AHG8: Use of inter RDPCM for blocks using intra block copy mode

JCTVC-D0170

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Introduction

- Inter RDPCM was adopted in the last meeting

- Mismatch between text specification and software

  - Text specification: inter RDPCM is applied to inter blocks
  - Software: inter RDPCM is applied to inter blocks as well as intra block copy

- Proposal
  - Change text specification to align with software

Results: (lossy All-Intra configuration)

- Turn off inter RDPCM for intra BC blocks

	All Intra HE Main-tier			All Intra HE High-tier			All Intra HE Super-High-tier		
	Y	U	V	Y	U	V	Y	U	V
Class F	0.4%	0.4%	0.5%	0.4%	0.4%	0.4%	0.3%	0.4%	0.3%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SC RGB 444	1.2%	1.2%	1.2%	1.4%	1.4%	1.3%	1.4%	1.3%	1.3%
Animation RGB 444	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SC YUV 444	1.0%	0.9%	1.0%	0.9%	0.9%	0.9%	1.0%	0.9%	0.9%
Animation YUV 444	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RangeExt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SC(444) GBR Optional	4.8%	4.9%	5.3%	5.7%	6.2%	6.7%	6.3%	6.1%	6.5%
SC(444) YUV Optional	2.9%	2.6%	2.6%	3.1%	2.9%	2.9%	3.3%	3.2%	3.3%
Enc Time[%]	97%			97%			98%		
Dec Time[%]	101%			103%			103%		

Results: (lossy RA and LB configuration)

- Turn off inter RDPCM for intra BC blocks

	Random Access HE Main-tier			Random Access HE High-tier		
	Y	U	V	Y	U	V
Class F	0.2%	0.2%	0.3%	0.1%	0.2%	0.2%
Class B	0.0%	0.1%	0.1%	0.0%	0.0%	0.1%
SC RGB 444	0.8%	0.8%	0.8%	0.9%	0.9%	0.9%
Animation RGB 444	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SC YUV 444	0.4%	0.5%	0.7%	0.5%	0.4%	0.5%
Animation YUV 444	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
RangeExt	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
SC(444) GBR Optional	3.7%	4.0%	4.3%	4.5%	4.9%	5.3%
SC(444) YUV Optional	1.6%	1.5%	1.4%	1.9%	2.0%	1.9%
Enc Time[%]	105%			104%		
Dec Time[%]	104%			104%		

	Low delay B HE Main-tier			Low delay B HE High-tier		
	Y	U	V	Y	U	V
Class F	0.2%	-0.5%	-0.2%	0.2%	-0.2%	-0.1%
Class B	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%
SC RGB 444	0.8%	0.7%	0.8%	0.5%	0.5%	0.5%
Animation RGB 444	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
SC YUV 444	0.1%	0.2%	0.2%	0.1%	0.2%	0.2%
Animation YUV 444	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
RangeExt	0.1%	0.0%	0.0%	0.0%	0.0%	-0.1%
SC(444) GBR Optional	2.4%	2.3%	2.5%	2.8%	2.8%	2.8%
SC(444) YUV Optional	0.2%	0.2%	0.3%	0.6%	0.7%	0.8%
Enc Time[%]	102%			102%		
Dec Time[%]	106%			105%		

Results (Lossless - Intra)

	AI Main								Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
	compression ratio (Total)		compression ratio (Average)		compression ratio (min)		compression ratio (max)					
	Ref.	Tested	Ref.	Tested	Ref.	Tested	Ref.	Tested				
Class F	4.57	4.55	5.57	5.54	2.27	2.26	11.14	11.09	-0.5%	-0.6%	-1.5%	-0.1%
Class B	2.24	2.24	2.26	2.26	2.08	2.08	2.44	2.44	0.0%	0.0%	0.0%	0.0%
SC RGB 444	7.88	7.77	9.5	9.33	5.23	5.20	14.73	14.39	-1.4%	-1.8%	-3.6%	-0.5%
Animation RGB 444	2.48	2.48	2.5	2.51	2.15	2.15	3.05	3.05	-0.1%	-0.1%	-0.2%	-0.1%
SC YUV 444	11.09	10.97	13.2	13.04	7.87	7.84	19.32	19.02	-1.1%	-1.3%	-2.4%	-0.3%
Animation YUV 444	3.00	3.00	3.2	3.16	2.57	2.56	3.93	3.93	0.0%	0.0%	-0.1%	0.0%
RangeExt	1.92	1.92	2.38	2.38	1.46	1.46	4.37	4.37	0.0%	0.0%	0.0%	0.0%
SC GBR 444 Optional	20.30	19.59	24.82	23.80	9.69	9.44	36.10	34.72	-3.6%	-4.0%	-5.2%	-2.7%
SC YUV 444 Optional	31.85	30.64	34.39	32.90	22.30	21.90	51.97	49.21	-3.9%	-4.1%	-5.6%	-1.8%
Enc Time[%]			100%									
Dec Time[%]			98%									

Results (Lossless – RA and LB configuration)

	RA Main								Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
	compression ratio (Total)		compression ratio (Average)		compression ratio (min)		compression ratio (max)					
	Ref.	Tested	Ref.	Tested	Ref.	Tested	Ref.	Tested				
Class F	8.66	8.65	36.22	35.96	3.01	3.01	90.48	89.46	-0.1%	-0.3%	-1.1%	0.0%
Class B	2.60	2.60	2.60	2.60	2.57	2.57	2.64	2.64	0.0%	0.0%	0.0%	0.0%
SC RGB 444	53.71	53.40	117.01	115.01	19.48	19.43	225.68	221.06	-0.6%	-1.2%	-2.3%	-0.3%
Animation RGB 444	3.58	3.58	3.60	3.59	3.43	3.43	3.70	3.70	0.0%	0.0%	0.0%	0.0%
SC YUV 444	73.79	73.40	157.08	155.08	24.42	24.36	287.13	282.65	-0.5%	-1.0%	-1.9%	-0.2%
Animation YUV 444	3.8	3.84	4.48	4.48	2.75	2.75	5.70	5.70	0.0%	0.0%	0.0%	0.0%
RangeExt	2.1	2.1	2.5	2.5	1.5	1.53	4.41	4.41	0.0%	0.0%	0.0%	0.0%
SC GBR 444 Optional	42.0	41.1	254.1	243.2	11.5	11.25	395.52	377.24	-2.0%	-3.6%	-4.8%	-1.8%
SC YUV 444 Optional	101.1	99.3	314.9	301.3	30.5	30.08	531.53	502.34	-1.8%	-3.4%	-5.8%	-1.3%
Enc Time[%]	102%											
Dec Time[%]	102%											

	LB Main								Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
	compression ratio (Total)		compression ratio (Average)		compression ratio (min)		compression ratio (max)					
	Ref.	Tested	Ref.	Tested	Ref.	Tested	Ref.	Tested				
Class F	8.9	8.9	57.8	57.6	3.0	3.0	169.5	168.8	0.0%	-0.1%	-0.4%	0.0%
Class B	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	0.0%	0.0%	0.0%	0.0%
SC RGB 444	62.2	62.0	355.6	348.9	20.5	20.5	1618.0	1581.3	-0.4%	-1.0%	-2.3%	-0.1%
Animation RGB 444	3.6	3.6	3.6	3.6	3.4	3.4	3.7	3.7	0.0%	0.0%	0.0%	0.0%
SC YUV 444	85.1	84.9	469.0	463.0	25.7	25.6	2105.0	2073.6	-0.3%	-0.7%	-1.5%	-0.1%
Animation YUV 444	4	3.9	4.5	4.5	2.8	2.8	5.8	5.8	0.0%	0.0%	0.0%	0.0%
RangeExt	2.1	2.1	2.5	2.5	1.5	1.5	4.4	4.4	0.0%	0.0%	0.0%	0.0%
SC GBR 444 Optional	45	44.3	1010.8	977.3	11.6	11.4	2253.7	2187.1	-1.7%	-3.1%	-4.6%	-1.7%
SC YUV 444 Optional	117.1	115.3	1139.4	1058.3	31.0	30.7	2208.6	2022.4	-1.5%	-5.1%	-9.2%	-1.2%
Enc Time[%]	99%											
Dec Time[%]	100%											

residual_dpcm_inter_enabled_flag

- Currently in software application of inter RDPCM to intra BC blocks is controlled by residual_dpcm_intra_enabled_flag
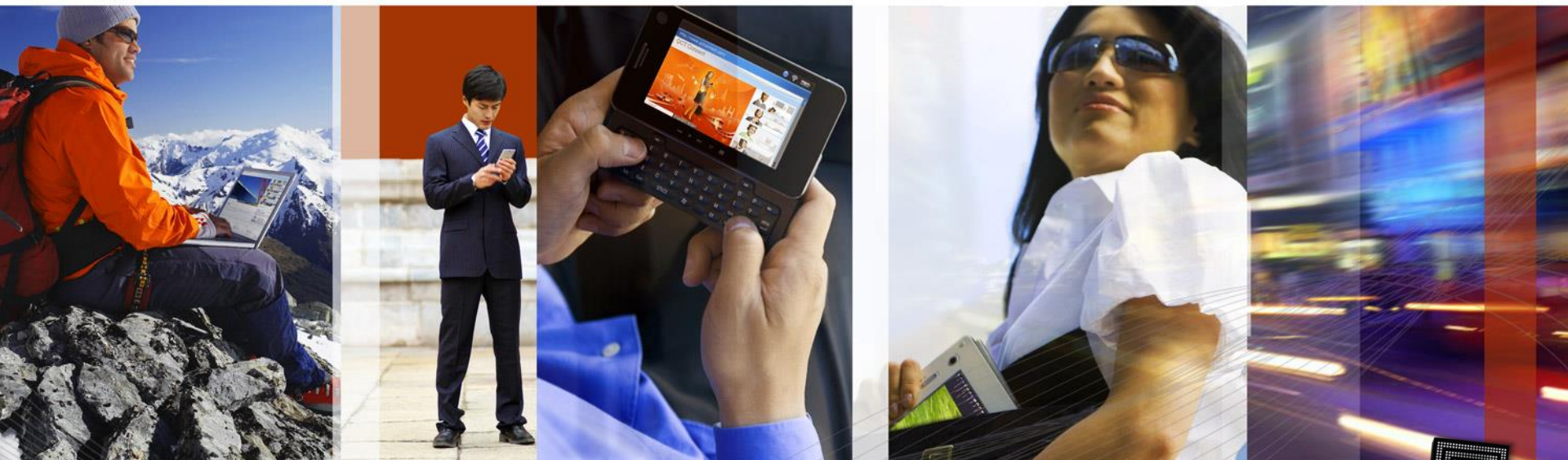
- Proposal:

  It should be made dependent on residual_dpcm_intra_enabled_flag

- Change the name to residual_dpcm_explicit_enabled_flag as proposed in JCTVC-O0185.

Conclusions

- Mismatch between text specification and software

  - Text specification: inter RDPCM is applied to inter blocks
  - Software: inter RDPCM is applied to inter blocks as well as intra block copy

- Recommendation

  - Change text specification to align with software
  - Application of inter RDPCM to intra BC blocks should be made dependent on residual_dpcm_intra_enabled_flag

- JCTVC-O0185 also proposes ths.

Qualcomm
CDMA Technologies

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