MEDIATEK

JVET-P0160
CE5-related: Unification of deblocking processes for transform block and prediction block boundaries

Chia-Ming Tsai, Chih-Wei Hsu, Yu-Wen Huang, Shaw-Min Lei

Presenter: Chih-Wei Hsu

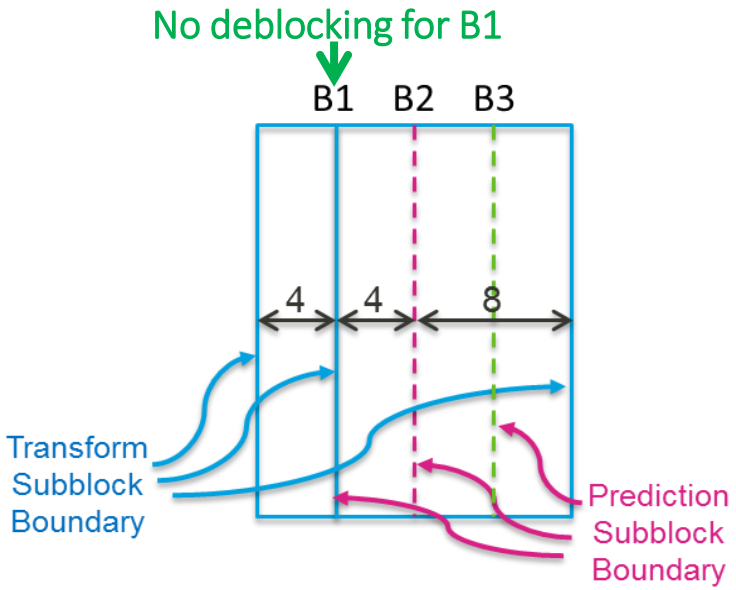
Overall Summary

- In current VVC, luma deblocking is only applied to 8x8 prediction subblock boundaries
  - 4x4 prediction subblock boundaries for affine mode are skipped
- Two methods are proposed to unify the luma deblocking filter processes for transform block (TB) and prediction block (PB) boundaries

Over VTM6.0		RA			LB			LP		
		Y	EncT	DecT	Y	EncT	DecT	Y	EncT	DecT
Under ALF-on	Method 1	-0.01%	100%	100%	-0.01%	100%	99%	0.03%	100%	99%
	Method 2	0.00%	100%	100%	0.00%	100%	99%	0.00%	100%	99%
Under ALF-off	Method 1	0.01%	99%	100%	-0.04%	99%	98%	-0.05%	99%	96%
	Method 2	0.00%	99%	100%	-0.01%	99%	98%	-0.01%	99%	96%

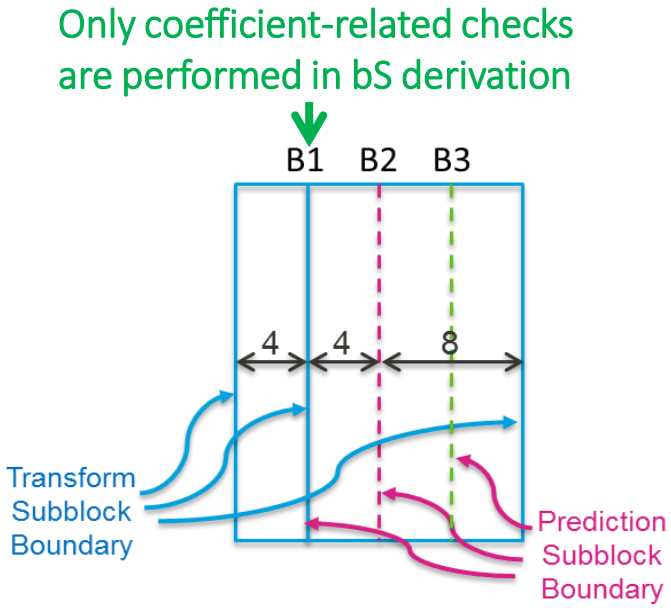
Method 1

- Deblocking grid basis for TB and PB boundaries is unified to 8x8 grid basis



Method 2

- When performing bS calculation, the motion-related checks are performed only for the edges coincided with 8x8 grids inside the CU
- The coefficient-related checks are kept unchanged



Detailed Results of Method 1

	Random Access Main 10									
	Over VTM6.0					Over VTM6.0 with ALF switch off				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class A1	0.01%	0.04%	0.04%	100%	100%	0.03%	0.06%	-0.03%	99%	100%
Class A2	0.01%	0.06%	0.05%	100%	101%	0.01%	0.06%	0.03%	99%	99%
Class B	-0.01%	0.03%	0.00%	100%	100%	0.01%	-0.02%	-0.04%	99%	99%
Class C	-0.02%	0.02%	0.01%	100%	100%	0.00%	0.00%	-0.06%	99%	103%
Overall	**-0.01%**	**0.03%**	**0.02%**	**100%**	**100%**	**0.01%**	**0.02%**	**-0.03%**	**99%**	**100%**
Class D	-0.02%	-0.06%	0.00%	100%	100%	-0.01%	0.03%	-0.07%	99%	102%
Class F	-0.01%	0.00%	-0.01%	100%	100%	0.00%	-0.03%	0.04%	99%	102%

	Low delay B Main10									
	Over VTM6.0					Over VTM6.0 with ALF switch off				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class B	0.00%	-0.02%	-0.03%	100%	99%	-0.02%	-0.08%	-0.23%	100%	100%
Class C	-0.03%	0.10%	0.05%	100%	100%	0.00%	0.06%	0.09%	99%	95%
Class E	-0.01%	0.42%	0.38%	100%	98%	-0.11%	-0.12%	0.01%	99%	98%
Overall	**-0.01%**	**0.13%**	**0.10%**	**100%**	**99%**	**-0.04%**	**-0.05%**	**-0.06%**	**99%**	**98%**
Class D	-0.04%	0.23%	0.21%	100%	99%	0.01%	0.27%	0.22%	100%	92%
Class F	0.07%	-0.11%	0.43%	100%	100%	0.02%	0.45%	0.07%	98%	97%

	Low delay B Main10									
	Over VTM6.0					Over VTM6.0 with ALF switch off				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class B	-0.01%	-0.13%	0.17%	100%	99%	-0.01%	-0.07%	0.27%	99%	99%
Class C	0.04%	0.18%	0.17%	100%	99%	-0.04%	-0.12%	0.11%	99%	93%
Class E	0.10%	0.13%	0.13%	100%	99%	-0.12%	-0.51%	-0.21%	99%	94%
Overall	**0.03%**	**0.04%**	**0.16%**	**100%**	**99%**	**-0.05%**	**-0.19%**	**0.10%**	**99%**	**96%**
Class D	0.08%	-0.22%	0.42%	100%	99%	0.00%	0.17%	0.09%	100%	95%
Class F	-0.14%	-0.16%	0.23%	100%	100%	-0.02%	0.09%	-0.25%	98%	94%

Detailed Results of Method 2

	Random Access Main 10									
	Over VTM6.0					Over VTM6.0 with ALF switch off				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class A1	0.00%	-0.01%	0.01%	100%	102%	0.00%	0.00%	0.00%	99%	101%
Class A2	0.00%	0.02%	0.02%	100%	101%	0.00%	-0.03%	-0.02%	99%	100%
Class B	0.00%	0.00%	-0.02%	100%	100%	0.00%	-0.01%	0.00%	99%	100%
Class C	0.00%	0.00%	0.00%	100%	100%	0.00%	0.00%	0.00%	99%	100%
Overall	**0.00%**	**0.00%**	**0.00%**	**100%**	**100%**	**0.00%**	**-0.01%**	**0.00%**	**99%**	**100%**
Class D	0.00%	0.00%	0.00%	100%	100%	0.00%	0.00%	0.00%	100%	101%
Class F	0.00%	0.00%	0.01%	100%	100%	0.00%	0.00%	0.00%	99%	99%

	Low delay B Main10									
	Over VTM6.0					Over VTM6.0 with ALF switch off				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class B	-0.01%	-0.05%	-0.09%	100%	99%	0.00%	-0.01%	-0.05%	99%	101%
Class C	-0.01%	-0.01%	-0.15%	100%	99%	-0.01%	0.04%	-0.06%	99%	96%
Class E	0.01%	-0.04%	0.00%	100%	98%	0.00%	0.01%	-0.01%	100%	96%
Overall	**0.00%**	**-0.03%**	**-0.08%**	**100%**	**99%**	**-0.01%**	**0.01%**	**-0.04%**	**99%**	**98%**
Class D	-0.02%	-0.01%	-0.08%	100%	99%	-0.01%	-0.05%	-0.06%	99%	92%
Class F	-0.01%	0.07%	0.31%	100%	100%	0.06%	0.16%	0.32%	99%	98%

	Low delay B Main10									
	Over VTM6.0					Over VTM6.0 with ALF switch off				
	Y	U	V	EncT	DecT	Y	U	V	EncT	DecT
Class B	0.00%	0.06%	0.03%	100%	99%	0.00%	0.03%	0.03%	99%	101%
Class C	0.01%	-0.04%	0.12%	100%	99%	-0.02%	-0.05%	-0.10%	99%	93%
Class E	0.00%	0.05%	-0.02%	100%	100%	0.00%	0.00%	-0.01%	100%	93%
Overall	**0.00%**	**0.02%**	**0.05%**	**100%**	**99%**	**-0.01%**	**-0.01**	**-0.02%**	**99%**	**96%**
Class D	0.02%	-0.01%	0.04%	100%	99%	0.00%	0.05%	-0.01%	102%	100%
Class F	-0.03%	-0.25%	-0.22%	100%	99%	-0.03%	0.14%	0.43%	98%	96%

Summary

- Two methods are proposed to unify the luma deblocking filter processes for TB and PB boundaries
- It is suggested to adopt one of these methods into the VVC draft specification and the VTM reference software

Appendix

- Method 1
  - Deblocking grid basis for TB and PB boundaries is unified to 8x8 grid basis
  - Specification text changes:

8.8.3.5 Derivation process of boundary filtering strength

…

– The variable bS[xD_i][yD_j] is derived as follows:
  – If cIdx is equal to 0 and edgeType is equal to EDGE_VER, xD_i is not equal to 0 and (xD_i % 8) is not equal to 0, bS[xD_i][yD_j] is set equal to 0.
  – Otherwise, if cIdx is equal to 0 and edgeType is equal to EDGE_HOR, yD_j is not equal to 0 and (yD_j % 8) is not equal to 0, bS[xD_i][yD_j] is set equal to 0.
  – Otherwise, if cIdx is equal to 0 and both samples p_0 and q_0 are in a coding block with intra_bdpcm_flag equal to 1, bS[xD_i][yD_j] is set equal to 0.
  – Otherwise, if the sample p_0 or q_0 is in the coding block of a coding unit coded with intra prediction mode, bS[xD_i][yD_j] is set equal to 2.
  – Otherwise, if the block edge is also a transform block edge and the sample p_0 or q_0 is in a coding block with ciip_flag equal to 1, bS[xD_i][yD_j] is set equal to 2.
  – Otherwise, if the block edge is also a transform block edge and the sample p_0 or q_0 is in a transform block which contains one or more non-zero transform coefficient levels, bS[xD_i][yD_j] is set equal to 1.
  – Otherwise, if the block edge is also a transform block edge, cIdx is greater than 0, and the sample p_0 or q_0 is in a transform unit with tu_joint_cbcr_residual_flag equal to 1, bS[xD_i][yD_j] is set equal to 1.
  – …

Appendix

- Method 2
  - When performing bS calculation, the motion-related checks are performed only for the edges coincided with 8x8 grids inside the CU while the coefficient-related checks are kept unchanged

8.8.3.5 Derivation process of boundary filtering strength

…

– The variable bS[xD_i][yD_j] is derived as follows:
  – …
  – Otherwise, if the block edge is also a transform block edge and the sample p_0 or q_0 is in a transform block which contains one or more non-zero transform coefficient levels, bS[xD_i][yD_j] is set equal to 1.
  – Otherwise, if the block edge is also a transform block edge, cIdx is greater than 0, and the sample p_0 or q_0 is in a transform unit with tu_joint_cbcr_residual_flag equal to 1, bS[xD_i][yD_j] is set equal to 1.
  – Otherwise, if cIdx is equal to 0 and edgeType is equal to EDGE_VER, xD_i is not equal to 0 and (xD_i % 8) is not equal to 0, bS[xD_i][yD_j] is set equal to 0.
  – Otherwise, if cIdx is equal to 0 and edgeType is equal to EDGE_HOR, yD_j is not equal to 0 and (yD_j % 8) is not equal to 0, bS[xD_i][yD_j] is set equal to 0.
  – Otherwise, if the prediction mode of the coding subblock containing the sample p_0 is different from the prediction mode of the coding subblock containing the sample q_0 (i.e. one of the coding subblock is coded in IBC prediction mode and the other is coded in inter prediction mode), bS[xD_i][yD_j] is set equal to 1.
  – Otherwise, if cIdx is equal to 0 and one or more of the following conditions are true, bS[xD_i][yD_j] is set equal to 1:
    – The coding subblock containing the sample p_0 and the coding subblock containing the sample q_0 are both coded in IBC prediction mode, and the absolute difference between the horizontal or vertical component of the block vectors used in the prediction of the two coding subblocks is greater than or equal to 8 in units of 1/16 luma samples.
    – …