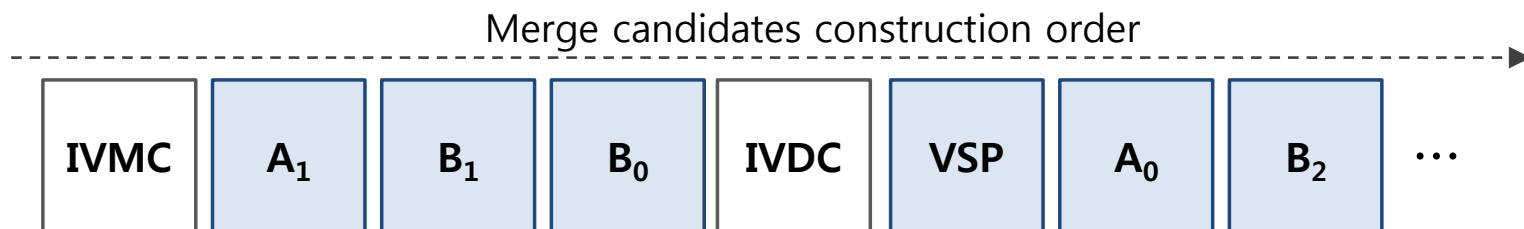# JCT3V-I0079:
DV Derivation for VSP

Min Woo Park

Multimedia Platform Lab.
DMC R&D Center
Samsung Electronics

VSP Candidates

❖ In 3D-HEVC, there can have multiple VSP candidates in merge list

❖ Every VSP candidate has
- the same DV (NBDV)
  - for finding the corresponding depth block and
- 2nd DV derivation method
  - for choosing max. value among 4 corner depth samples

❖ VSP candidates in the same merge list are identical each other

❖ In merge list, A_1, B_1, B_0, VSP, A_0, B_2 can be the VSP candidate

Merge candidates construction order

| IVMC | A_1 | B_1 | B_0 | IVDC | VSP | A_0 | B_2 | ... |

SAMSUNG

Proposed Method 1

❖ To utilize multiple VSP candidate efficiently, we propose to use the different DV derivation method for each VSP candidate

❖ **Method 1**: According to the availability order, the different DV derivation method can be applied to different candidate

▪ There are 2 options

	Current	Proposed (Option 1)	Proposed (Option 2)
1st available VSP	Max.	Max.	Max.
2nd available VSP	Max.	Average	Top-left
3rd available VSP	Max.	Center	Bottom-right
4th available VSP	Max.	Max.	Top-right
5th available VSP	Max.	Max.	Bottom-left
6th available VSP	Max.	Max.	Center

Simulation Results – Method 1

❖ **Option 1**: Using max., average, and center

- Based on CTC and HTM 11
  - 0.4% and 0.3% bit-saving for dependent views
    - ✦ 1.6% and 1.4% bit-saving for Undo_Dancer
  - 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%	-0.1%	0.1%	0.0%	0.0%	0.0%	99.1%	91.8%	98.6%
Kendo	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	98.2%	92.2%	96.3%
Newspaper_CC	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	97.7%	93.9%	98.1%
GT_Fly	0.0%	-0.4%	-0.2%	-0.1%	-0.1%	0.0%	99.7%	98.2%	100.9%
Poznan_Hall2	0.0%	-0.1%	-0.1%	0.0%	-0.1%	0.0%	99.1%	94.2%	101.5%
Poznan_Street	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	98.6%	90.6%	99.2%
Undo_Dancer	0.0%	-1.6%	-1.4%	-0.4%	-0.4%	-0.3%	98.2%	94.7%	99.9%
Shark	0.0%	-0.7%	-0.6%	-0.2%	-0.2%	-0.1%	99.5%	102.5%	103.6%
1024x768	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	98.3%	92.6%	97.7%
1920x1088	0.0%	-0.6%	-0.5%	-0.2%	-0.1%	-0.1%	99.0%	96.0%	101.0%
average	**0.0%**	**-0.4%**	**-0.3%**	**-0.1%**	**-0.1%**	**-0.1%**	**98.8%**	**94.8%**	**99.8%**

SAMSUNG

Simulation Results – Method 1

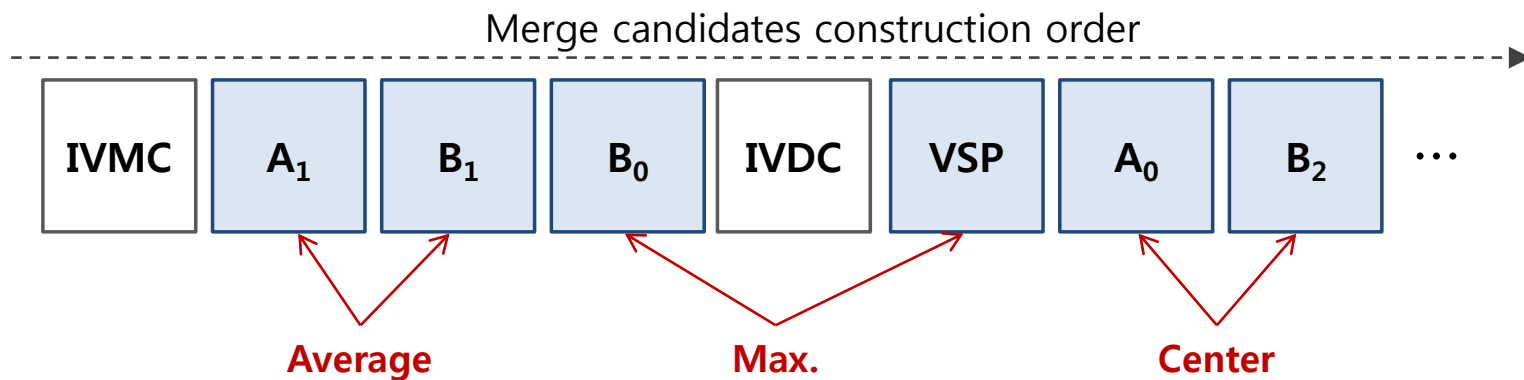❖ **Option 2**: Using max., top-left, bottom-right, top-right, bottom-left and center

- Based on CTC and HTM 11
  - 0.3% and 0.2% bit-saving for dependent views
    - ✦ 1.3% and 1.1% bit-saving for Undo_Dancer
  - 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%	0.0%	0.2%	0.0%	0.1%	0.0%	97.9%	91.4%	97.7%
Kendo	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	97.5%	95.7%	96.8%
Newspaper_CC	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%	98.4%	90.1%	99.8%
GT_Fly	0.0%	-0.3%	-0.3%	-0.1%	-0.1%	-0.1%	98.5%	108.7%	101.7%
Poznan_Hall2	0.0%	0.0%	-0.2%	-0.1%	-0.1%	0.0%	95.7%	97.1%	98.3%
Poznan_Street	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	96.0%	87.7%	95.6%
Undo_Dancer	0.0%	-1.3%	-1.1%	-0.4%	-0.3%	-0.2%	98.9%	95.6%	100.9%
Shark	0.0%	-0.5%	-0.4%	-0.1%	-0.1%	-0.1%	98.9%	97.9%	102.3%
1024x768	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	98.0%	92.4%	98.1%
1920x1088	0.0%	-0.4%	-0.4%	-0.1%	-0.1%	-0.1%	97.6%	97.4%	99.8%
average	**0.0%**	**-0.3%**	**-0.2%**	**-0.1%**	**-0.1%**	**-0.1%**	**97.7%**	**95.5%**	**99.1%**

SAMSUNG

Proposed Method 2

❖ **Method 2**: the DV derivation method can be applied differently according to the type of the candidate

Candidate Type	Current	Proposed
A_1 or B_1	Max.	Average
B_0 or VSP	Max.	Max.
A_0 or B_2	Max.	Center

Merge candidates construction order

IVMC	A_1	B_1	B_0	IVDC	VSP	A_0	B_2	$\cdots$

Average　　　**Max.**　　　**Center**

Simulation Results – Method 2

❖ Based on CTC and HTM 11

- 0.3% and 0.2% bit-saving for dependent views
  - 1.6% and 1.4% bit-saving for Undo_Dancer
- 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%	-0.1%	0.0%	0.0%	0.0%	0.0%	98.9%	93.6%	99.2%
Kendo	0.0%	-0.1%	0.0%	0.0%	-0.1%	0.0%	96.9%	88.7%	96.1%
Newspaper_CC	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	98.8%	90.9%	97.1%
GT_Fly	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%	97.1%	98.1%	98.0%
Poznan_Hall2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	95.7%	98.6%	98.8%
Poznan_Street	0.0%	0.1%	-0.1%	0.0%	0.0%	0.0%	97.0%	98.6%	97.6%
Undo_Dancer	0.0%	-1.6%	-1.4%	-0.4%	-0.4%	-0.3%	97.0%	100.0%	97.3%
Shark	0.0%	-0.7%	-0.5%	-0.2%	-0.2%	-0.1%	96.3%	100.1%	98.3%
1024x768	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%	98.2%	91.1%	97.4%
1920x1088	0.0%	-0.5%	-0.4%	-0.1%	-0.1%	-0.1%	96.6%	99.1%	98.0%
average	**0.0%**	**-0.3%**	**-0.2%**	**-0.1%**	**-0.1%**	**-0.1%**	**97.2%**	**96.1%**	**97.8%**

SAMSUNG

Conclusion

❖ We proposed to use the multiple DV derivation method for VSP
- Three methods are proposed
  - These enable to utilize multiple VSP candidates efficiently
  - All methods provide 0.1% bit-saving for coded and synthesized views

❖ We recommend to adopt the proposed method into next 3D-HEVC WD

Thanks NTT for the cross check (JCT3V-I0184).

SAMSUNG