

The MEDIATEK logo is displayed in white, uppercase letters within an orange parallelogram shape.

CE7-related: TB-level constraints on context-coded bins for coefficient coding

Tzu-Der Chuang, Shih-Ta Hsiang,
Zhi-Yi Lin, Ching-Yeh Chen, Yu-Wen Huang, Shaw-Min Lei

The bottom third of the slide features a solid orange background with a dense, white line-art pattern of various objects including a pot, a bowl of food, a laptop, a desk lamp, a lightbulb, a camera, a whisk, and other kitchen and office items.

Presented by Tzu-Der (Peter) Chuang
14th Meeting: Geneva, CH,
19–27 March 2019

Overall Summary

- The averaged maximum number of context-coded bins per 16 samples in VVC is increased by 28% compared with that in HEVC
- Propose to use a **transform block (TB) level constraint** instead of coefficient subblock-level constraint
 - Luma TB constraint value = $TB_area * 1.75$
 - Chroma TB constraint value = $TB_area * 1.25$
 - The averaged maximum number of context-coded bins per 16 samples is only increased by **1.3%**

	AI			RA			LB		
	Y	U	V	Y	U	V	Y	U	V
Proposed Method	0.03%	0.06%	0.06%	0.01%	-0.03%	0.03%	0.01%	0.13%	0.02%

Problem Definition

- In HEVC, for a 4x4 coefficient subblock, the maximum number of context-coded bins per 16 samples is 25
 - Including 16 significant flags, eight greater than 1 (gt1) flags, and one greater than 2 (gt2) flag
- In VVC-4.0, a constraint on the maximum number of context-coded bins is proposed
 - At most 32 context-coded bins can be used in a 4x4 coefficient subblock
 - At most 8 context-coded bins can be used in a 2x2 coefficient subblock
 - Still have **28%** more maximum number of context-coded bins than HEVC

Discussion in the Last Meeting

- In JVET-M0173, a coefficient subblock-level constraint is proposed to reduce the maximum number of context-coded bins to only increased by 1.3%. However, the BD-rate loss is too much.
- It was commented that limiting context coded bins at 4x4 coefficient subblock level is not desirable
- Imposing such a limit at a higher level may be better

Proposed Methods

- Propose to use a **transform block (TB) level constraint** instead of coefficient subblock-level constraint
 - Luma TB constraint value = $TB_area * 1.75$
 - Chroma TB constraint value = $TB_area * 1.25$
 - When subblock transform (SBT) is applied, the constraint value can be enlarged
 - The averaged maximum number of context-coded bins per 16 samples is only increased by **1.3%**
 - Only one context-coded-to-bypass-coded transition for pass-one in one TB

Averaged Maximum Number of Context-Coded Bins

Number of maximum context-coded bins per sub-block	4x4 luma sub-block	4x4 chroma sub-block	2x2 chroma sub-block	Maximum number of context-coded bins in one 64-sample luma block and two 16-sample chroma blocks	Averaged maximum number of context-coded bins per 16 samples
HEVC	25	25	N/A	$25*4 + 25*2 = 150$	25 (1.00x)
VVC-4.0	32	32	8	$32*4 + 8*8 = 192$	32 (1.28x)
Proposed	28	20	5	$28*4 + 5*8 = 152$	25.33 (1.013x)

Simulation Results

- Anchor: VTM-4.0
 - Test condition: CTC QP and low QP (2, 7, 12, 17)
- Proposed method
 - transform block (TB) level constraint
 - The averaged maximum number of context-coded bins per 16 samples is only increased by 1.3%

	AI			RA			LB		
	Y	U	V	Y	U	V	Y	U	V
CTC QP (22, 27, 32, 37)	0.03%	0.06%	0.06%	0.01%	-0.03%	0.03%	0.01%	0.13%	0.02%
Low QP (2, 7, 12, 17)	0.08%	0.01%	0.02%	0.14%	0.15%	0.16%	0.08%	0.19%	0.20%

Conclusions

- Propose to use a **transform block (TB) level constraint** instead of coefficient subblock-level constraint
 - Luma TB constraint value = $TB_area * 1.75$
 - Chroma TB constraint value = $TB_area * 1.25$
 - The averaged maximum number of context-coded bins per 16 samples is only increased by **1.3%**

	AI			RA			LB		
	Y	U	V	Y	U	V	Y	U	V
Proposed Method	0.03%	0.06%	0.06%	0.01%	-0.03%	0.03%	0.01%	0.13%	0.02%



everyday genius