



JVET-00098: CE2.1.2: luma-chroma dependency reduction for LMCS

July, 2019

Dolby Laboratories

Summary of contribution

1. Test results for CE2-1.2

- SDR CTC
- HDR PQ

2. Proposed specification changes to support CE2-1.2

CE2-1 – Chroma residual scaling luma-chroma dependency reduction – Single-tree case			
Test #	Description	Tester	Cross-checker
CE2-1.2	Derivation of the scaling factor from the first (upper-left) sample value of the corresponding luma prediction	T. Lu (tlu@dolby.com) (Dolby)	C. Chevance (InterDitigal)

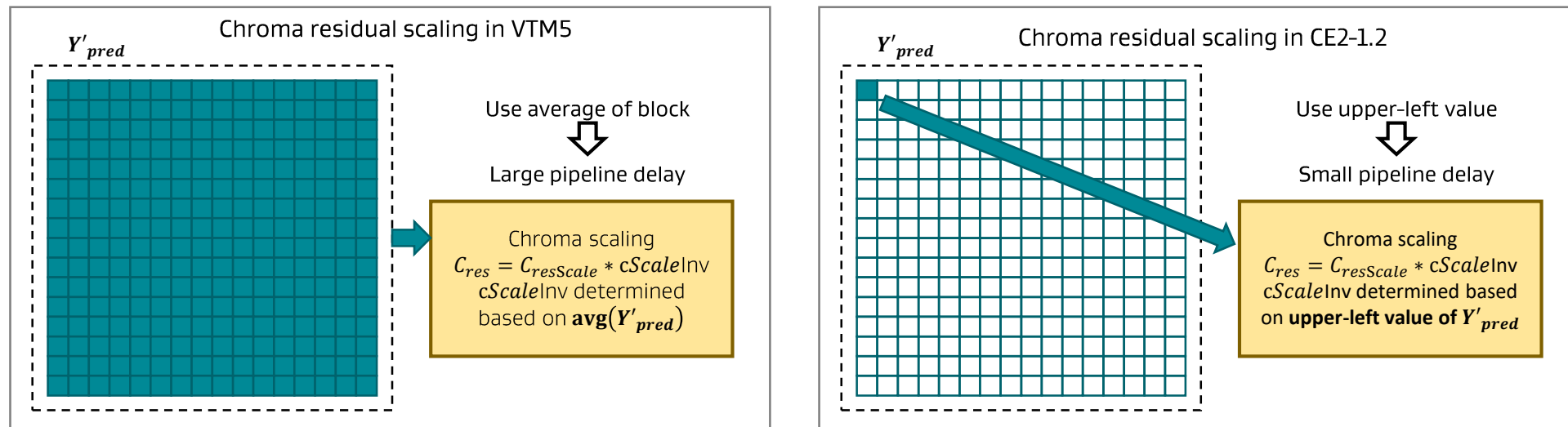
What problem are we trying to solve?

Objective

Minimize the pipeline delay for reconstructing chroma components

Proposed solution (CE2-1.2)

Use only the first co-located luma prediction value instead of the average value of the whole luma block to calculate the chroma residue scaling factor (*cScaleInv*)



Results

CE2-1.2 results on SDR over VTM5.0 SDR CTC Anchors

	Random access Main10			Low delay B Main10		
	Y	U	V	Y	U	V
Class A1	0.01%	-0.19%	-0.02%			
Class A2	-0.01%	-0.05%	-0.07%			
Class B	0.01%	-0.10%	-0.10%	0.02%	0.06%	-0.20%
Class C	-0.01%	-0.05%	-0.19%	0.01%	0.00%	0.21%
Class E				0.04%	0.12%	-0.08%
Overall	0.00%	-0.09%	-0.10%	0.02%	0.05%	-0.03%
Class D	0.00%	0.01%	0.17%	0.01%	-0.33%	0.99%
Class F	-0.01%	0.03%	-0.03%	0.05%	0.20%	0.08%

- All Intra results are identical to VTM5.0 (CRS is disabled in DualTree)
- Change in overall BD-rate is very small
- Enc/Dec time is similar to VTM5.0

CE2-1.2 results on HDR-PQ over VTM5.0 HDR LMCS1 (LQP0)

	Random Access: BD-rate				
	DE100	PSNRL100	wPsnrY	wPsnrU	wPsnrV
Average HDR-B	0.08%	0.00%	-0.01%	0.05%	0.27%

Specification Change

- In clause 8.7.5.3, replace equation 8-996:

$$\begin{aligned} \text{invAvgLuma} = & \text{Clip1}_Y((\sum_{k=0}^{\text{SubWidthC} * \text{nCurrSw}_{-1}} \sum_{l=0}^{\text{SubHeightC} * \text{nCurrSh}_{-1}} \text{PredMapSamples}[k][l] \\ & + \text{nCurrSw} * \text{nCurrSh} * ((\text{SubWidthC} * \text{SubHeightC}) / 2)) / \\ & (\text{nCurrSw} * \text{nCurrSh} * \text{SubWidthC} * \text{SubHeightC})) \end{aligned} \quad (8-996)$$

- with:

$$\text{invAvgLuma} = \text{Clip1}_Y(\text{predMapSamples}[0][0]) \quad (8-996)$$

Conclusion

- CE2-1.2 proposal can significantly reduce the pipeline latency of CRS
- Coding efficiency is preserved
- Specification change is minimal
- Recommended for adoption

Acknowledgement

- We would like to thank InterDigital for crosschecking the test results.



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