit	291	141	385	413	141	291	349	177	431	571	177	349
Matrix [1][5] Bit	291	141	385	413	141	291	349	177	431	571	177	349
Matrix [2][0] Bit	0	0	0	0	0	0	0	0	0	0	0	0
Matrix [2][1] Bit	0	0	0	0	0	0	0	0	0	0	0	0
Matrix [2][2] Bit	0	0	0	0	0	0	0	0	0	0	0	0
Matrix [2][3] Bit	0	0	0	0	0	0	0	0	0	0	0	0
Matrix [2][4] Bit	0	0	0	0	0	0	0	0	0	0	0	0
Matrix [2][5] Bit	0	0	0	0	0	0	0	0	0	0	0	0
Matrix [3][0] Bit	0	0	0	0	0	0	0	0	0	0	0	0
Matrix [3][1] Bit	0	0	0	0	0	0	0	0	0	0	0	0
Total Bit	2026	1260	2576	2552	1428	2110	2400	1456	2860	3714	1684	2430
MaxError	19	14	66	37	62	103	10	11	86	129	55	134
AvgError	1.998031	3.453248	19.981545	4.866142	18.825787	33.987451	2.18873	2.782726	17.217766	15.425443	15.570866	28.31939

Results (2)

	Random Access HE			Random Access LC			Random Access HE-10		
	Y	U	V	Y	U	V	Y	U	V
Class A (8bit)	-4.7%	-4.0%	-4.3%	-4.5%	-4.6%	-4.5%	-5.7%	-7.6%	-8.1%
Class B	-12.0%	-10.9%	-10.4%	-11.8%	-10.6%	-10.3%	-12.1%	-11.0%	-10.5%
Class C	-22.8%	-21.5%	-21.3%	-22.8%	-21.4%	-21.4%			
Class D	-42.6%	-40.6%	-40.9%	-43.0%	-41.5%	-41.6%			
Class E									
Overall	-22.1%	-20.7%	-20.6%	-22.1%	-20.9%	-20.8%	-9.2%	-9.5%	-9.4%
	-22.1%	-20.8%	-20.7%	-22.1%	-21.0%	-20.9%	-9.4%	-9.5%	-9.5%
Class F	-21.6%	-20.4%	-20.5%	-21.4%	-20.1%	-20.3%			
Enc Time[%]		100%			100%			100%	
Dec Time[%]		100%			100%			101%	

	All Intra HE		
	Y	U	V
Class A (8bit)	-0.3%	-1.1%	-1.3%
Class B	-1.6%	-1.7%	-1.7%
Class C	-4.1%	-3.8%	-3.9%
Class D	-10.7%	-9.9%	-10.1%
Class E	-5.0%	-4.8%	-4.9%
Overall	-4.6%	-4.5%	-4.5%
	-4.6%	-4.5%	-4.6%
Class F	-3.4%	-3.2%	-3.2%
Enc Time[%]		100%	
Dec Time[%]		100%	

	Low delay B HE		
	Y	U	V
Class A			
Class B	-12.7%	-11.4%	-11.0%
Class C	-22.6%	-21.0%	-21.2%
Class D	-41.9%	-40.0%	-39.9%
Class E	-46.2%	-43.4%	-43.5%
Overall	-28.8%	-26.9%	-26.9%
	-28.8%	-27.0%	-27.0%
Class F	-30.5%	-29.2%	-29.3%
Enc Time[%]		100%	
Dec Time[%]		100%	

Harmonization with HVS Quant. Matrices

- Generate 8x8 default basis HVS quantization matrices by sub-sampling current default 16x16,32x32 quantization matrices.
- Derivation of default 16x16 and 32x32 quantization matrices by linear interpolation of the basis matrices.

8x8 Intra basis matrix

16	16	16	16	17	18	21	26
16	16	16	17	18	21	26	28
16	16	17	18	21	26	28	31
16	17	18	21	26	28	31	39
17	18	21	26	28	31	39	51
18	21	26	28	31	39	51	70
21	26	28	31	39	51	70	97
26	28	31	39	51	70	97	130

8x8 Inter basis matrix

16	16	16	16	17	18	21	26
16	16	16	17	18	21	26	28
16	16	17	18	21	26	28	30
16	17	18	21	26	28	30	36
17	18	21	26	28	30	36	45
18	21	26	28	30	36	45	59
21	26	28	30	36	45	59	79
26	28	30	36	45	59	79	103

Conclusion

- Results for deriving 16x16 and 32x32 quantization matrices from 8x8 quantization matrices are reported.
- Results show significant BD-rate reductions (gain) by skipping explicit signaling of 16x16 and 32x32 quantization matrices.
- Recommend to include derivation of large size (32x32, 16x16) quantization matrices from 8x8 quantization matrices in HM.

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