

# **JCT3V-I0077: Partition Derivation for DBBP**

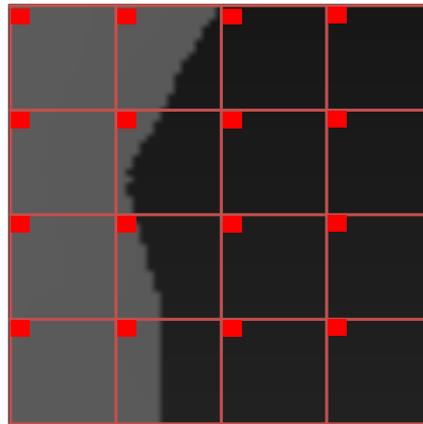
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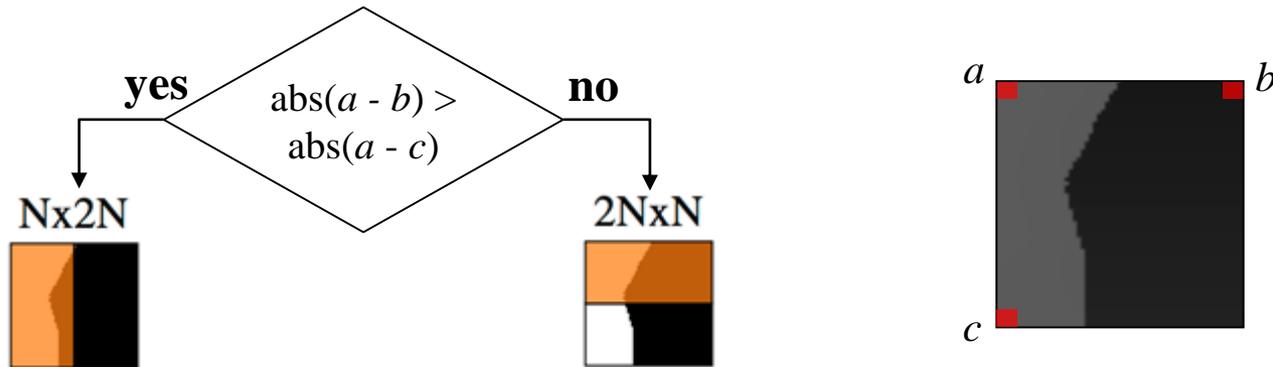
# Partition Derivation for DBBP

- ❖ This proposal is the follow-up of JCT-H0068
- ❖ The partition derivation has a relatively high complexity
  - Current CU is partitioned into 4x4 blocks
  - Threshold is calculated by averaging top-left samples of all the 4x4 blocks
  - 4x4 block-wise segmentation map is generated by the threshold
  - Best matching PU partition mode is decided between 2NxN and Nx2N



# Proposed Method 1

- ❖ Simplification of partition derivation and dbbp\_flag signaling
  - It is proposed to use 3 corner depth samples to derive the PU partition



- dbbp\_flag needs to be optimized
  - Every partition has to signal dbbp\_flag, and when dbbp\_flag is enabled, the partition mode is set to  $2N \times N$ .
  - Therefore, it is proposed to signal dbbp\_flag only when the current partition mode is equal to  $2N \times N$

# Simulation Results – Test 1

## ❖ Test 1: Simplification of the partition derivation

- Based on CTC and HTM 11
- No coding loss

	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%	0.05%	0.19%	0.04%	0.04%	0.08%	99.9%	95.8%	98.6%
Kendo	0.00%	-0.01%	0.06%	0.00%	-0.03%	0.03%	99.9%	99.5%	99.6%
Newspaper_CC	0.00%	-0.02%	-0.02%	-0.01%	0.03%	-0.02%	98.9%	93.0%	99.0%
GT_Fly	0.00%	-0.04%	0.07%	0.01%	0.01%	-0.01%	99.4%	103.3%	99.6%
Poznan_Hall2	0.00%	-0.15%	-0.06%	-0.03%	-0.02%	-0.06%	99.1%	96.5%	100.7%
Poznan_Street	0.00%	0.09%	-0.08%	-0.01%	-0.01%	0.02%	99.1%	94.2%	99.0%
Undo_Dancer	0.00%	-0.01%	-0.05%	0.00%	0.00%	0.02%	99.3%	99.7%	101.1%
Shark	0.00%	-0.06%	0.00%	-0.01%	-0.01%	0.01%	98.8%	96.1%	99.4%
1024x768	0.00%	0.00%	0.08%	0.01%	0.02%	0.03%	99.6%	96.1%	99.1%
1920x1088	0.00%	-0.03%	-0.02%	-0.01%	0.00%	-0.01%	99.1%	98.0%	100.0%
<b>average</b>	<b>0.00%</b>	<b>-0.02%</b>	<b>0.01%</b>	<b>0.00%</b>	<b>0.00%</b>	<b>0.01%</b>	<b>99.3%</b>	<b>97.3%</b>	<b>99.6%</b>

# Simulation Results – Test 2

## ❖ Test 2: optimization of dbbp\_flag signaling

- Based on CTC and HTM 11
- 0.1% bit-saving on coded views

	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%	-0.15%	-0.27%	-0.09%	-0.08%	-0.05%	101.0%	92.4%	102.2%
Kendo	0.00%	-0.24%	-0.12%	-0.07%	-0.11%	-0.06%	100.5%	97.8%	100.6%
Newspaper_CC	0.00%	-0.34%	0.01%	-0.06%	-0.05%	-0.09%	100.1%	96.5%	101.9%
GT_Fly	0.00%	-0.20%	-0.16%	-0.03%	-0.04%	-0.08%	100.7%	101.8%	102.4%
Poznan_Hall2	0.00%	-0.02%	-0.28%	-0.06%	-0.04%	0.01%	100.5%	101.9%	102.7%
Poznan_Street	0.00%	-0.11%	-0.03%	-0.03%	-0.01%	0.01%	100.4%	101.4%	102.0%
Undo_Dancer	0.00%	-0.29%	-0.36%	-0.08%	-0.07%	-0.01%	100.2%	101.9%	102.1%
Shark	0.00%	-0.34%	-0.16%	-0.05%	-0.04%	-0.03%	100.7%	97.4%	104.7%
1024x768	0.00%	-0.24%	-0.13%	-0.07%	-0.08%	-0.07%	100.5%	95.6%	101.6%
1920x1088	0.00%	-0.19%	-0.20%	-0.05%	-0.04%	-0.02%	100.5%	100.9%	102.8%
<b>average</b>	<b>0.00%</b>	<b>-0.21%</b>	<b>-0.17%</b>	<b>-0.06%</b>	<b>-0.06%</b>	<b>-0.04%</b>	<b>100.5%</b>	<b>98.9%</b>	<b>102.3%</b>

# Simulation Results – Test 3

## ❖ Test 3: Combining of Test 1 and Test 2

- Based on CTC and HTM 11
- 0.1% bit-saving on coded views

	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%	-0.12%	-0.05%	-0.05%	-0.05%	0.00%	100.7%	97.4%	102.2%
Kendo	0.00%	-0.13%	-0.07%	-0.04%	-0.10%	-0.09%	100.5%	97.9%	101.2%
Newspaper_CC	0.00%	-0.30%	-0.12%	-0.09%	-0.09%	-0.03%	99.4%	98.5%	100.5%
GT_Fly	0.00%	-0.37%	-0.22%	-0.05%	-0.06%	-0.09%	100.4%	103.3%	102.0%
Poznan_Hall2	0.00%	-0.13%	-0.30%	-0.09%	-0.08%	-0.04%	99.7%	96.8%	102.7%
Poznan_Street	0.00%	-0.16%	-0.17%	-0.05%	-0.05%	-0.03%	99.7%	99.5%	101.9%
Undo_Dancer	0.00%	-0.32%	-0.26%	-0.07%	-0.06%	-0.03%	99.9%	99.3%	102.2%
Shark	0.00%	-0.44%	-0.14%	-0.06%	-0.04%	-0.03%	99.8%	105.7%	105.3%
1024x768	0.00%	-0.19%	-0.08%	-0.06%	-0.08%	-0.04%	100.2%	97.9%	101.3%
1920x1088	0.00%	-0.29%	-0.22%	-0.07%	-0.06%	-0.04%	99.9%	100.9%	102.8%
<b>average</b>	<b>0.00%</b>	<b>-0.25%</b>	<b>-0.17%</b>	<b>-0.06%</b>	<b>-0.07%</b>	<b>-0.04%</b>	<b>100.0%</b>	<b>99.8%</b>	<b>102.3%</b>

# Proposed Method 2

- ❖ We propose to remove the partition derivation from the decoder and to signal `dbbp_flag` only when the partition mode is `2NxN` or `Nx2N`
  - The partition derivation is completely removed
  - The coded partition mode in the bitstream is always identical with the one used in DBBP
- ❖ Syntax change

	Descriptor
<code>coding_unit( x0, y0, log2CbSize , ctDepth) {</code>	
<code>...</code>	
<code>if( depth_based_blk_part_flag[ nuh_layer_id ]     &amp;&amp; CuPredMode[ x0 ][ y0 ] != MODE_INTRA     &amp;&amp; ( PartMode == PART_2NxN     PartMode == PART_Nx2N ) )</code>	
<code>    dbbp_flag[ x0 ][ y0 ]</code>	<code>ae(v)</code>
<code>...</code>	

# Simulation Results – Test 4

## ❖ Test 4: Removal of the partition derivation

- Based on CTC and HTM 11
- 0.2% bit-saving for dependent views

	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%	-0.18%	-0.11%	-0.03%	-0.02%	-0.05%	100.8%	96.5%	101.2%
Kendo	0.00%	-0.17%	-0.19%	-0.08%	-0.11%	-0.06%	100.7%	98.9%	100.6%
Newspaper_CC	0.00%	-0.27%	-0.02%	-0.04%	-0.01%	0.03%	99.8%	95.0%	100.5%
GT_Fly	0.00%	-0.17%	-0.14%	-0.01%	-0.01%	-0.03%	100.2%	103.7%	101.7%
Poznan_Hall2	0.00%	0.00%	-0.20%	-0.03%	-0.02%	0.10%	100.3%	95.6%	102.0%
Poznan_Street	0.00%	-0.05%	-0.07%	-0.02%	0.00%	0.02%	100.4%	99.3%	101.5%
Undo_Dancer	0.00%	-0.31%	-0.30%	-0.05%	-0.03%	-0.03%	99.9%	100.9%	100.8%
Shark	0.00%	-0.22%	-0.23%	-0.03%	-0.02%	-0.01%	101.0%	100.0%	107.1%
1024x768	0.00%	-0.21%	-0.11%	-0.05%	-0.05%	-0.02%	100.4%	96.8%	100.8%
1920x1088	0.00%	-0.15%	-0.19%	-0.03%	-0.02%	0.01%	100.3%	99.9%	102.6%
<b>average</b>	<b>0.00%</b>	<b>-0.17%</b>	<b>-0.16%</b>	<b>-0.04%</b>	<b>-0.03%</b>	<b>0.00%</b>	<b>100.4%</b>	<b>98.7%</b>	<b>101.9%</b>

# Simulation Results – Test 5

- ❖ **Test 5:** Removal of the partition derivation + Test 1
  - Test 1 is used at the encoder side
  - Based on CTC and HTM 11
  - 0.2% bit-saving for dependent views

	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%	-0.31%	-0.04%	-0.05%	-0.03%	-0.05%	99.8%	96.8%	99.5%
Kendo	0.00%	-0.13%	-0.15%	-0.06%	-0.09%	-0.08%	99.7%	97.3%	100.9%
Newspaper_CC	0.00%	-0.32%	0.03%	-0.04%	0.00%	0.04%	98.9%	95.6%	97.5%
GT_Fly	0.00%	-0.21%	-0.27%	-0.01%	-0.02%	-0.05%	99.8%	101.1%	100.4%
Poznan_Hall2	0.00%	-0.07%	-0.23%	-0.04%	-0.01%	0.04%	98.9%	95.0%	100.1%
Poznan_Street	0.00%	-0.15%	-0.08%	-0.03%	-0.02%	0.00%	99.2%	95.8%	99.4%
Undo_Dancer	0.00%	-0.26%	-0.34%	-0.06%	-0.04%	-0.04%	98.4%	102.6%	98.7%
Shark	0.00%	-0.24%	-0.19%	-0.03%	-0.01%	-0.01%	98.8%	96.4%	99.2%
1024x768	0.00%	-0.25%	-0.06%	-0.05%	-0.04%	-0.03%	99.5%	96.6%	99.3%
1920x1088	0.00%	-0.19%	-0.22%	-0.04%	-0.02%	-0.01%	99.0%	98.2%	99.6%
<b>average</b>	<b>0.00%</b>	<b>-0.21%</b>	<b>-0.16%</b>	<b>-0.04%</b>	<b>-0.03%</b>	<b>-0.02%</b>	<b>99.2%</b>	<b>97.6%</b>	<b>99.5%</b>

# Conclusion

- ❖ We proposed to simplify the partition derivation process for DBBP
  - Option 1: simplification of the derivation and optimization of dbbp\_flag signaling
  - Option 2: removal of the derivation from decoder
    - dbbp\_flag is signaled only when the partition mode is  $2N \times N$  or  $N \times 2N$
    - 0.2% bit-saving for dependent views
  
- ❖ We recommend to adopt the proposed method into next 3D-HEVC WD

**Thanks NTT for the cross check (JCT3V-I0183).**

