JCT3V-E0205
Forward Block-based View Synthesis Prediction (FVSP)

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Summary

- Block-based VSP using forward warping method FVSP:
  - Proposed in JCT3V-D0168 in Incheon
  - -0.3% gain vs HTM 7.0r1
  - Constrained 1x1 FVSP
  - -0.2% gain vs HTM 7.0r1

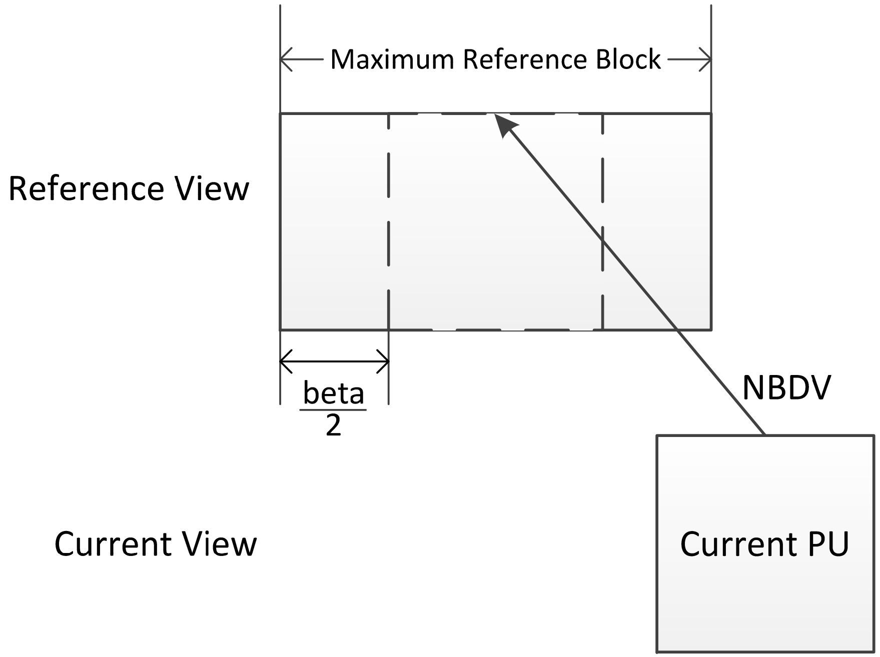
Introduction

- DCP using DoNBDV
  - MxN depth block + (M+7)x(N+7) texture block
- 4x4 BVSP using NBDV
  - MxN depth block + (4+7)x4 texture block * (M/4)*(N/4)

- Constrained FVSP (CFVSP)
  - Reduce the memory bandwidth to achieve equivalent needs on number of texture-plus-depth samples to DCP in current 3D-HEVC.
  - The maximum width of the reference block used to do the forward warping is constrained to (PU_Width + “beta”)

    → Constrained Maximum Reference Block (CMRB)
  - The variable “beta” is determined based on the size of PU coded by VSP mode, similar to the CVSP which has been adopted to the software.

Description



- Center of CMRB is located by NBDV (currently used by BVSP in 3D-HEVC), then extended by half of beta on each side of the reference block.
- The depth map used to reduce the size of reference block is limited to the corresponding depth block of the CMRB (used for correspondence estimating of corner pixels of current PU).

Experimental results

- FVSP vs Anchor

	Video 0	Video 1	Video 2	Video PSNR / Video bitrate	Video PSNR / Total bitrate	Synth PSNR / Total bitrate	Encoding Time	Decoding Time
Balloons	0.0%	-0.2%	-0.2%	-0.1%	-0.1%	-0.1%		100.7%
Kendo	0.0%	-0.3%	-0.2%	-0.1%	-0.1%	-0.1%		99.5%
Newspaper_CC	0.0%	-0.3%	-0.5%	-0.1%	-0.1%	-0.4%		100.2%
GT_Fly	0.0%	-1.1%	-1.4%	-0.3%	-0.3%	-0.3%		98.1%
Poznan_Hall2	0.0%	-0.4%	-0.5%	-0.2%	-0.1%	-0.3%		100.0%
Poznan_Street	0.0%	-0.6%	-0.4%	-0.1%	-0.1%	-0.1%		99.0%
Undo_Dancer	0.0%	-5.8%	-7.2%	-1.8%	-1.6%	-1.1%		99.8%
1024x768	0.0%	-0.2%	-0.3%	-0.1%	-0.1%	-0.2%		100.2%
1920x1088	0.0%	-2.0%	-2.4%	-0.6%	-0.6%	-0.4%		99.2%
average	0.0%	-1.2%	-1.5%	-0.4%	-0.4%	-0.3%		99.6%

Experimental results

- CFVSP vs Anchor

	Video 0	Video 1	Video 2	Video PSNR / Video bitrate	Video PSNR / Total bitrate	Synth PSNR / Total bitrate	Encoding Time	Decoding Time
Balloons	0.0%	-0.3%	-0.1%	-0.1%	-0.1%	-0.1%	120.6%	98.0%
Kendo	0.0%	0.0%	-0.4%	-0.1%	0.0%	0.0%	104.7%	99.4%
Newspaper_CC	0.0%	-0.1%	-0.2%	-0.1%	0.0%	-0.3%	94.0%	100.7%
GT_Fly	0.0%	-0.2%	-0.4%	-0.1%	-0.1%	-0.2%	104.6%	96.4%
Poznan_Hall2	0.0%	-0.1%	-0.3%	-0.1%	-0.1%	-0.2%	80.7%	98.1%
Poznan_Street	0.0%	-0.2%	0.1%	0.0%	0.0%	0.0%	96.0%	97.6%
Undo_Dancer	0.0%	-2.4%	-3.1%	-0.8%	-0.8%	-0.5%	103.7%	96.8%
1024x768	0.0%	-0.2%	-0.2%	-0.1%	0.0%	-0.1%	106.4%	99.4%
1920x1088	0.0%	-0.7%	-0.9%	-0.3%	-0.2%	-0.2%	96.2%	97.2%
average	0.0%	-0.5%	-0.6%	-0.2%	-0.2%	-0.2%	100.6%	98.2%

Conclusion

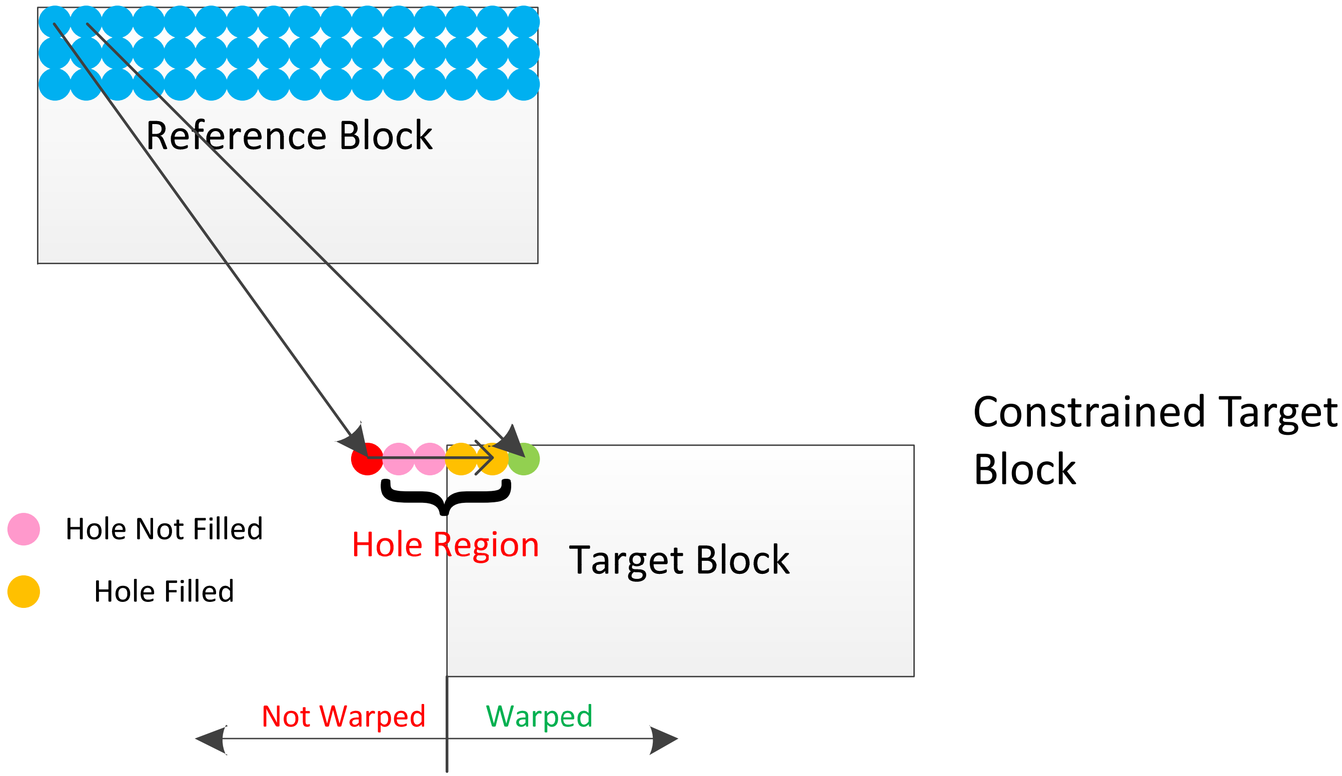
- FVSP achieves -0.3% BDrate gain vs HTM7.0.
- CFVSP achieves -0.2% BDrate gain vs HTM7.0.
- Memory bandwidth is controled by constraining the maximum reference block.
- Decoding time of FVSP/CFVSP is similar to that of BVSP in Anchor.

“beta”

		DCP			1x1 CFVSP					CFVSP vs MCP/DCP
M	N	Texture	Depth	T+D		CMRB	Texture	Depth	T+D	
		(M+7)x(N+7)	MxN	Total	beta	beta+M	(M+beta+7)xN	(M+beta)xN	Total	
4	8	165	32	197	5	9	128	72	200	101.52%
8	4	165	32	197	13	21	112	84	196	99.49%
8	8	225	64	289	7	15	176	120	296	102.42%
8	16	345	128	473	4	12	304	192	496	104.86%
16	8	345	128	473	10	26	264	208	472	99.79%
16	16	529	256	785	5	21	448	336	784	99.87%
16	32	897	512	1409	3	19	832	608	1440	102.20%
32	16	897	512	1409	9	41	768	656	1424	101.06%
32	32	1521	1024	2545	5	37	1408	1184	2592	101.85%
32	64	2769	2048	4817	2	34	2624	2176	4800	99.65%
64	32	2769	2048	4817	8	72	2528	2304	4832	100.31%
64	64	5041	4096	9137	4	68	4800	4352	9152	100.16%
									Ave.	101.10%

Warping

- Warping area in current coding view is restricted within the target block, i.e., pixel whose warping position is outside of target block is not warped to the current view.



FVSP - Reference Block Estimation

- Derived from depth map of base view
- 1. locate CC0 by Disp(128)
- 2. locate CC1 by Disp(CC0)
- 3. locate CC2 by Disp(CC1)

Left Boundary = Min (R0, R1)
Right Boundary = Max (R2, R3)