

JCTVC-718:Context reduction for CABAC

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Qualcomm

Proposed changes

- Prediction type
 - HM4.0 : The binarization for P slice and the binarization for B slice are different.
 - **Proposal : P and B slices use the same binarization.**
- Asymmetric partition
 - HM4.0 : 2 context sets (2 contexts in each set, one for each bin) is used depending on the partition direction.
 - **Proposal : Removing the dependency on partition direction. Bypass mode is used for the last bin and one context is used for second last bin.**
- Inter prediction flag
 - HM4.0 : context index is equal to CU depth.
 - **Proposal : context index is equal to CU depth and capped at 2.**
- Reference frame index
 - HM4.0 : one context is share for all bins come after bin1.
 - **Proposal : one context is share for all bins come after bin0.**
- Chroma cbf
 - HM4.0 : one context set (5 contexts) for each of chroma cbf (cbf_cb, cbf_cr).
 - **Proposal : one shared context set (5 contexts) for chroma cbf (cbf_cb, cbf_cr).**

Proposed changes

- Coefficient level coding
 - HM4.0 :
 - `coeff_abs_level_greater1_flag`: 6 context set (5 contexts in each context set)
 - `coeff_abs_level_greater2_flag`: 6 context set (5 contexts in each context set)
 - Proposal:
 - `coeff_abs_level_greater1_flag`
 - If context set index is equal to 0 or 3, 5 contexts are used.
 - Otherwise, 2 contexts are used.
 - `coeff_abs_level_greater2_flag`
 - If context set index is greater than 2, 5 contexts are used.
 - Otherwise, 2 contexts are used.

Number of contexts

# of Contexts	HM4.0	Proposed method
pred_type	10	6
merge_idx	4	1
inter_pred_flag	4	3
ref_idx_lc, ref_idx_l0, ref_idx_l1	3	2
cbf_cb, cbf_cr	10	5
coeff_abs_level_greater1_flag	60	36
coeff_abs_level_greater2_flag	60	42
Total	151	95

Simulation results (individual)

	Low Delay P
pred_type	0.01%

	All Intra	Random Access	Low Delay
AMP		0.0%	0.0%
mrg_idx		0.0%	0.0%
inter_pred_flag		0.0%	0.0%
ref_idx		0.0%	0.0%
cbf_cb, cbf_cr	0.0%/0.2%/-0.7%	0.0%/0.3%/-1.3%	0.0%/0.4%/-0.9%
coeff level	0.0%	0.0%	0.0%

Simulation results (combined)

BD-rate	All Intra HE			Random access HE			Low delay B HE		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.00%	0.59%	-1.10%	0.00%	0.74%	-0.73%			
Class B	0.01%	0.58%	-1.06%	-0.04%	0.74%	-1.40%	-0.04%	1.17%	-1.86%
Class C	-0.01%	0.13%	-0.74%	-0.01%	0.03%	-0.79%	-0.10%	0.05%	-0.89%
Class D	0.00%	-0.19%	-0.55%	0.02%	-0.14%	-0.78%	-0.10%	-0.33%	-0.95%
Class E	0.01%	-0.43%	0.20%				-0.33%	0.75%	1.02%
All	0.00%	0.19%	-0.71%	-0.01%	0.37%	-0.95%	-0.12%	0.43%	-0.85%
Enc T[%]		99%			99%			98%	
Dec T[%]		100%			99%			100%	

Conclusions

- The proposal reduces 56 contexts with slight coding gain.
- Recommend the adoption of the proposed changes

Simulation results (individual)

	Low Delay P
pred_type	0.01%

	All Intra	Random Access	Low Delay
AMP		0.01%	0.00%
mrg_idx		0.03%	0.00%
inter_pred_flag		0.01%	-0.04%
ref_idx		0.00%	-0.03%
cbf_cb, cbf_cr	0.00%/0.21%/-0.70%	0.01%/0.30%/-1.31%	0.02%/0.36%/-0.87%
coeff level	0.01%	0.03%	0.03%