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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**  8th Meeting: Valencia, ES, 29 March – 4 April 2014 | Document: JCT3V- H0074 |

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

In current 3D-HEVC, the sub-PU prediction is only allowed in partition 2Nx2N in order to avoid the irregular 8x12/12x8 and bi-predicted 4x8/8x4 motion compensated prediction (MCP) block sizes that are not in HEVC specification. However, with the sub-PU motion parameter inheritance (MPI) merging candidate in depth coding, current 3D-HEVC could still generate irregular 8x12/12x8 and bi-predicted 4x8/8x4 MCP blocks. To solve these problems caused by sub-PU MPI, this contribution proposes to use PU level MPI for non-2Nx2N partition in order to align with the sub-PU prediction in texture coding as proposed in JCT3V-G0077, and avoid the irregular sub-PU partitions. As a further simplification, it is proposed to simply use the HEVC merging candidate list for non-2Nx2N partitions in depth coding. The experimental results reportedly show no coding loss for both simplifications.

# Introduction

In current 3D-HEVC [1], the motion parameter inheritance (MPI) merging candidate is applied at sub-PU level for depth coding [2]. For each sub-PU, the motion parameters are inherited from a collocated texture block. The sub-PU size for MPI is explicitly transmitted in the video parameter set and the allowed minimum sub-PU size is 8x8.

When the sub-PU size is set to 8x8, the sub-PU partition process for MPI in current 3D-HEVC will cause two problems. First, when the PU size is 16x12 /12x16, sub-blocks of size 8x12/12x8 are generated. Second, when the PU size is 16x4/4x16, sub-blocks of size 8x4/4x8 are generated while the prediction direction can be bi-prediction. However, 8x12 and 12x8 MCP block sizes are not in HEVC specification and bi-prediction is also prohibited for 8x4 and 4x8 MCP blocks.

# Proposed scheme

To avoid the problems stated in the above section, this contribution proposes two solutions.

In the first solution, use PU level MPI when PU partition is not 2Nx2N in order to align with the sub-PU IVMP in texture coding [3] and avoid the irregular sub-PU partitions.

In the second solution, this contribution further proposes to only allow 3D-HEVC merging candidates in 2Nx2N partition and simply use the HEVC merging candidate list for other non-2Nx2N partitions in depth coding. In this way, the merging candidate list construction process could be simplified.

# Experimental results

The proposed schemes are integrated into HTM-10.0r1 [4], and the tests are conducted under the common test conditions [5]. The experimental results for solution 1 and solution 2 are shown in Table 1 and Table 2, respectively. As shown in the results, all simplified solutions bring no coding loss.

**Table 1. The results of Solution 1 (use PU level MPI 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% | 0.01% | -0.01% | 0.00% | -0.01% | 0.01% | 99.0% | 98.1% | 99.0% |
| Kendo | 0.00% | 0.00% | -0.09% | -0.01% | 0.01% | -0.04% | 100.6% | 101.9% | 102.0% |
| Newspaper\_CC | 0.00% | 0.08% | -0.02% | 0.01% | -0.01% | -0.01% | 100.4% | 97.4% | 100.7% |
| GT\_Fly | 0.00% | -0.01% | 0.07% | 0.00% | 0.00% | -0.03% | 101.5% | 102.3% | 98.0% |
| Poznan\_Hall2 | 0.00% | 0.13% | 0.04% | 0.05% | 0.01% | -0.07% | 97.4% | 96.2% | 98.0% |
| Poznan\_Street | 0.00% | -0.10% | -0.03% | -0.02% | -0.01% | -0.02% | 100.9% | 100.5% | 101.8% |
| Undo\_Dancer | 0.00% | -0.07% | -0.08% | -0.01% | -0.03% | -0.10% | 99.6% | 101.1% | 98.3% |
| Shark | 0.00% | 0.03% | 0.03% | 0.00% | -0.01% | -0.04% | 101.6% | 103.5% | 99.0% |
| 1024x768 | 0.00% | 0.03% | -0.04% | 0.00% | 0.00% | -0.01% | 100.0% | 99.1% | 100.6% |
| 1920x1088 | 0.00% | 0.00% | 0.01% | 0.00% | -0.01% | -0.05% | 100.2% | 100.7% | 99.0% |
| **average** | **0.00%** | **0.01%** | **-0.01%** | **0.00%** | **-0.01%** | **-0.04%** | **100.1%** | **100.1%** | **99.6%** |

**Table 2. The results of Solution 2 (only use the HEVC merging candidate list 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% | 0.05% | 0.02% | 0.02% | 0.01% | -0.01% | 104.9% | 112.4% | 110.7% |
| Kendo | 0.00% | -0.01% | -0.19% | -0.03% | -0.02% | -0.02% | 99.5% | 99.5% | 103.0% |
| Newspaper\_CC | 0.00% | 0.06% | 0.05% | 0.03% | 0.00% | 0.00% | 100.3% | 98.9% | 100.9% |
| GT\_Fly | 0.00% | 0.15% | -0.09% | 0.00% | 0.02% | 0.04% | 101.3% | 114.2% | 101.4% |
| Poznan\_Hall2 | 0.00% | -0.11% | -0.10% | -0.03% | -0.04% | -0.04% | 97.9% | 104.1% | 100.5% |
| Poznan\_Street | 0.00% | -0.11% | -0.01% | -0.02% | 0.00% | 0.03% | 98.7% | 99.9% | 100.8% |
| Undo\_Dancer | 0.00% | -0.02% | 0.03% | 0.00% | 0.00% | 0.03% | 100.1% | 104.0% | 100.4% |
| Shark | 0.00% | 0.08% | 0.06% | 0.01% | 0.00% | -0.01% | 102.0% | 101.3% | 100.7% |
| 1024x768 | 0.00% | 0.03% | -0.04% | 0.01% | 0.00% | -0.01% | 101.5% | 103.6% | 104.9% |
| 1920x1088 | 0.00% | 0.00% | -0.02% | -0.01% | -0.01% | 0.01% | 100.0% | 104.7% | 100.8% |
| **average** | **0.00%** | **0.01%** | **-0.03%** | **0.00%** | **-0.01%** | **0.00%** | **100.6%** | **104.3%** | **102.3%** |

# Conclusion

In this contribution, two solutions are proposed to align the MCP size with HEVC and simplify the merging candidate list construction for depth coding. Experimental results show no coding loss.

# 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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