JCT3V-F0141 – CE1 related: Improvement of View Synthesis Prediction

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Introduction

❖ Performance of BVSP (Backward View Synthesis Prediction)

- BVSP off vs. BVSP on
  - 0.3% and 0.2% gain for coded and synthesized views
  - CG test sequences: relatively large gain
  - Most of non-CG test sequences: coding loss

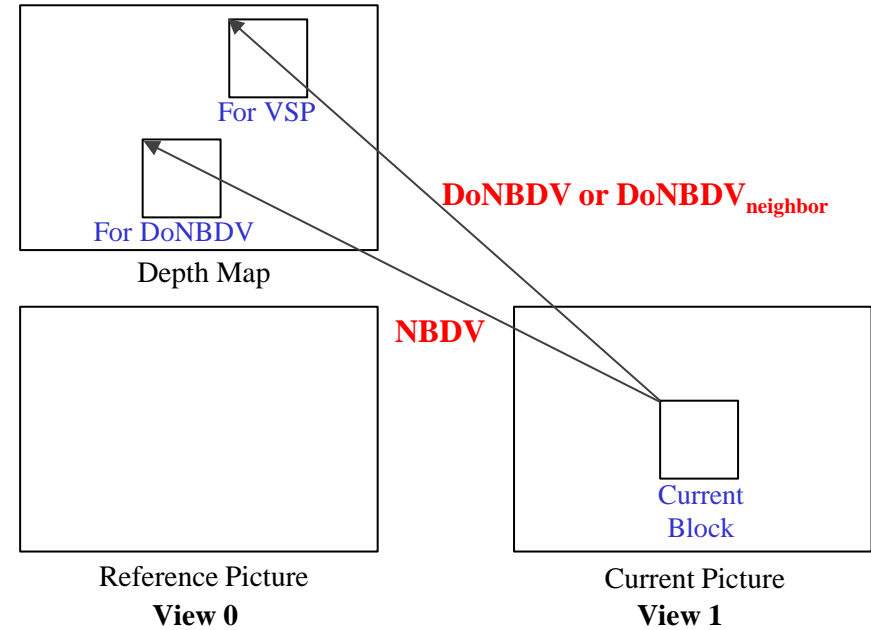|	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate	enc time	dec time	ren time
Balloons	0.0%	0.5%	0.2%	0.2%	0.2%	0.1%	100.5%	104.8%	102.6%
Kendo	0.0%	0.7%	0.6%	0.4%	0.4%	0.3%	100.6%	96.4%	100.9%
Newspaper_CC	0.0%	0.2%	0.3%	0.2%	0.2%	0.1%	99.9%	104.1%	100.8%
GT_Fly	0.0%	-7.1%	-6.4%	-1.5%	-1.4%	-1.0%	99.8%	101.0%	99.7%
Poznan_Hall2	0.0%	0.2%	0.4%	0.2%	0.2%	0.3%	100.6%	104.2%	100.9%
Poznan_Street	0.0%	-1.6%	-1.0%	-0.3%	-0.3%	-0.2%	99.5%	98.7%	99.7%
Undo_Dancer	0.0%	-6.3%	-5.7%	-1.5%	-1.4%	-1.2%	98.6%	99.7%	99.6%
1024x768	0.0%	0.5%	0.4%	0.3%	0.3%	0.2%	100.4%	101.7%	101.4%
1920x1088	0.0%	-3.7%	-3.2%	-0.8%	-0.7%	-0.5%	99.6%	100.9%	100.0%
average	**0.0%**	**-1.9%**	**-1.7%**	**-0.3%**	**-0.3%**	**-0.2%**	**99.9%**	**101.3%**	**100.6%**
Shark	0.0%	-4.4%	-3.8%	-0.8%	-0.7%	-0.6%	100.0%	100.5%	99.6%

- Improving BVSP coding performance is desirable way to study
  - while maintaining the complexity of the current design

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Proposed Methods (1/2)

❖ We propose to use DoNBDV instead of NBDV for BVSP

- to enable more accurate 2nd DCP
- No additional complexity in terms of operations and memory bandwidth
  - DoNBDV is always available before BVSP candidate
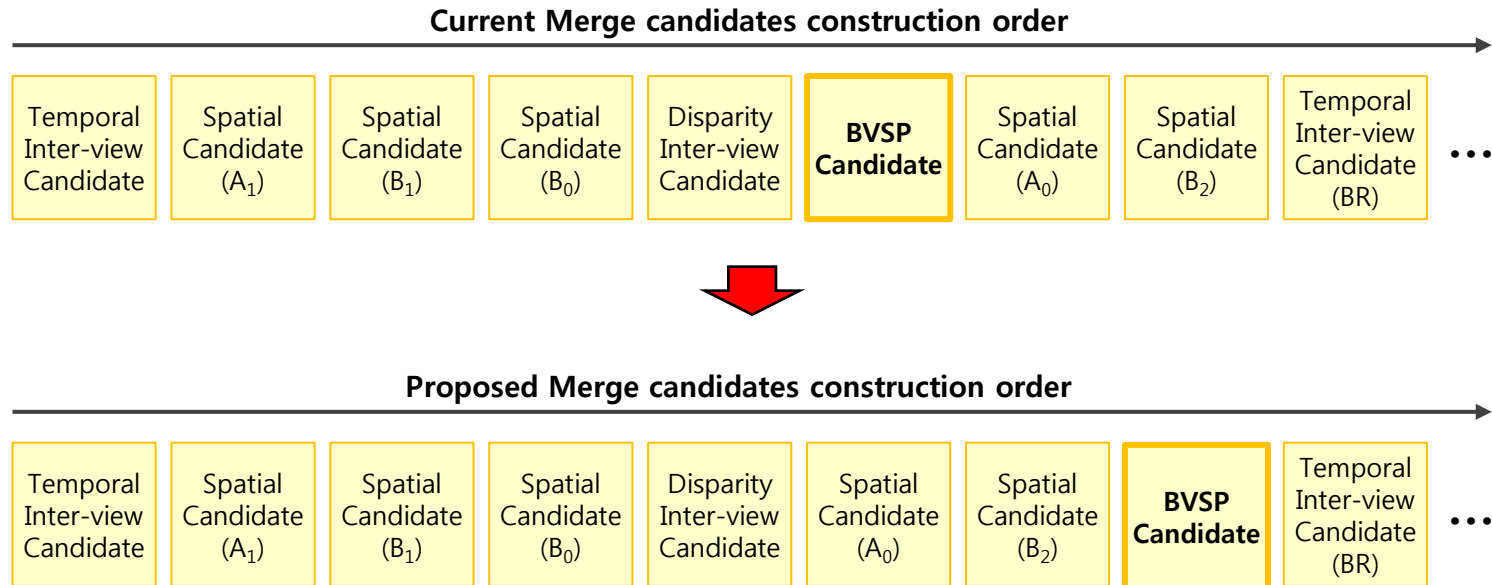 - Both the current and the proposed method has the same number of depth block fetches in the worst case ➔ "2"
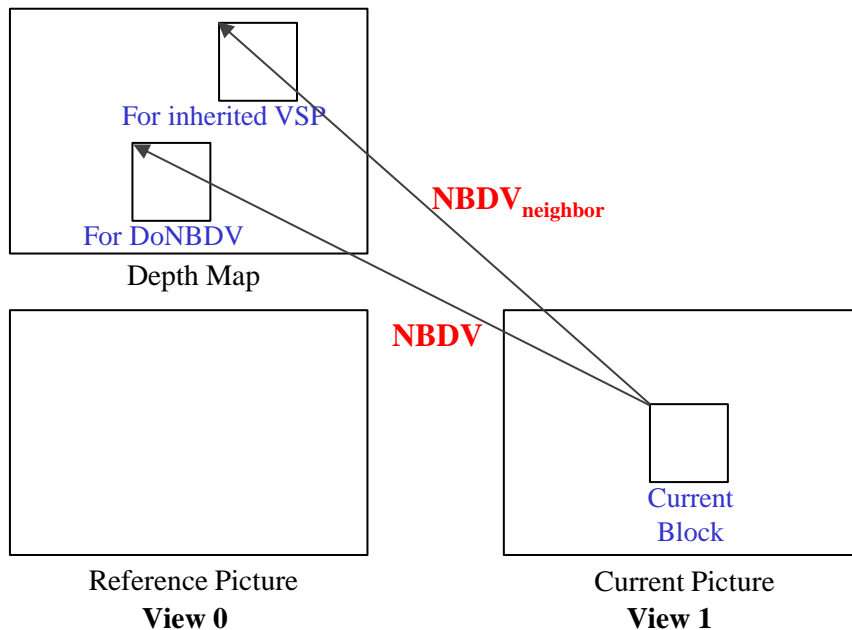
Current   **Proposed**

Proposed Methods (2/2)

❖ We also propose to move fixed VSP candidate from 6th to 8th position

Current Merge candidates construction order

| Temporal Inter-view Candidate | Spatial Candidate (A_1) | Spatial Candidate (B_1) | Spatial Candidate (B_0) | Disparity Inter-view Candidate | **BVSP Candidate** | Spatial Candidate (A_0) | Spatial Candidate (B_2) | Temporal Inter-view Candidate (BR) | ... |

Proposed Merge candidates construction order

| Temporal Inter-view Candidate | Spatial Candidate (A_1) | Spatial Candidate (B_1) | Spatial Candidate (B_0) | Disparity Inter-view Candidate | Spatial Candidate (A_0) | Spatial Candidate (B_2) | **BVSP Candidate** | Temporal Inter-view Candidate (BR) | ... |

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Experimental Results

❖ Based on CTC with HTM 8.0

- ▪ 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%	-0.3%	0.0%	-0.1%	-0.1%	-0.1%	100.1%	97.9%	98.1%
Kendo	0.0%	-0.3%	-0.1%	-0.1%	-0.1%	-0.1%	99.7%	100.3%	98.9%
Newspaper_CC	0.0%	-0.1%	-0.2%	-0.1%	-0.1%	0.0%	99.7%	97.9%	98.4%
GT_Fly	0.0%	-0.4%	-0.5%	-0.1%	-0.1%	-0.1%	99.1%	98.9%	99.8%
Poznan_Hall2	0.0%	-0.1%	-0.5%	-0.1%	-0.1%	-0.2%	99.8%	91.7%	100.4%
Poznan_Street	0.0%	-0.3%	-0.2%	-0.1%	-0.1%	-0.1%	100.0%	95.0%	100.6%
Undo_Dancer	0.0%	-0.3%	-0.5%	-0.1%	-0.1%	-0.2%	99.7%	93.1%	100.9%
1024x768	0.0%	-0.2%	-0.1%	-0.1%	-0.1%	-0.1%	99.8%	98.7%	98.5%
1920x1088	0.0%	-0.3%	-0.4%	-0.1%	-0.1%	-0.2%	99.7%	94.7%	100.4%
average	**0.0%**	**-0.2%**	**-0.3%**	**-0.1%**	**-0.1%**	**-0.1%**	**99.7%**	**96.4%**	**99.6%**
Shark	0.0%	-0.4%	-0.5%	-0.1%	-0.1%	-0.1%	99.4%	94.9%	99.6%

- ▪ Compared with BVSP off case: 0.4% bit-saving

	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%	0.2%	0.2%	0.0%	100.6%	102.6%	100.6%
Kendo	0.0%	0.4%	0.5%	0.3%	0.3%	0.2%	100.3%	96.7%	99.8%
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1920x1088	0.0%	-3.9%	-3.6%	-0.9%	-0.8%	-0.7%	99.3%	95.5%	100.4%
average	**0.0%**	**-2.1%**	**-1.9%**	**-0.4%**	**-0.4%**	**-0.4%**	**99.7%**	**97.6%**	**100.2%**
Shark	0.0%	-4.8%	-4.3%	-0.8%	-0.8%	-0.7%	99.3%	95.3%	99.2%

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Conclusions

❖ We propose methods to improve BVSP coding performance
- Using DoNBDV instead of NBDV
- Moving the fixed VSP position: 6th → 8th
- 0.1% bit-saving for coded and synthesized views
  - Compared with BVSP off case: 0.4% bit-saving
- No additional complexity

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

Thanks NTT for the cross checking (JCT3V-F0183).

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