

JVET-Y0118: AHG10: On Temporal-Layer-Based ChromaQP Coding

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Introduction

- With the hierarchical B-pict structure employed in RA CTC condition, the image quality of the lower temporal layers will affect the image quality of the higher temporal layers.
 - Coding efficiency improvement can be realized to enhance image quality of the lower temporal layers by for example spending more bits.
 - Computational cost reduction can be realized to apply coding tools just to lower temporal layers.
- JVET-X0063 [2] proposed a temporal-layer-based deblocking parameter setting as a non-normative change.
- JVET-X0144 [3] proposed a temporal-layer-based partitioning information setting as a non-normative change.
- **This contribution proposes a temporal-layer-based chroma qp setting as a non-normative change both for VTM and ECM.**

Proposed Method

- ChromaQP is set as shown in the following table both with the anchor and tested.

tid	l slice	0	1	2	3	4	5
anchor	0	0	0	0	0	0	0
tested	0	-1	-1	0	0	1	1

Test1: On ECM3.1 and VTM15,0 Simulation Condition

- Simulation is conducted based on the RA condition as specified in CTC. ChromaQP is set as shown in Table in PPT#4 both with the anchor and tested.
- Both ECM3.1 and VTM-15.0 are tested.
- Thank Tencent for Crosschecking!

Test1: On ECM3.1 and VTM15,0
Simulation Result [1/]

	Random access Main10				
	Over ECM3.1				
	Y	U	V	EncT	DecT
Class A1	-1.01%	0.95%	-1.05%	119%	123%
Class A2	0.06%	-2.23%	-1.66%	118%	120%
Class B	0.08%	-2.28%	-1.73%	115%	117%
Class C	0.08%	-1.33%	-0.89%	113%	112%
Class E					
Overall	-0.14%	-1.37%	-1.36%	116%	117%
Class D	0.19%	-1.96%	-0.96%	116%	111%
Class F	0.06%	-0.35%	-0.20%	236%	245%

(*) EncT/DecT are not accurate.

Test1: On ECM3.1 and VTM15,0

Simulation Result [2/]

	Random access Main10				
	Over VTM-15.0				
	Y	U	V	EncT	DecT
Class A1	-1.17%	0.95%	-0.79%	99%	106%
Class A2	0.02%	-2.33%	-1.74%	100%	107%
Class B	0.06%	-2.40%	-1.88%	98%	103%
Class C	0.02%	-1.34%	-0.77%	96%	96%
Class E					
Overall	-0.21%	-1.43%	-1.34%	98%	103%
Class D	0.09%	-1.90%	-1.10%	96%	94%
Class F	0.01%	-0.28%	-0.19%	198%	204%

(*) EncT/DecT are not accurate.

Test2: On JVET-Y0126

Simulation Condition

- The proposed method is tested on top of JVET-Y0126 (basis: VTM14.2).
- Both RA and LDB conditions are tested.
- For LDB CbQpOffset and CrQpOffset are set as follows:
- Thank Qualcomm for crosschecking!

	Type	POC	<u>CbQpoffset</u>	<u>CrQpoffset</u>
Frame1:	B	1	1	1
Frame2:	B	2	0	0
Frame3:	B	3	1	1
Frame4:	B	4	0	0
Frame5:	B	5	1	1
Frame6:	B	6	0	0
Frame7:	B	7	1	1
Frame8:	B	8	-1	-1

Test2: On JVET-Y0126
Simulation Result [1/]

	Random Access Main 10				
	Over JVET-Y0126				
	Y	U	V	EncT	DecT
Class A1	-1.16%	0.94%	-0.73%	▲ #DIV/0!	▲ #DIV/0!
Class A2	0.15%	-2.26%	-1.72%	▲ #DIV/0!	▲ #DIV/0!
Class B	0.07%	-2.12%	-1.57%	101%	98%
Class C	0.02%	-1.12%	-0.76%	103%	107%
Class E					
Overall	-0.17%	-1.27%	-1.22%	▲ #DIV/0!	▲ #DIV/0!
Class D	0.17%	-1.44%	-0.87%	103%	112%
Class F	-0.02%	-0.18%	0.10%	104%	106%
Class TGM	▲ #VALUE!	▲ #VALUE!	▲ #VALUE!	▲ #NUM!	▲ #NUM!

Test2: On JVET-Y0126
Simulation Result [2/]

	Low delay B Main10				
	Over JVET-Y0126				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	#VALUE!	#VALUE!	#VALUE!	#DIV/0!	#DIV/0!
Class C	0.53%	-8.61%	-8.17%	104%	109%
Class E	0.49%	-8.25%	-9.71%	103%	115%
Overall	#VALUE!	#VALUE!	#VALUE!	#DIV/0!	#DIV/0!
Class D	0.56%	-10.76%	-10.44%	100%	105%
Class F	#VALUE!	#VALUE!	#VALUE!	#NUM!	#NUM!
Class TGM	#VALUE!	#VALUE!	#VALUE!	#DIV/0!	#DIV/0!

Conclusion

- This contribution proposes a temporal-layer-based chroma qp setting as a non-normative change both for VTM and ECM.
- The simulation results show that the following gain is obtained for Y, Cb, Cr with RA test condition:
 - 0.14%, -1.37%, -1.36% over ECM3.1
 - 0.21%, -1.43%, -1.34% over VTM15.0
- Additionally, the proposed method is tested on top of JVET-Y0126 encoder optimization. RA and LDB conditions are tested. Gain over Y0126 (on top of VTM14.2) is as follows:
 - -0.17 %, -1.27 %, -1.22 % in RA condition
 - xx %, xx %, xx % in LD condition
- It is recommended to adopt the proposed method into ECM and VTM CTC.
- Also, it is recommended to study the efficient syntax structure and design of VPS and SPS based on temporal hierarchy not only for chroma qp offset but also for other parameters relating to such as deblocking filter and block partitioning information under AHG.
 - It is recommended that the study topic of this AHG will cover both ECM and NNVC in terms of
 - Coding efficiency
 - Computational cost
 - Subjective quality

References

- [1] “Common Test Conditions and evaluation procedures for enhanced compression tool testing” , JVET-X2017, Oct 2021
- [2] “AHG10: Deblocking filter setting for VTM” , JVET-X0063, Oct 2021
- [3] “EE2: Encoder partitioning optimization for ECM and crosscheck of EE2-1.1” , JVET-X0144, Oct 2021
- [4] “AHG10: VTM encoder configurations for tests targeting improved coding performance”

Thank you

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