

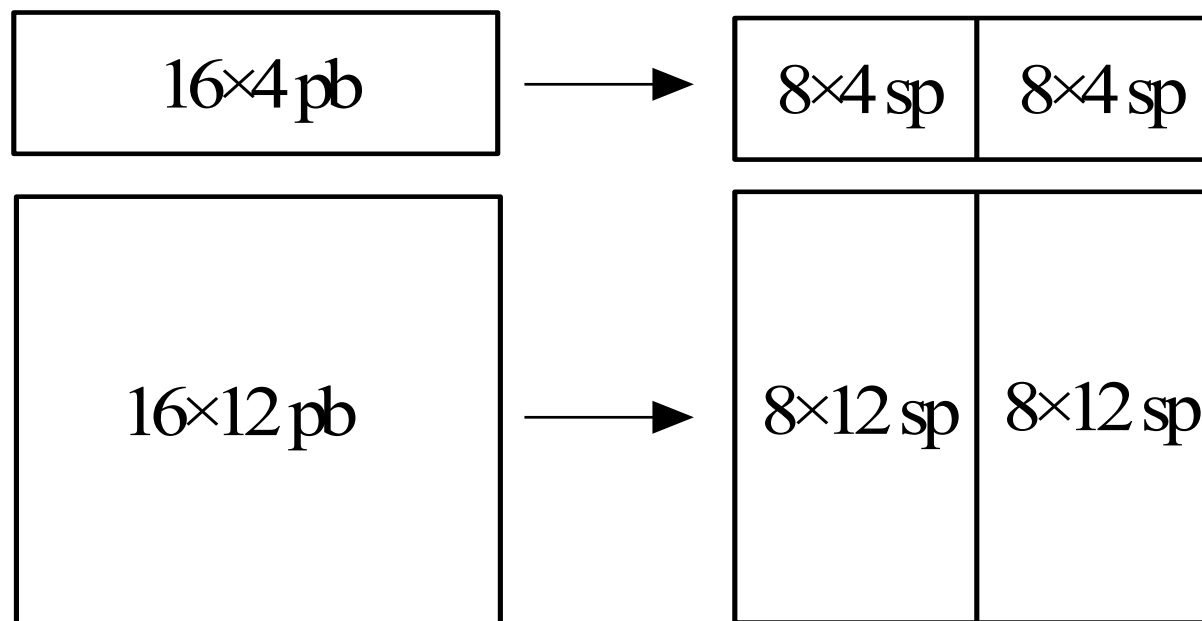
**JCT3V-J0066: Simplification and
improvement of sub-PU
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Summary

- Motivation
 - ◆ Remove irregular sub-PU blocksizes and get the coding gain
- Experimental results
 - ◆ Method 1: No impact on coding performance
 - ◆ Method 2: 0.07% gain on video
- Cross-check: JCT3V-J0089 by MediaTek

Current sub-PU design

- Apply for IVMC and MPI, and irregular sub-PU blocksizes, e.g. 12x8 / 8x12 sub-PU, are used at AMP cases

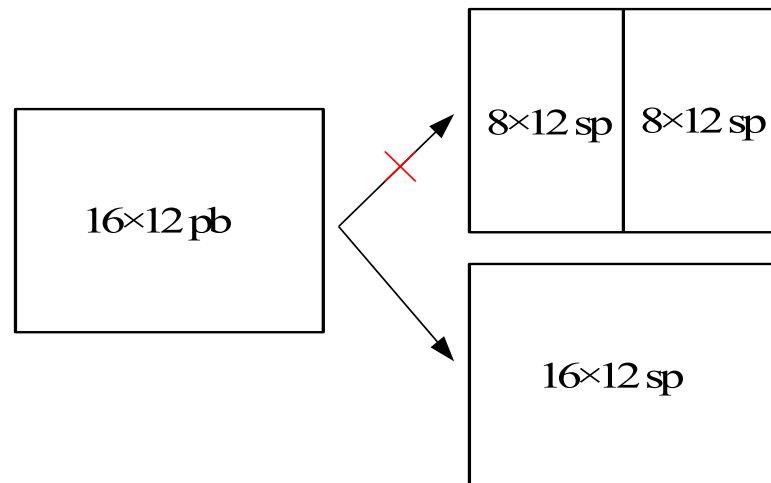
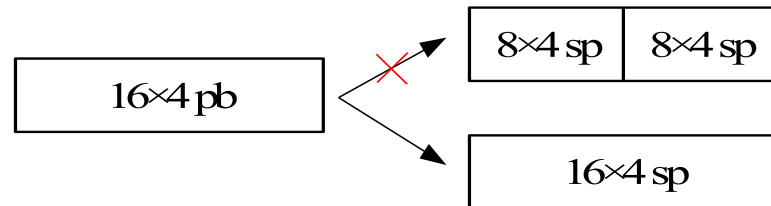


Current sub-PU design (2)

- Several proposals, e.g. G0077, H0066, H0074 and H0133, suggest restricting sub-PU prediction on $2N \times 2N$ PU only at previous meetings
- Considering the limitation of the flexibility for the use of sub-PU, those suggestions have been adopted

Proposed methods

- Propose two methods to remove the irregular sub-PU blocksizes, and still keep the flexibility of sub-PU
- Method 1: restrict the use of sub-PU in particular AMP block sizes

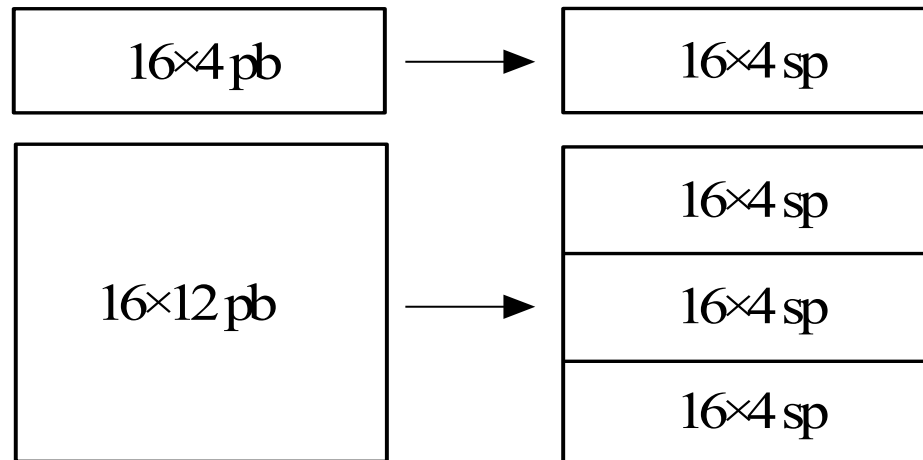


Check whether PU edge size is the multiple of pre-set sub-PU size

$$\begin{aligned} nSbW &= (nPbW \% SubPbSize[nuh_layer_id] \neq 0 \parallel \\ &nPbH \% SubPbSize[nuh_layer_id] \neq 0) ? nPbW : minSize \\ nSbH &= (nPbW \% SubPbSize[nuh_layer_id] \neq 0 \parallel \\ &nPbH \% SubPbSize[nuh_layer_id] \neq 0) ? nPbH : minSize \end{aligned}$$

Proposed methods (2)

- Method 2: apply non-square sub-PU for non-square PU, e.g. 16×12 PU splits into 16×4 sub-PU, 12×16 PU splits into 4×16 sub-PU



Experimental results

● 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%	0.0%	0.01%	0.03%	0.06%	99.3%	96.6%	98.6%
Kendo	0.0%	-0.1%	0.0%	0.00%	0.00%	-0.02%	104.3%	123.2%	102.1%
Newspaper_CC	0.0%	0.0%	0.0%	-0.01%	-0.04%	-0.09%	103.9%	93.2%	99.4%
GT_Fly	0.0%	-0.1%	-0.1%	0.00%	-0.01%	0.00%	100.0%	93.7%	102.8%
Poznan_Hall2	0.0%	0.2%	0.1%	0.04%	0.07%	0.08%	98.6%	96.0%	96.0%
Poznan_Street	0.0%	0.0%	0.1%	0.00%	0.00%	0.00%	98.7%	108.5%	104.5%
Undo_Dancer	0.0%	0.0%	0.0%	0.00%	0.00%	-0.05%	100.9%	112.2%	99.6%
Shark	0.0%	0.0%	0.0%	0.01%	0.01%	0.00%	100.2%	106.5%	99.2%
1024x768	0.0%	0.0%	0.0%	0.00%	0.00%	-0.02%	102.5%	104.3%	100.0%
1920x1088	0.0%	0.0%	0.0%	0.01%	0.01%	0.00%	99.7%	103.4%	100.4%
average	0.0%	0.0%	0.0%	0.01%	0.01%	0.00%	100.7%	103.7%	100.3%

Experimental results (2)

● 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%	-0.08%	-0.10%	0.01%	99.9%	95.2%	95.9%
Kendo	0.0%	-0.2%	0.0%	-0.07%	-0.08%	0.03%	99.1%	99.5%	100.9%
Newspaper_CC	0.0%	-0.1%	-0.1%	-0.05%	-0.06%	-0.07%	100.1%	102.9%	100.2%
GT_Fly	0.0%	-0.2%	0.0%	-0.07%	-0.08%	-0.04%	99.5%	82.2%	102.0%
Poznan_Hall2	0.0%	-0.1%	0.2%	-0.02%	-0.03%	0.07%	100.2%	100.8%	99.2%
Poznan_Street	0.0%	0.0%	0.0%	-0.02%	-0.03%	-0.02%	98.9%	122.0%	102.0%
Undo_Dancer	0.0%	-0.2%	-0.4%	-0.12%	-0.12%	-0.10%	100.4%	107.2%	96.4%
Shark	0.0%	0.1%	-0.1%	-0.02%	-0.02%	0.00%	100.0%	96.3%	99.8%
1024x768	0.0%	-0.2%	0.0%	-0.07%	-0.08%	-0.01%	99.7%	99.2%	99.0%
1920x1088	0.0%	-0.1%	-0.1%	-0.05%	-0.06%	-0.02%	99.8%	101.7%	99.9%
average	0.0%	-0.1%	-0.1%	-0.06%	-0.07%	-0.01%	99.8%	100.8%	99.5%

Summary of benefits for the removal of irregular sub-PU sizes

- Cost for splitting one 8x12 to three 8x4 blocks
 - ◆ Introduce 8x4 bi-prediction module that isn't used at HEVC v1
 - ◆ Data traffic control need be used to keep same data fetching for three 8x4 blocks' MC compared to one 8x12 block
- Cost for two 8x12 block's MC compared to one 16x12's MC
 - ◆ Additional 7x19 data fetching (30%+ increase compared to 16x12) is required for the support of 8x12 that has impact on average case
 - Data fetching for two 8x12 block: $2 \times 15 \times 19$
 - Data fetching for one 16x12 block: 23×19
 - ◆ Additional control path to support the shape of 8x12
- Benefits for the removal of 8x12
 - ◆ Avoid the cost mentioned above
 - ◆ All of sub-PU's have the same blocksize that make the implementation more clean

Conclusions

- Both proposed methods can remove the irregular sub-PU blocksizes, and still keep the flexibility of the use of sub-PU
- Suggest adopting one of the methods



Thank you!

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