

# **JCT3V-E0143 – CE4.h related: Illumination Compensation for BVSP and adaptive IC model**

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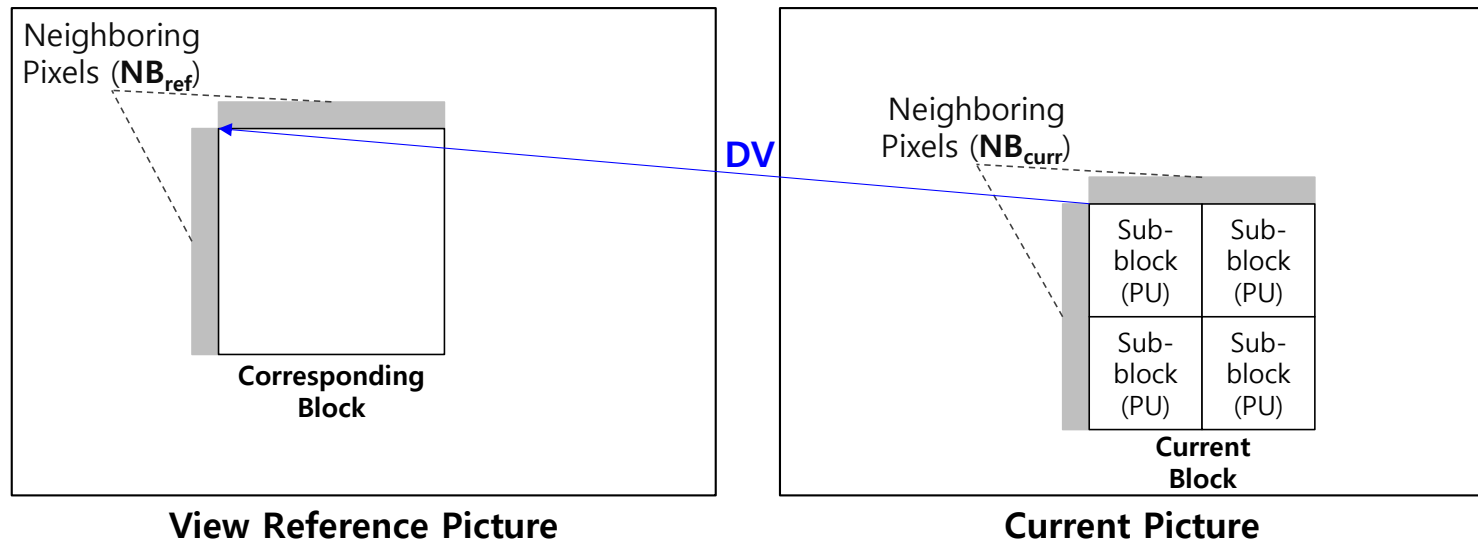
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# List of Proposed Methods

- ❖ Method 1: Applying IC to BVSP mode
- ❖ Method 2: Offset model for chroma
- ❖ Method 3: Offset model for depth map

# Applying IC to BVSP Mode (1)

- ❖ `ic_flag` is signalled for every BVSP mode
  - But, BVSP mode does not use IC (i.e. `ic_flag` is always set to '0')
- ❖ Therefore, we propose to apply IC to BVSP mode with the offset model



- Offset parameter derivation

$$sumCurr = \sum_{i=1}^{N-1} NB_{curr}(i)$$

$$sumRef = \sum_{i=0}^{N-1} NB_{ref}(i)$$

$$offset = (sumCurr - sumRef + (N \gg 1)) \gg \log_2 N$$

$N$ : number of available neighboring pixel  
 $NB_{curr}(i)$ : neighboring sample of the current block  
 $NB_{ref}(i)$ : neighboring sample of the corresponding block  
 $offset$ : offset parameter

# Applying IC to BVSP Mode (2)

## ❖ Experimental results

- Based on HTM 7.0r1
- 0.1% and 0.4% bit-saving for video 1 and video 2
- 0.1% bit-saving for coded and synthesized 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	0.0%	-0.2%	-0.2%	-0.1%	-0.1%	-0.1%	100.7%	91.8%	99.8%
Kendo	0.0%	-0.2%	-0.4%	-0.1%	-0.1%	-0.1%	99.9%	95.6%	99.6%
Newspaper_CC	0.0%	0.0%	-0.2%	0.0%	0.0%	-0.4%	100.2%	95.7%	99.6%
GT_Fly	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.8%	98.0%	102.3%
Poznan_Hall2	0.0%	-0.3%	-1.2%	-0.4%	-0.4%	-0.1%	100.1%	98.0%	99.9%
Poznan_Street	0.0%	0.0%	-0.5%	-0.1%	-0.1%	0.0%	99.6%	105.1%	100.8%
Undo_Dancer	0.0%	0.1%	-0.1%	0.0%	0.0%	0.0%	100.5%	104.1%	100.0%
1024x768	0.0%	-0.1%	-0.3%	-0.1%	-0.1%	-0.2%	100.3%	94.4%	99.6%
1920x1088	0.0%	-0.1%	-0.4%	-0.1%	-0.1%	0.0%	100.0%	101.3%	100.7%
<b>average</b>	<b>0.0%</b>	<b>-0.1%</b>	<b>-0.4%</b>	<b>-0.1%</b>	<b>-0.1%</b>	<b>-0.1%</b>	<b>100.1%</b>	<b>98.3%</b>	<b>100.3%</b>

# Offset Model for Chroma

- ❖ We observed that the offset model is appropriate for chroma
- ❖ Offset model can also reduce the computational complexity
- ❖ Experimental results
  - Based on HTM 7.0r1
  - 0.2% and 0.4% bit-saving for video 1 and video 2
  - 0.1% bit-saving for coded and synthesized 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	0.0%	-0.5%	-0.5%	-0.2%	-0.2%	-0.2%	99.4%	89.9%	100.0%
Kendo	0.0%	-0.1%	-0.6%	-0.1%	-0.1%	0.0%	100.2%	97.7%	99.2%
Newspaper_CC	0.0%	0.1%	-0.5%	-0.1%	-0.1%	0.0%	100.3%	95.7%	99.8%
GT_Fly	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.5%	96.8%	101.7%
Poznan_Hall2	0.0%	-1.1%	-0.8%	-0.4%	-0.4%	-0.2%	100.5%	98.7%	99.4%
Poznan_Street	0.0%	-0.1%	-0.2%	0.0%	0.0%	0.0%	99.3%	99.0%	100.2%
Undo_Dancer	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	99.8%	102.7%	99.7%
1024x768	0.0%	-0.2%	-0.5%	-0.1%	-0.1%	-0.1%	100.0%	94.5%	99.7%
1920x1088	0.0%	-0.3%	-0.3%	-0.1%	-0.1%	-0.1%	100.0%	99.3%	100.3%
<b>average</b>	<b>0.0%</b>	<b>-0.2%</b>	<b>-0.4%</b>	<b>-0.1%</b>	<b>-0.1%</b>	<b>-0.1%</b>	<b>100.0%</b>	<b>97.2%</b>	<b>100.0%</b>

# Offset Model for Depth Map

- ❖ We also propose to apply the offset model to depth map
- ❖ Experimental results
  - Based on HTM 7.0r1
  - No coding loss
  - Offset model can reduce the computational complexity

	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%	0.0%	0.0%	0.0%	0.0%	0.0%	99.0%	89.4%	98.1%
Kendo	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	99.3%	96.7%	99.1%
Newspaper_CC	0.0%	0.0%	0.0%	0.0%	0.2%	-0.2%	99.9%	94.5%	100.0%
GT_Fly	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.7%	97.8%	100.8%
Poznan_Hall2	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	99.7%	99.2%	100.9%
Poznan_Street	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.3%	97.7%	99.6%
Undo_Dancer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.7%	108.4%	99.8%
1024x768	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	99.4%	93.5%	99.0%
1920x1088	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.6%	100.7%	100.3%
<b>average</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>99.5%</b>	<b>97.7%</b>	<b>99.8%</b>

# Combined Results

## ❖ Based on HTM 7.0r1

- Method 1 + Method 2 + Method 3
- 0.4% and 0.6% bit-saving for video 1 and video 2
- 0.2% and 0.1% bit-saving for coded and synthesized 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	0.0%	-0.7%	-0.6%	-0.3%	-0.3%	-0.2%	100.1%	95.5%	98.5%
Kendo	0.0%	-0.4%	-1.0%	-0.3%	-0.1%	0.0%	100.6%	97.2%	100.0%
Newspaper_CC	0.0%	-0.2%	-0.5%	-0.1%	0.0%	-0.2%	100.5%	98.6%	100.5%
GT_Fly	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.2%	106.6%	99.6%
Poznan_Hall2	0.0%	-1.3%	-1.6%	-0.7%	-0.6%	-0.3%	100.9%	96.0%	100.2%
Poznan_Street	0.0%	0.0%	-0.5%	-0.1%	-0.1%	0.0%	100.2%	104.7%	99.6%
Undo_Dancer	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	100.2%	102.0%	98.7%
1024x768	0.0%	-0.4%	-0.7%	-0.2%	-0.1%	-0.1%	100.4%	97.1%	99.6%
1920x1088	0.0%	-0.3%	-0.5%	-0.2%	-0.2%	-0.1%	100.4%	102.3%	99.5%
<b>average</b>	<b>0.0%</b>	<b>-0.4%</b>	<b>-0.6%</b>	<b>-0.2%</b>	<b>-0.2%</b>	<b>-0.1%</b>	<b>100.4%</b>	<b>100.1%</b>	<b>99.6%</b>

# Conclusions

- ❖ We propose 3 methods for illumination compensation
  - 0.4% and 0.6% bit-saving for video 1 and video 2
  - 0.2% and 0.1% bit-saving for coded and synthesized views

	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate
Method 1: Applying IC to BVSP mode w/ offset model	-0.1%	-0.4%	-0.1%	-0.1%	-0.1%
Method 2: Using offset model for chroma	-0.2%	-0.4%	-0.1%	-0.1%	-0.1%
Method 3: Using offset model for depth	0.0%	0.0%	0.0%	0.0%	0.0%
Combined results (Method 1 + Method 2 + Method 3)	-0.4%	-0.6%	-0.2%	-0.2%	-0.1%

- ❖ We recommend to adopt the proposed methods into next 3D-HEVC TM.

**Thanks to Sharp for the cross checking (JCT3V-E0250).**



