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| **Joint Collaborative Team on 3D Video Coding Extensions**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11**  7th Meeting: San José, US, 11–17 Jan. 2014 | Document: JCT3V-G0035 |

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| *Title:* | **VSP depth access simplification** | | |
| *Status:* | Input Document to JCT-3V | | |
| *Purpose:* | Proposal | | |
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# Abstract

This proposal presents a simplification for VSP. Currently VSP applies to 8x4 and 8x4 block basis and access four depth values in each block. However it is asserted such a small block doesn’t need so many accesses and there is more efficient position for coding efficiency. This contribution proposes one position instead of four corners. The experiment result shows that the BD-rate gain is 0.07 %, 0.07 % and 0.05 % in video, total video and synthesis respectively.

# Introduction

Currently VSP applies 8x4 and 8x4 block basis and in each block the maximum of four corners is derived to get a representing depth value. However it can be considerable that so many access is not needed for such a small block. Besides, the maximum of four corners generate so similar depth values that it can exacerbate coding efficiency.

Note: The four corner concept is quite reasonable in DoNBDV, in which block can be large as much as 64x64 and the robustness from the concept is important.

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Fig. 1 VSP depth access (HTM9)

# Proposal

A depth pixel, in which coordination is (x + 2, y + 2), is used to get the representing depth value.



Fig. 1 VSP depth access (propose)

Note: The center position (x + width/2 , y + height/2) has been also tested by the proponent and found that the results are almost the same as the proposal. Considering easiness of constant position, the position (x+2, y+2) was chosen.

# Proposed Text

The array disparitySamples is derived as specified in the following:

* For sBy in the range of 0 to ( ( nPSH / nSubBlkH) –1 ), inclusive, the following applies:
  + For sBx in the range of 0 to ( ( nPSW / nSubBlkW) –1 ), inclusive, the following applies:
    - When splitFlag is equal to 1, The variable maxDep is derived as follows

xSubB = sBx \* nSubBlkW  
 ySubB = sBy \* nSubBlkH  
 xP0 = Clip3( 0, pic\_width\_in\_luma\_samples – 1, xTL + xSubB + 2 )  
 yP0 = Clip3( 0, pic\_height\_in\_luma\_samples – 1, yTL + ySubB +2 )  
 maxDep = refDepPels[ xP0 ][ yP0 ]

* + - Otherwise (splitFlag is equal to 0), The variable maxDep is set equal to –1 and modified as specified in the following.

xSubB = sBx \* nSubBlkW  
 ySubB = sBy \* nSubBlkH  
 xP0 = Clip3( 0, pic\_width\_in\_luma\_samples – 1, xTL + xSubB )  
 yP0 = Clip3( 0, pic\_height\_in\_luma\_samples – 1, yTL + ySubB )   
 xP1 = Clip3( 0, pic\_width\_in\_luma\_samples – 1, xTL + xSubB + nSubBlkW – 1 )  
 yP1 = Clip3( 0, pic\_height\_in\_luma\_samples – 1, yTL + ySubB + nSubBlkH – 1 )  
 maxDep = Max( maxDep, refDepPels[ xP0 ][ yP0 ] )  
 maxDep = Max( maxDep, refDepPels[ xP0 ][ yP1] )  
 maxDep = Max( maxDep, refDepPels[ xP1][ yP0 ] )  
 maxDep = Max( maxDep, refDepPels[ xP1][ yP1 ] )

* + - The values of the array depthSamples are modified as specified in the following:

for ( yOff = 0; yOff < nSubBlkH; yOff++ )  
 for( xOff = 0; xOff < nSubBlkW; xOff++ ) {  
 x = xSubB + xOff   
 y = ySubB + yOff   
 disparitySamples[ x ][ y ] = DepthToDisparityB[ refViewIdx ][ maxDep ]  
 }

# Simulation results

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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% | 0.0% | 0.0% | -0.1% | 0.0% | 100.5% | 104.4% | 100.3% |
| Kendo | 0.0% | -0.3% | -0.2% | -0.1% | -0.1% | -0.1% | 100.4% | 102.1% | 97.4% |
| Newspaper\_CC | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 101.0% | 102.1% | 99.8% |
| GT\_Fly | 0.0% | 0.5% | 0.4% | 0.0% | 0.0% | 0.0% | 100.1% | 99.7% | 99.7% |
| Poznan\_Hall2 | 0.0% | 0.0% | -0.1% | 0.0% | 0.0% | -0.1% | 100.3% | 102.1% | 100.5% |
| Poznan\_Street | 0.0% | -0.1% | -0.1% | 0.0% | 0.0% | 0.0% | 100.0% | 99.9% | 99.6% |
| Undo\_Dancer | 0.0% | -1.4% | -1.2% | -0.4% | -0.4% | -0.3% | 100.3% | 100.2% | 99.9% |
| Shark | 0.0% | -0.1% | -0.1% | -0.1% | -0.1% | 0.0% | 100.4% | 99.7% | 100.4% |
| 1024x768 | 0.0% | -0.2% | -0.1% | 0.0% | 0.0% | 0.0% | 100.6% | 102.9% | 99.2% |
| 1920x1088 | 0.0% | -0.2% | -0.2% | -0.1% | -0.1% | -0.1% | 100.2% | 100.3% | 100.0% |
| **average** | **0.0%** | **-0.2%** | **-0.2%** | **-0.07%** | **-0.07%** | **-0.05%** | **100.4%** | **101.3%** | **99.7%** |

# Conclusion

This contribution proposes one position to get a representing depth value in 8x4 / 4x8 VSP block. This reduce the number of access to one forth compared with the current design. It is recommended to adopt this method in 3D-HEVC.

# Patent rights declaration(s)

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