

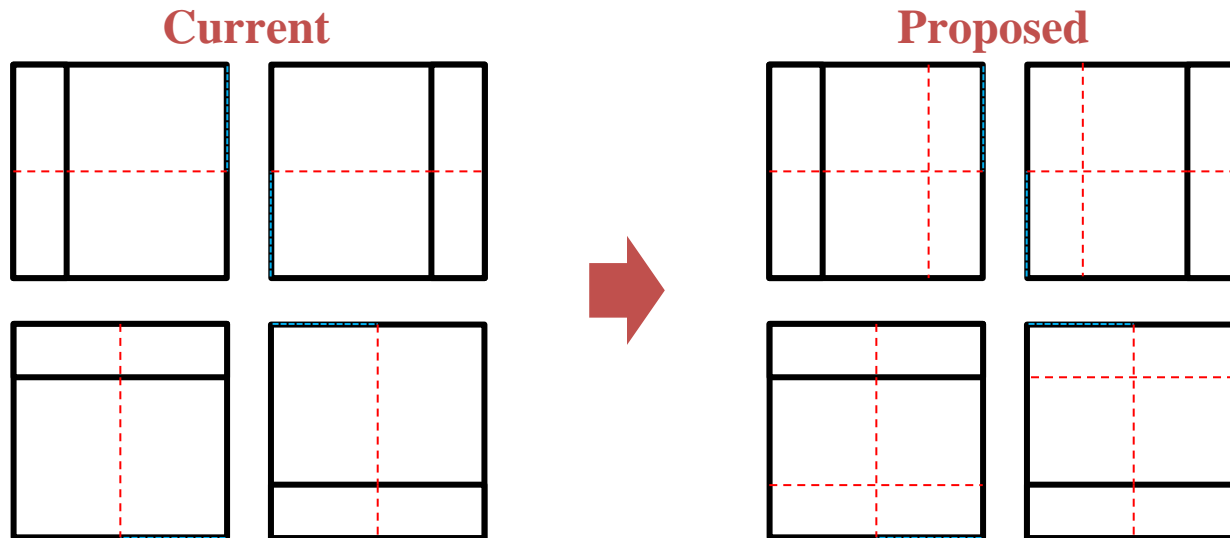
JCT3V-G0077 – CE1 related: MCP Size and DV for Sub-PU Prediction

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MCP Size for Sub-PU

- ❖ Currently, the Sub-PU prediction allows MCP sizes which are not in HEVC version 1, such as 12x8 and 8x12
- ❖ To align with HEVC version 1, we propose two options
 - **Method 1:** Using three MCP sizes (8x8, 8x4 and 4x8)



- **Method 2:** Allowing Sub-PU only to 2Nx2N partition
 - MCP size is always 8x8

MCP Size for Sub-PU

❖ Simulation Results

■ Method 1: Using three MCP sizes (8x8, 8x4 and 4x8)

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate	enc time	dec time	ren time
Balloons	0.00%	-0.01%	-0.02%	0.00%	-0.01%	-0.03%	99.1%	99.9%	94.7%
Kendo	0.00%	-0.15%	-0.20%	-0.06%	-0.02%	-0.07%	100.4%	112.4%	101.7%
Newspaper_CC	0.00%	0.00%	0.01%	0.00%	-0.01%	0.01%	99.8%	110.6%	101.9%
GT_Fly	0.00%	-0.02%	-0.03%	-0.01%	-0.01%	0.00%	100.4%	112.2%	96.6%
Poznan_Hall2	0.00%	0.04%	0.05%	0.02%	0.00%	0.05%	101.2%	109.2%	94.6%
Poznan_Street	0.00%	-0.08%	-0.17%	-0.02%	-0.02%	-0.03%	101.6%	111.9%	101.6%
Undo_Dancer	0.00%	0.07%	-0.03%	0.00%	0.00%	-0.02%	99.9%	118.4%	100.0%
Shark	0.00%	0.01%	-0.04%	-0.01%	-0.02%	0.00%	99.0%	113.4%	95.7%
1024x768	0.00%	-0.05%	-0.07%	-0.02%	-0.01%	-0.03%	99.8%	107.6%	99.4%
1920x1088	0.00%	0.00%	-0.05%	0.00%	-0.01%	0.00%	100.4%	113.0%	97.7%
average	0.00%	-0.02%	-0.05%	-0.01%	-0.01%	-0.01%	100.2%	111.0%	98.4%

no coding loss
 → 0.01% bit-saving
 for synthesized views

■ Method 2: Allowing Sub-PU only to 2Nx2N partition (8x8)

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate	enc time	dec time	ren time
Balloons	0.00%	-0.10%	-0.02%	0.00%	0.02%	-0.06%	98.8%	93.3%	95.3%
Kendo	0.00%	-0.16%	-0.21%	-0.05%	-0.02%	-0.06%	99.8%	96.8%	101.3%
Newspaper_CC	0.00%	-0.18%	-0.05%	-0.04%	-0.04%	-0.09%	99.6%	102.4%	103.3%
GT_Fly	0.00%	0.16%	0.12%	0.07%	0.09%	0.06%	100.0%	108.2%	98.0%
Poznan_Hall2	0.00%	0.01%	-0.07%	-0.01%	-0.02%	0.09%	100.6%	97.5%	93.3%
Poznan_Street	0.00%	-0.04%	-0.18%	-0.02%	-0.02%	-0.04%	101.0%	103.5%	102.4%
Undo_Dancer	0.00%	-0.24%	-0.22%	-0.06%	-0.06%	-0.11%	99.2%	100.5%	100.7%
Shark	0.00%	0.12%	-0.09%	0.02%	0.02%	0.01%	98.5%	106.3%	95.8%
1024x768	0.00%	-0.15%	-0.09%	-0.03%	-0.01%	-0.07%	99.4%	97.5%	100.0%
1920x1088	0.00%	0.00%	-0.09%	0.00%	0.00%	0.00%	99.9%	103.2%	98.1%
average	0.00%	-0.05%	-0.09%	-0.01%	0.00%	-0.02%	99.7%	101.1%	98.8%

no coding loss
 → 0.02% bit-saving
 for synthesized views

Disparity Vector for Sub-PU

- ❖ We observed that more accurate MV can be obtained if the vertical comp. of DV used for searching MV in the reference view is set to '0'
- ❖ Simulation Results (with Method 1 and Method 2)

- Setting vertical comp. of DV w/ Method 1

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate	enc time	dec time	ren time
Balloons	0.0%	-0.1%	-0.1%	0.0%	0.0%	-0.1%	98.9%	99.3%	94.3%
Kendo	0.0%	-0.3%	-0.2%	-0.1%	-0.1%	-0.1%	99.7%	110.1%	102.8%
Newspaper_CC	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.6%	108.9%	101.2%
GT_Fly	0.0%	-0.2%	-0.1%	0.0%	0.0%	0.0%	99.9%	113.9%	96.7%
Poznan_Hall2	0.0%	-0.2%	-0.1%	0.0%	0.0%	0.0%	99.9%	97.1%	92.3%
Poznan_Street	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%	100.0%	105.6%	99.6%
Undo_Dancer	0.0%	-0.1%	-0.2%	0.0%	0.0%	0.0%	98.9%	112.4%	97.3%
Shark	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%	99.1%	114.9%	98.3%
1024x768	0.0%	-0.1%	-0.1%	0.0%	0.0%	-0.1%	99.4%	106.1%	99.5%
1920x1088	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%	99.5%	108.8%	96.8%
average	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%	99.5%	107.8%	97.8%

- Setting vertical comp. of DV w/ Method 2

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate	enc time	dec time	ren time
Balloons	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%	98.5%	92.6%	93.8%
Kendo	0.0%	-0.2%	-0.3%	-0.1%	-0.1%	-0.2%	99.5%	101.1%	101.1%
Newspaper_CC	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%	99.0%	108.6%	100.6%
GT_Fly	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	98.9%	106.9%	96.9%
Poznan_Hall2	0.0%	-0.5%	-0.3%	-0.1%	-0.1%	-0.1%	99.4%	89.0%	92.0%
Poznan_Street	0.0%	-0.2%	-0.1%	0.0%	0.0%	0.0%	99.8%	100.1%	99.2%
Undo_Dancer	0.0%	-0.3%	-0.4%	-0.1%	-0.1%	-0.1%	98.4%	97.9%	97.6%
Shark	0.0%	-0.1%	-0.2%	0.0%	0.0%	0.0%	98.4%	109.2%	97.7%
1024x768	0.0%	-0.1%	-0.2%	0.0%	0.0%	-0.1%	99.0%	100.8%	98.5%
1920x1088	0.0%	-0.2%	-0.2%	0.0%	0.0%	0.0%	99.0%	100.6%	96.7%
average	0.0%	-0.2%	-0.2%	0.0%	0.0%	-0.1%	99.0%	100.7%	97.4%

➔ 0.1% bit-saving
for synthesize views

Syntax Clean-up

- ❖ Range of Sub-PU size: 4x4 to 64x64
 - 4x4 MCP size needs to be prevented to align with HEVC version 1
 - Minimum size of Sub-PU should be aligned with minimum CU size
 - Maximum size of Sub-PU should be aligned with CTU size
- ❖ So, `log2_sub_pu_size_minus2[layerId]` can be changed as below

Current

`log2_sub_pb_size_minus2[layerId]` specifies the value of the variable `SubPbSize[layerId]` that is used in the decoding of prediction units using the inter-view merge candidate. The value of `log2_sub_pb_size_minus2` shall be in the range of 0 to 4, inclusive.

The variable `SubPbSize[layerId]` is derived as specified in the following:

$$\text{SubPbSize[layerId]} = \text{VpsDepthFlag(layerId)} ? 64 : 1 \ll (\text{log2_sub_pb_size_minus2[layerId]} + 2)$$


Proposed

`log2_sub_pb_size_minus3[layerId]` specifies the value of the variable `SubPbSize[layerId]` that is used in the decoding of prediction units using the inter-view merge candidate. The value of `log2_sub_pb_size_minus3` shall be in the range of $(\text{MinCbLog2SizeY} - 3)$ to $(\text{CtbLog2SizeY} - 3)$, inclusive.

The variable `SubPbSize[layerId]` is derived as specified in the following:

$$\text{SubPbSize[layerId]} = \text{VpsDepthFlag(layerId)} ? \text{CtbSizeY} : 1 \ll (\text{log2_sub_pb_size_minus3[layerId]} + 3)$$

- This syntax element can be moved from VSP to SPS

Conclusions

- ❖ We propose methods to align MCP sizes with HEVC version 1, to set vertical comp. of DV for Sub-PU to '0', and to clean up the syntax for Sub-PU size signaling
 - Proposed methods provides 0.1% bit-saving for synthesized views
- ❖ We recommend to adopt the proposed methods into next 3D-HEVC WD

Thanks **NTT** for the cross checking (JCT3V-G0153).

