

Non-CE3: Contexts in Chroma transform skip residual coding (JVET-Q0144)

Y. Kato, K. Abe, T. Toma
Panasonic Corporation

Introduction

In current TSRC syntax, same context of coefficient flag is used between Luma and Chroma, whereas different contexts are used between Luma and Chroma in RRC syntax.

Table 1: Number of contexts in RRC and TSRC

	RRC		TSRC
	Luma	Chroma	Luma/Chroma
coded_sub_block_flag	2	2	3
sig_coeff_flag	36	24	3
coeff_sign_flag			6
abs_level_gt1_flag	21	11	4
parity_flag	21	11	1
abs_level_gt3_flag	21	11	1
abs_level_gt5_flag			1
abs_level_gt7_flag			1
abs_level_gt9_flag			1

Proposal

Propose to add independent contexts in chroma TSRC in all coefficient flags to improve coding gain for lossless coding.

Derivation process for ctxInc of contexts is completely the same as Luma TSRC.

Table 2: Number of contexts in RRC and proposed TSRC

	RRC		TSRC	
	Luma	Chroma	Luma	Chroma
coded_sub_block_flag	2	2	3	3
sig_coeff_flag	36	24	3	3
coeff_sign_flag			6	6
abs_level_gt1_flag	21	11	4	4
parity_flag	21	11	1	1
abs_level_gt3_flag	21	11	1	1
abs_level_gt5_flag			1	1
abs_level_gt7_flag			1	1
abs_level_gt9_flag			1	1

Simulation results

Lossless

	All Intra			Random Access			Low delay B		
	ratio		bit-rate savings	ratio		bit-rate savings	ratio		bit-rate savings
	VTM7.0	proposal		VTM7.0	proposal		VTM7.0	proposal	
Class A1	2.2	2.2	-0.28%	2.2	2.3	-0.79%			
Class A2	1.6	1.6	-0.05%	1.7	1.7	-0.24%			
Class B	2.2	2.2	-0.19%	2.3	2.4	-0.59%	2.3	2.4	-0.60%
Class C	1.9	1.9	-0.22%	2.4	2.5	-0.91%	2.4	2.4	-0.96%
Class D	1.9	1.9	-0.23%	2.8	2.8	-0.85%	2.7	2.8	-0.92%
Class E	2.8	2.8	-0.41%				3.1	3.2	-1.44%
Class F	5.3	5.3	-0.17%	33.7	33.9	-0.43%	50.7	50.9	-0.45%
TGM	11.8	11.9	-0.36%	107.1	107.6	-0.55%	124.9	125.4	-0.52%
Overall	2.1	2.1	-0.23%	2.2	2.2	-0.65%	2.6	2.6	-0.93%
Enc Time[%]	100%			96%			91%		
Dec Time[%]	108%			102%			99%		

Especially for RA and LB, coding gain is remarkable.

Overall gain: -0.23% AI -0.65% RA LB -0.93%

Simulation results

■ CTC

	All Intra Main10				
	Over VTM-7.0				
	Y	U	V	EncT	DecT
Class A1	-0.01%	-0.04%	0.03%	100%	99%
Class A2	-0.01%	0.01%	-0.04%	100%	99%
Class B	0.00%	-0.03%	-0.02%	100%	100%
Class C	0.01%	0.00%	0.05%	100%	99%
Class E	0.00%	0.00%	0.00%	101%	99%
Overall	0.00%	-0.01%	0.00%	100%	99%
Class D	0.00%	0.07%	0.03%	100%	99%
Class F	0.00%	0.02%	-0.01%	100%	100%
TGM	-0.11%	-0.35%	-0.35%	100%	100%

	Random Access Main 10						Low delay B Main10				
	Over VTM-7.0						Over VTM-7.0				
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1	0.00%	-0.06%	0.08%	101%	99%	Class A1					
Class A2	-0.03%	0.03%	0.06%	99%	98%	Class A2					
Class B	-0.01%	0.03%	-0.10%	101%	99%	Class B	-0.03%	-0.20%	-0.16%	99%	98%
Class C	0.02%	0.08%	0.00%	100%	100%	Class C	0.00%	-0.21%	-0.04%	104%	98%
Class E						Class E	0.04%	0.09%	-0.11%	100%	96%
Overall	0.00%	0.02%	0.00%	100%	99%	Overall	0.00%	-0.13%	-0.11%	101%	97%
Class D	-0.03%	-0.22%	-0.16%	100%	100%	Class D	-0.03%	-0.15%	-0.51%	104%	101%
Class F	0.01%	0.02%	-0.06%	101%	100%	Class F	0.00%	-0.13%	0.77%	100%	98%
TGM	-0.08%	-0.32%	-0.33%	100%	99%	TGM	-0.03%	-0.20%	-0.16%	99%	98%

Simulation results

LowQP

	All Intra Main10				
	Over VTM-7.0(100Frm,4K,LowQP)				
	Y	U	V	EncT	DecT
Class A1	-0.01%	0.00%	-0.03%	102%	100%
Class A2	0.00%	-0.01%	-0.01%	102%	100%
Class B	-0.01%	0.01%	0.00%	100%	101%
Class C	-0.01%	-0.02%	-0.02%	110%	112%
Class E	-0.07%	0.01%	0.05%	106%	105%
Overall	-0.02%	0.00%	0.00%	104%	104%
Class D	-0.02%	0.02%	-0.02%	92%	90%
Class F	-0.09%	-0.14%	-0.12%	105%	106%
TGM	-0.28%	-0.45%	-0.44%	100%	100%

	Random Access Main 10						Low delay B Main10				
	Over VTM-7.0(100Frm,4K,LowQP)						Over VTM-7.0(100Frm,4K,LowQP)				
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1	-0.01%	-0.03%	-0.01%	100%	99%	Class A1					
Class A2	0.00%	0.00%	0.00%	100%	99%	Class A2					
Class B	0.00%	-0.02%	-0.05%	97%	95%	Class B	0.01%	-0.03%	-0.03%	98%	100%
Class C	0.00%	-0.09%	-0.11%	102%	101%	Class C	0.00%	-0.03%	-0.05%	94%	90%
Class E						Class E	-0.03%	0.03%	0.05%	96%	94%
Overall	0.00%	-0.03%	-0.05%	100%	98%	Overall	-0.01%	-0.02%	-0.02%	96%	95%
Class D	0.01%	-0.01%	-0.16%	98%	97%	Class D	0.00%	0.01%	-0.06%	111%	108%
Class F	-0.05%	-0.07%	0.02%	98%	97%	Class F	-0.05%	-0.10%	-0.18%	94%	95%
TGM	0.06%	-0.30%	-0.32%	103%	104%	TGM	-0.20%	-0.43%	-0.41%	112%	108%

Conclusion

- **Adding independent contexts for Chroma TSRC leads to the coding gain in Lossless coding**

→ Propose to adopt our proposal

**Thank Kwai for cross checking!
(JVET-Q0646)**