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| *Title:* | **3D-CE1 related: Simplification on merging candidate list in texture coding** | | |
| *Status:* | Input Document | | |
| *Purpose:* | Proposal | | |
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# Abstract

This contribution proposes to only allow VSP merging candidate in 2Nx2N PU partition to simplify the merging candidate list construction process. The experimental results reportedly show no coding loss. As a further simplification, it is also proposed to simply use the HEVC merging candidate list for non-2Nx2N partitions in texture coding. The experimental results reportedly show 0.07% coding loss.

# Introduction

In current 3D-HEVC [1], additional tools such as inter-view motion parameter prediction (IvMP), inter-view disparity compensation (IvDC), view synthesis prediction (VSP) and their variations are used to construct merging candidates in addition to the HEVC merging candidates. The sub-PU level IvMP candidate is disabled when PU partition mode is not 2Nx2N in order to avoid irregular 8x12/12x8 MCP block sizes [2]. Currently, the VSP candidate is enabled for all PU partitions. When VSP is applied, current PU is divided into several non-overlapping 8x4 or 4x8 sub-PUs. The decision of sub-PU partition type is based on the PU size or the depth values at the 4 corners in the corresponding depth block. Let the width and height of a PU be *W* and *H*, and the 4 depth values be *D0, D1, D2, D3* as shown in Fig. 1. The sub-PU partition type decision process in VSP can be described as follows:

If *(H % 8 != 0)*

8x4 sub-PU partition is applied

Else if (*W % 8 != 0)*

4x8 sub-PU partition is applied

Else if *(D0< D3 == D1< D2)*

8x4 sub-PU partition is applied

Else

4x8 sub-PU partition is applied

Such decision process requires additional checks of the PU size and it needs to access 8 depth samples in non-2Nx2N partition, thus increases the complexity of VSP merging candidate. However, VSP does not provide much coding benefits in non-2Nx2N partitions.

Fig. . Sub-PU partition type decision in VSP

# Proposal

This contribution proposes the following two simplification methods:

1. Disable VSP (and VSP inheritance) when the PU partition mode is not 2Nx2N.
2. Simply use HEVC merging candidate list when the PU partition mode is not 2Nx2N.

Note that *(H % 8 != 0)* and *(W % 8 != 0)* are always false in 2Nx2N partition, and the refined disparity vector in DoNBDV is based on the maximum depth value of the same depth samples as shown in Fig. 1. Therefore, by the proposed simplification methods, there is no need to check the PU size, and the depth access in DoNBDV can be reused for sub-PU partition type decision in VSP. In the second method, the merging candidate list construction process is significantly simplified for non-2Nx2N partitions.

# Experimental results

The proposed simplifications are integrated into HTM-10.0r1 [3], and the tests are conducted under the common test conditions [4]. The experimental results are shown in Table 1 and Table 2, respectively.

**Table 1. The results of method 1 (disable VSP when PU partition is not 2Nx2N)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 | 0.00% | 0.00% | 0.15% | 0.03% | 0.03% | 0.01% | 101.0% | 97.2% | 102.0% |
| Kendo | 0.00% | -0.07% | -0.05% | -0.04% | -0.03% | -0.01% | 101.1% | 101.5% | 102.5% |
| Newspaper\_CC | 0.00% | -0.05% | -0.19% | -0.05% | -0.06% | -0.03% | 99.1% | 100.3% | 100.2% |
| GT\_Fly | 0.00% | 0.32% | 0.17% | 0.04% | 0.04% | 0.02% | 100.9% | 100.9% | 98.5% |
| Poznan\_Hall2 | 0.00% | -0.05% | -0.37% | -0.08% | -0.12% | -0.13% | 98.9% | 103.4% | 101.0% |
| Poznan\_Street | 0.00% | 0.04% | 0.13% | 0.03% | 0.04% | 0.03% | 100.1% | 98.6% | 101.1% |
| Undo\_Dancer | 0.00% | 0.48% | 0.52% | 0.13% | 0.13% | 0.11% | 99.1% | 103.3% | 100.3% |
| Shark | 0.00% | 0.18% | 0.15% | 0.03% | 0.03% | 0.02% | 99.2% | 109.2% | 99.8% |
| 1024x768 | 0.00% | -0.04% | -0.03% | -0.02% | -0.02% | -0.01% | 100.4% | 99.7% | 101.6% |
| 1920x1088 | 0.00% | 0.20% | 0.12% | 0.03% | 0.02% | 0.01% | 99.7% | 103.1% | 100.1% |
| **average** | **0.00%** | **0.11%** | **0.06%** | **0.01%** | **0.01%** | **0.00%** | **99.9%** | **101.8%** | **100.7%** |

**Table 2. The results of method 2 (only use the HEVC merging candidate list for non-2Nx2N PU partition in texture coding)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 | 0.00% | 0.16% | -0.02% | 0.04% | 0.04% | 0.02% | 99.9% | 104.0% | 98.7% |
| Kendo | 0.00% | -0.07% | 0.03% | 0.00% | -0.01% | 0.01% | 100.8% | 107.1% | 103.9% |
| Newspaper\_CC | 0.00% | 0.10% | 0.04% | 0.03% | 0.02% | -0.02% | 99.7% | 96.5% | 102.0% |
| GT\_Fly | 0.00% | 0.42% | 0.58% | 0.18% | 0.18% | 0.10% | 100.9% | 101.1% | 102.3% |
| Poznan\_Hall2 | 0.00% | 0.36% | -0.40% | 0.01% | -0.02% | -0.05% | 97.8% | 98.6% | 102.1% |
| Poznan\_Street | 0.00% | -0.06% | 0.17% | 0.04% | 0.05% | 0.02% | 99.1% | 102.8% | 103.2% |
| Undo\_Dancer | 0.00% | 0.60% | 0.58% | 0.21% | 0.20% | 0.14% | 99.0% | 100.6% | 99.0% |
| Shark | 0.00% | 0.43% | 0.64% | 0.15% | 0.16% | 0.10% | 101.8% | 104.8% | 99.1% |
| 1024x768 | 0.00% | 0.06% | 0.02% | 0.02% | 0.01% | 0.00% | 100.2% | 102.5% | 101.5% |
| 1920x1088 | 0.00% | 0.35% | 0.31% | 0.12% | 0.11% | 0.06% | 99.7% | 101.6% | 101.1% |
| **average** | **0.00%** | **0.24%** | **0.20%** | **0.08%** | **0.08%** | **0.04%** | **99.9%** | **102.0%** | **101.3%** |

In JCT3V-H0074 [5], it is also proposed to simply use the HEVC merging candidate list for non-2Nx2N PU partition in depth coding. When combined with method 2 in this contribution, i.e. simply use the HEVC merging candidate list for non-2Nx2N PU partition in both texture and depth coding, the experimental results are shown in Table 3.

**Table 3. only use the HEVC merging candidate list for non-2Nx2N PU partition in both texture and depth coding**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 | 0.00% | 0.16% | -0.03% | 0.04% | 0.02% | 0.05% | 100.0% | 104.7% | 98.9% |
| Kendo | 0.00% | -0.05% | 0.17% | 0.03% | 0.02% | 0.08% | 99.7% | 104.1% | 100.8% |
| Newspaper\_CC | 0.00% | 0.12% | 0.08% | 0.04% | 0.03% | 0.01% | 100.4% | 99.2% | 101.1% |
| GT\_Fly | 0.00% | 0.42% | 0.62% | 0.18% | 0.20% | 0.16% | 101.5% | 107.2% | 99.4% |
| Poznan\_Hall2 | 0.00% | 0.37% | -0.23% | 0.04% | 0.00% | -0.02% | 99.4% | 100.0% | 102.3% |
| Poznan\_Street | 0.00% | 0.02% | 0.14% | 0.04% | 0.05% | 0.04% | 98.8% | 95.2% | 99.2% |
| Undo\_Dancer | 0.00% | 0.53% | 0.62% | 0.21% | 0.21% | 0.12% | 99.0% | 100.6% | 96.9% |
| Shark | 0.00% | 0.56% | 0.51% | 0.15% | 0.14% | 0.09% | 100.0% | 107.6% | 99.7% |
| 1024x768 | 0.00% | 0.08% | 0.08% | 0.03% | 0.02% | 0.04% | 100.0% | 102.6% | 100.3% |
| 1920x1088 | 0.00% | 0.38% | 0.33% | 0.12% | 0.12% | 0.08% | 99.7% | 102.1% | 99.5% |
| **average** | **0.00%** | **0.27%** | **0.24%** | **0.09%** | **0.08%** | **0.07%** | **99.8%** | **102.3%** | **99.8%** |

# Patent rights declaration(s)

**MediaTek Inc****. may have current or pending patent rights relating to the technology described in this contribution and, conditioned on reciprocity, is prepared to grant licenses under reasonable and non-discriminatory terms as necessary for implementation of the resulting ITU-T Recommendation | ISO/IEC International Standard (per box 2 of the ITU-T/ITU-R/ISO/IEC patent statement and licensing declaration form).**

# References

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