

JCT3V-C0087

CE1.h

Forward Warping Block-based VSP(FBVSP)

Yichen Zhang, Yin Zhao, Lu Yu

Zhejiang University



Summary

- FBVSP is a block-based VSP using forward warping
 - Implemented on HTM-5.1-VSP (VSP anchor)
 - -0.1% bitrate saving against HTM-5.1-VSP
 - 55.0% decoding time of HTM-5.1-VSP
- -0.7% bitrate saving against HTM-5.1
- 106.5% decoding time of HTM5.1

Introduction

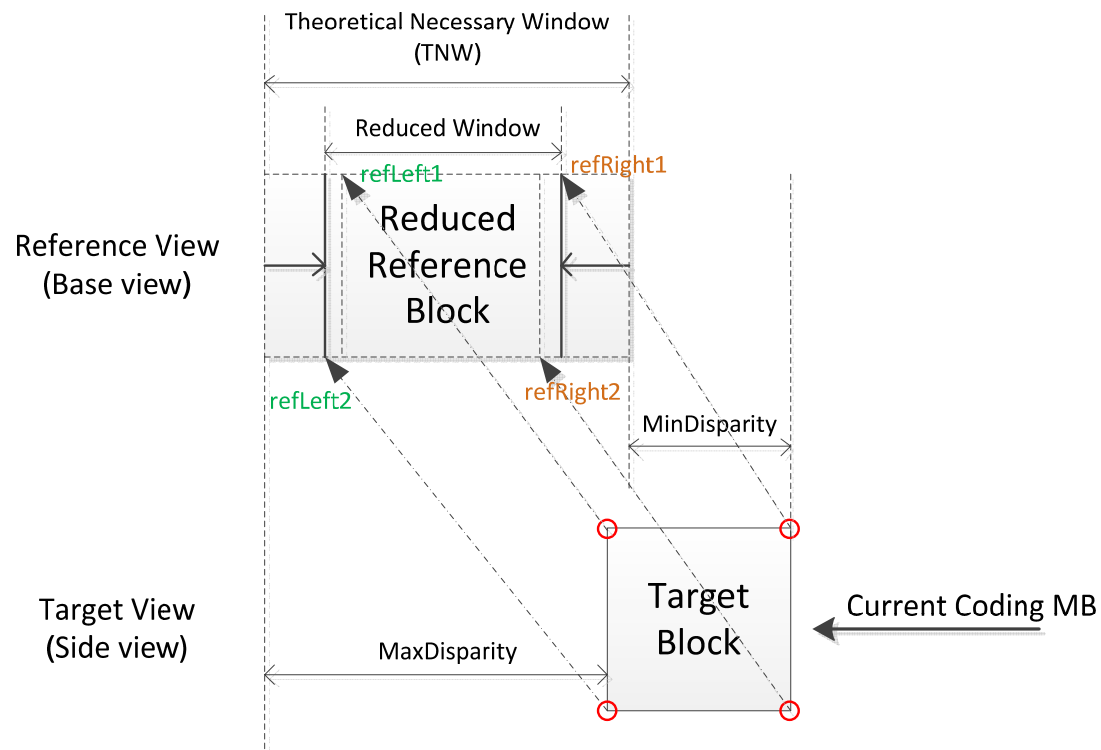
- Frame-based VSP in HTM-5.1-VSP
- Forward warping method
- -0.7% bitrate saving against HTM-5.1
- ~200% decoding time of HTM-5.1
- Too much decoding complexity increase

Algorithm Description

- FBVSP:
 - Block based VSP;
 - Based on forward warping method.
-
- Proposed in JCT3V-B0121 in October 2012, Shanghai.
 - 1. Estimates a window in base view, i.e., reference block, by only using dependent view depth map;
 - 2. Warping reference block to a target block in dependent view to be the prediction block for current coding block.

Algorithm Description

- Window determination: three-step method
 1. Defining a maximum reference block with TNW
 2. Estimating correspondence of every corner pixel in reference view
 3. Final determination of the reduced reference block by the four correspondences



Implementation Details

- Implemented on HTM-5.1-VSP
- Size of target block is always 16x16:
 - For a PU larger than 16x16, multiple target blocks are generated to cover the whole PU and merged together to be its prediction block.
 - For a PU smaller than 16x16, the prediction samples are copied from the target block directly
- Warping size of luma component is 1x1
- Warping size of chroma component is 1x1 (not up-sampled)
 - Top-left corner depth value of its corresponding 2x2 depth block
- MV for VSP blocks is fixed to zero (same as HTM-5.1-VSP)

Experimental Results

- Three simulations:
 - 1. Common anchor -- HTM-5.1 (CTC)
 - 2. VSP anchor -- HTM-5.1-VSP
 - 3. FBVSP on HTM-5.1-VSP
- (VSP is applied on all frames of dependent-view texture and depth – Case A)

Experimental Results

- FBVSP vs HTM-5.1-VSP

	video 0	video 1	video 2	video only	synthesized only	coded & synthesized	enc time	dec time
Balloons	0.0%	-0.2%	0.3%	0.0%	0.0%	0.0%	101.1%	51.4%
Kendo	0.0%	-0.1%	0.1%	0.0%	0.0%	0.0%	90.7%	49.5%
Newspapercc	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%	104.6%	53.1%
GhostTownFly	0.0%	-1.1%	-0.5%	-0.1%	0.6%	0.3%	99.2%	53.2%
PoznanHall2	0.0%	0.3%	-1.0%	-0.2%	-0.2%	-0.2%	116.0%	61.2%
PoznanStreet	0.0%	-0.2%	-0.1%	0.0%	-0.1%	-0.1%	103.9%	60.9%
UndoDancer	0.0%	-0.9%	-0.5%	-0.2%	-0.4%	-0.4%	100.0%	56.8%
1024x768	0.0%	-0.1%	0.1%	0.0%	0.0%	0.0%	98.6%	51.3%
1920x1088	0.0%	-0.5%	-0.5%	-0.1%	0.0%	-0.1%	104.6%	57.9%
average	0.0%	-0.3%	-0.2%	-0.1%	0.0%	-0.1%	102.0%	55.0%

Experimental Results

- FBVSP vs HTM-5.1

	video 0	video 1	video 2	video only	synthesized only	coded & synthesized	enc time	dec time
Balloons	0.0%	-0.2%	2.2%	0.6%	0.4%	0.4%	105.2%	106.5%
Kendo	0.0%	0.0%	0.8%	0.3%	0.1%	0.2%	127.7%	105.3%
Newspapercc	0.0%	1.3%	1.5%	0.6%	0.6%	0.6%	162.5%	108.7%
GhostTownFly	0.0%	-8.3%	-8.3%	-2.0%	-1.6%	-1.8%	101.9%	107.5%
PoznanHall2	0.0%	-0.4%	-0.7%	-0.1%	-0.3%	-0.2%	124.8%	104.6%
PoznanStreet	0.0%	-3.1%	-2.8%	-0.8%	-0.6%	-0.7%	121.6%	105.8%
UndoDancer	0.0%	-15.0%	-13.9%	-4.0%	-3.7%	-3.8%	103.6%	107.1%
1024x768	0.0%	0.4%	1.5%	0.5%	0.4%	0.4%	129.7%	106.8%
1920x1088	0.0%	-6.7%	-6.4%	-1.7%	-1.6%	-1.6%	112.5%	106.2%
Average	0.0%	-3.7%	-3.0%	-0.8%	-0.7%	-0.7%	119.6%	106.5%

Size Of Reference Blocks

Sequence	≤ 16	≤ 17	> 17	Average
Balloons	77.95%	86.10%	13.90%	16.49
Kendo	78.71%	87.89%	12.11%	16.42
Newspaper	57.32%	69.01%	30.99%	18.69
Poznanhall2	81.58%	88.52%	11.48%	16.73
PoznanStreet	49.18%	74.65%	25.35%	17.44
GhostTownFly	58.74%	88.90%	11.10%	16.58
UndoDancer	64.23%	90.05%	9.95%	17.12
Average	66.82%	83.59%	16.41%	17.07

Conclusion

- FBVSP reduce the complexity of VSP module of HTM-5.1-VSP significantly (~45%) without coding performance penalty.
- FBVSP also achieves 0.7% bitrate saving against HTM-5.1.
- Focuses on improvement of VSP prediction samples generation process, can be incorporated with other VSP related syntax, mode design.

Thanks Qualcomm ([JCT3V-B0167](#)) for
cross-checking our proposal