JCTVC-F252: Block-size and pixel position independent boundary smoothing for non-directional Intra prediction

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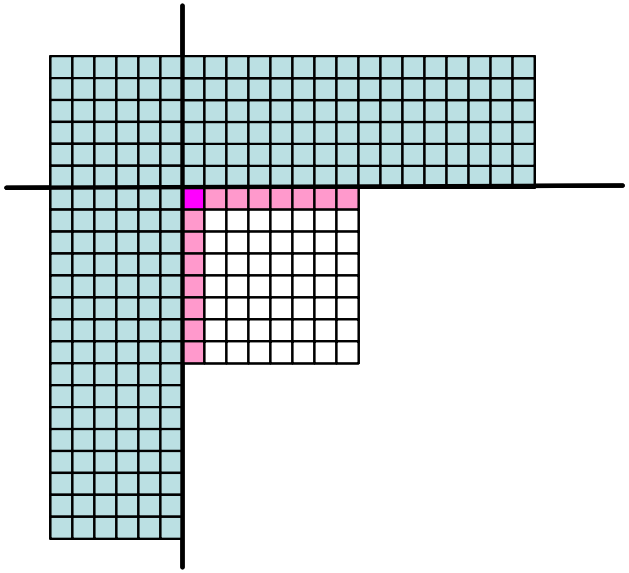
Motivation

- Boundary smoothing is applied in HM3.0 for non-directional prediction
- Pros
  - Overall gain from this tool is 0.1%
  - Was noticed that boundary smoothing is beneficial for block artifacts illumination
- Cons
  - Smoothing filter depends on PU size
  - Smoothing filter depends on pixel position

Proposed changes:



reference samples

samples to be filtered using 2 taps

samples to be filtered using 3 taps

samples to be filtered using 3 taps twice

Filter #A

1/8

7/8

Filter #B

2/8

6/8

Filter #C

3/8

5/8

Filter #A

1/8

1/8 6/8

Filter #B

2/8

2/8 4/8

Filter #C

3/8

3/8 2/8

Mult-free implementation: $y_{i,j} = (y_{i,j-1} + y_{i-1,j} + (y_{i,j} << 1) + 1) >> 1;$

WD text:

If nS is equal to 4, the prediction samples predSamples[x, y] are derived as

4 lines

Otherwise, if nS is equal to 8, the prediction samples predSamples[x, y] are derived as

4 lines

Otherwise, if nS is equal to 16, the prediction samples predSamples[x, y] are derived as

4 lines

predSamples[0, 0] = (p[-1, 0] + (DCVal <<1)+ p[0, -1] + 2) >> 2
predSamples[x, 0] = (p[x, -1] + (DCVal<<1)+ DCVal + 2) >> 2,
predSamples[0, y] = (p[-1, y] + (DCVal<<1)+ DCVal + 2) >> 2,
predSamples[x, y] = DCVal,

4 lines

Test results

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A	-0,2	-0,3	-0,2	-0,1	-0,2	-0,2
Class B	0,0	-0,1	-0,2	0,0	-0,1	-0,1
Class C	0,0	-0,1	0,0	0,0	0,0	0,0
Class D	0,0	0,0	0,0	0,0	0,0	0,0
Class E	0,0	-0,1	-0,1	0,0	-0,1	-0,1
Overall	**-0,04**	**-0,12**	**-0,12**	**-0,02**	**-0,09**	**-0,10**
Enc Time[%]	100%			100%		
Dec Time[%]	99%			100%		

Additional gain provided by unification is comparable with overall gain form this tool provides (0.1%).

We would like to thank Nokia for verification of this test results!
JCTV-F740

Conclusion

Based on presented test results

Avg. BD-rate: 0.0%/-0.1%/-0.1% (Y/U/V)

we propose to adopt proposed unification for boundary smoothing design.

Benefits:

- 46 lines of code → 4 lines
- removal of one LUT
- no condition check
- multiplication-free realization