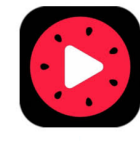


CE8-1.6-RELATED: IBC DEDICATED BUFFER WITH 120X128 8-BIT SETTING

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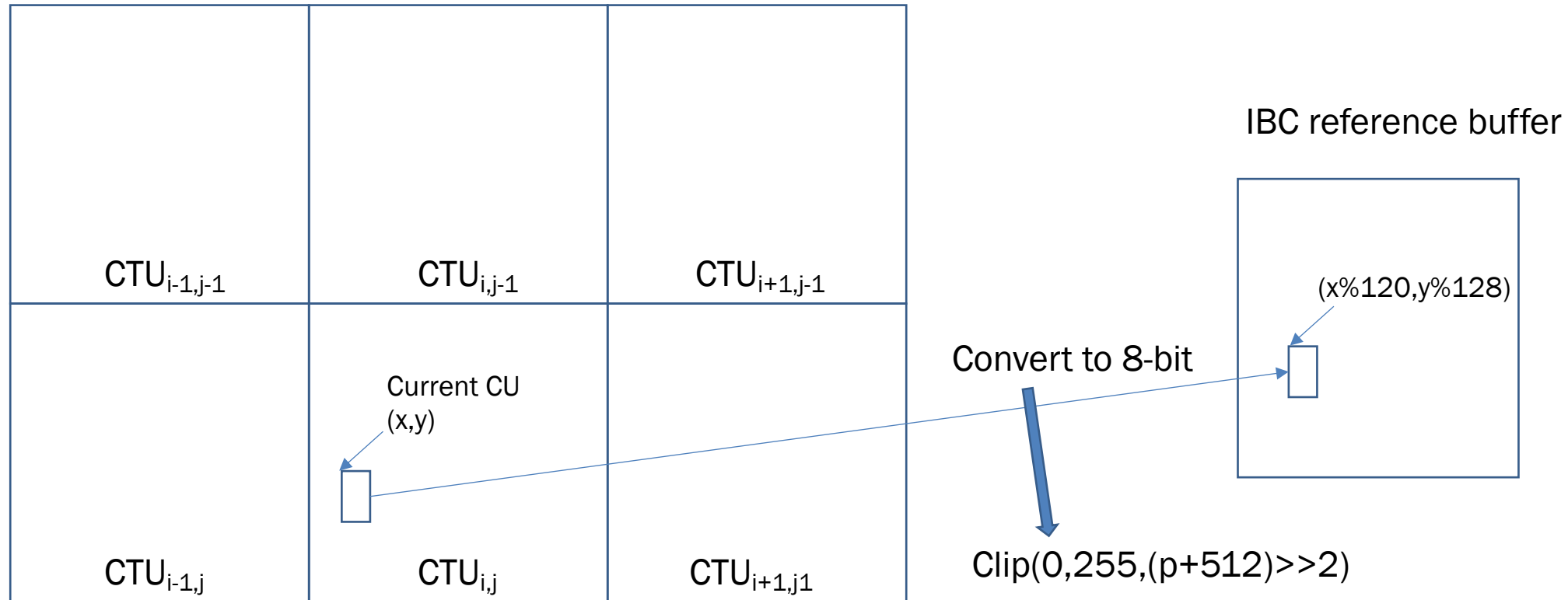


CE8-1.6 with a different parameter setting

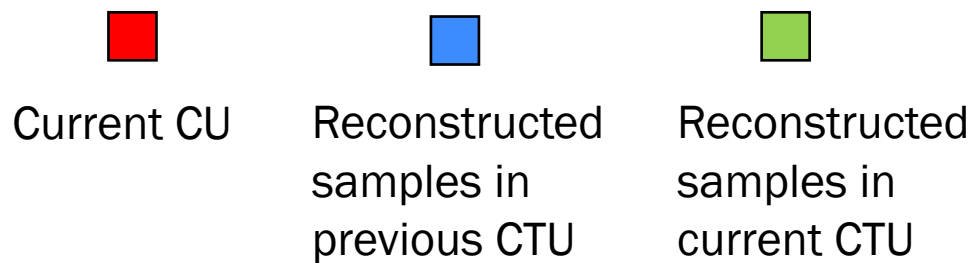
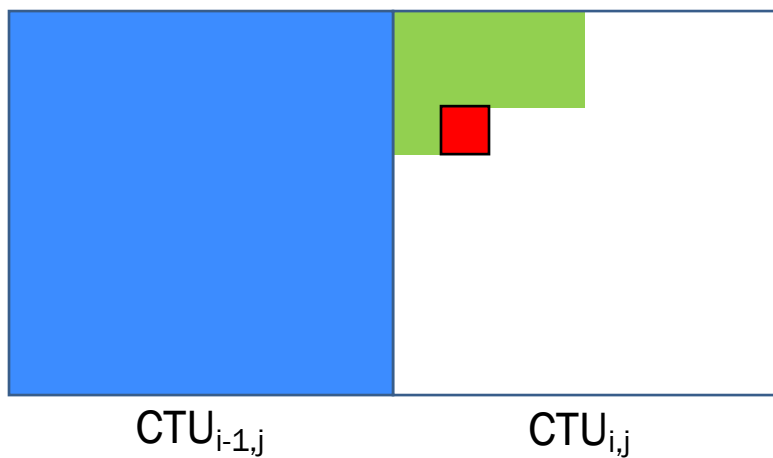
- No changes to the software
 - *One macro changed to IBC_BUFFER_WIDTH=120*
- Compared with VTM5.0
 - *AI: -0.86%/-2.13% classF/TGM*
- Unify operations for CTUs with different sizes
- Text simplification
 - *-- 68 lines*
- BV checking simplification
 - *17 → 3*

Writing to the buffer

- For 120x128 CTU
 - After decoding a CU, its reconstructed pixels before loop-filtering will be written to the buffer

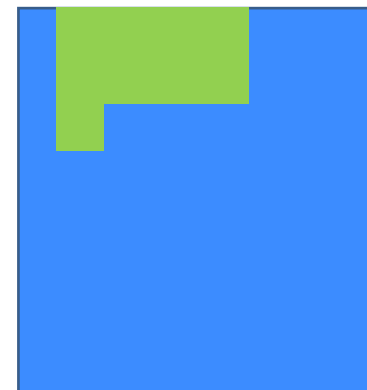


An example

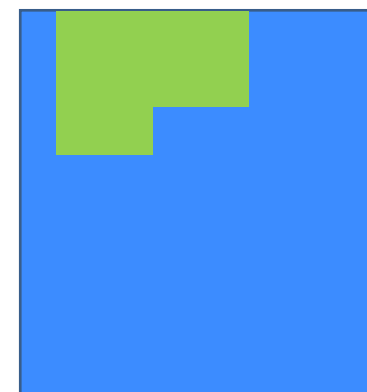


IBC reference buffer status

Before decoding current CU



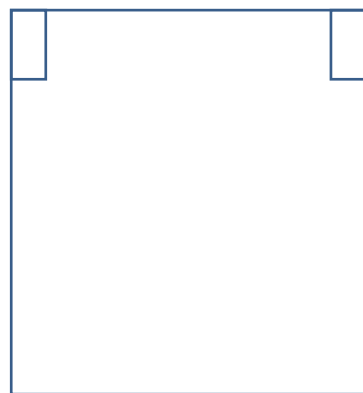
After decoding current CU



Buffer reference

- For any sample (x, y) relative to the picture with block vector (BVx, Bvy)
 - Its prediction is $IBC_buffer[(x+Bv_x)\%120][(y+Bv_y)\%128]$, converted to 10-bit.
 $p \ll 2$
 - “Wrap-around” within IBC reference buffer
- One CU’s IBC takes 1 or 2 parts’ copying from IBC reference buffer when there is no vertical wrap-around

IBC reference buffer



$$(xC_b+Bv_x)\%120 = 116$$

$$(yC_b+Bv_y)\%128 = 0$$

BV checks

- If a reference block is outside of picture boundary.
 - $refLeftX \geq 0$
 - $refRightX < picWidth$
 - $refTopY \geq 0$
 - $refBottomY < picHeight$
- If a reference block is outside of current CTU row.
 - $(refToY \gg 7) \geq (Y \gg 7)$
 - $(refBottom \gg 7) \leq (Y \gg 7)$
- If a reference block is outside of VPDU memory reused area
 - $isDecomp((refLeftX + (1 \ll 7))/64 * 64, refTopY/64 * 64) == false$
 - $((refLeftX + (1 \ll 7))/64 * 64, refTopY/64 * 64) != (X, Y)$
- If the upper left sample of the reference block has been reconstructed and accessible.
 - $isDecomp(refLeftX, refTopY) == true$
- If the bottom right sample of the reference block has been reconstructed and accessible.
 - $isDecomp(refRightX, refBottomY) == true$

BV validity

- Make sure a reference block represented by a BV is well-defined
 - *Once the buffer has been filled in with reconstructed pixels, any reference is well-defined*
 - After one CTU, no need to have any checks
 - For the 1st CTU, 3 or 4 checks to make sure that no unknown area is used
 - $refLeftX \geq 0$
 - $refTopY/128 \geq Y/128$
 - $refBottomY/128 \leq Y/128$
 - $isDecomp((refRightX, refBottomY) == true$

BV checks

- If a reference block is outside of picture boundary.
 - $refLeftX \geq 0$
 - ~~— $refRightX < picWidth$~~
 - ~~— $refTopY \geq 0$~~
 - ~~— $refBottomY < picHeight$~~
- If a reference block is outside of current CTU row.
 - $(refToY \gg 7) \geq (Y \gg 7)$
 - ~~— $(refBottom \gg 7) \leq (Y \gg 7)$~~
- ~~■ If a reference block is outside of VPDU memory reused area~~
 - ~~— $isDecomp((refLeftX + (1 \ll 7))/64 * 64, refTopY/64 * 64) == false$~~
 - ~~— $((refLeftX + (1 \ll 7))/64 * 64, refTopY/64 * 64) != (X, Y)$~~
- ~~■ If the upper left sample of the reference block has been reconstructed and accessible.~~
 - ~~— $isDecomp(refLeftX, refTopY) == true$~~
- If the bottom right sample of the reference block has been reconstructed and accessible.
 - $isDecomp(refRightX, refBottomY) == true$

Experimental results (vs. VTM-5.0)

All Intra					
Over VTM 5.0					
	Y	U	V	EncT	DecT
Class A1	-0.04%	-0.06%	0.00%	150%	101%
Class A2	-0.72%	-0.95%	-0.90%	153%	100%
Class B	-0.74%	-0.73%	-0.81%	163%	101%
Class C	-0.29%	-0.31%	-0.19%	167%	101%
Class E	-1.26%	-1.10%	-1.14%	167%	99%
Overall	-0.61%	-0.62%	-0.61%	161%	100%
Class D	-0.53%	-0.52%	-0.53%	155%	104%
Class F	-0.86%	-0.72%	-0.78%	104%	99%
4:2:0 TGM	-2.13%	-2.15%	-2.17%	102%	98%

Random Access					
Over VTM 5.0					
	Y	U	V	EncT	DecT
Class A1	0.11%	-0.18%	0.37%	110%	101%
Class A2	-0.03%	-0.18%	-0.12%	109%	100%
Class B	-0.12%	-0.22%	-0.51%	113%	101%
Class C	0.17%	-0.13%	-0.29%	118%	103%
Class E					
Overall	0.02%	-0.18%	-0.20%	113%	101%
Class D	0.11%	-0.34%	-0.07%	115%	104%
Class F	-0.66%	-0.58%	-0.39%	102%	101%
4:2:0 TGM	-1.17%	-1.12%	-1.22%	102%	100%

Low delay B					
Over VTM 5.0					
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.05%	0.25%	0.39%	122%	95%
Class C	0.13%	0.07%	-0.16%	128%	101%
Class E	0.24%	0.20%	-0.32%	117%	99%
Overall	0.12%	0.18%	0.03%	122%	98%
Class D	0.06%	0.03%	1.12%	131%	99%
Class F	-0.25%	-0.61%	-0.50%	102%	97%
4:2:0 TGM	-0.50%	-0.64%	-0.60%	100%	102%

Thanks to Tencent for cross-checking

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