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| *Title:* | **Comparative Results for 3D-HEVC and MV-HEVC with depth coding** | | |
| *Status:* | Input Document | | |
| *Purpose:* | Proposal | | |
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# Abstract

This contribution evaluates the coding performance of the current implementations of 3D-HEVC and MV-HEVC with depth coding (based on HTM‑9.0r1). The results show that 3D-HEVC provides an average bit rate reduction of 20% on average relative to MV-HEVC. Based on this result, it is proposed that the 3D-HEVC working draft progress to Proposed Draft Amendment (PDAM) at this meeting.

# Experimental Results

This section provides simulation results for the current version of 3D-HEVC with all coding tools vs. MV-HEVC based on HTM‑9.0r1. For MV-HEVC, the video components are jointly coded with MV‑HEVC, while the depth components are coded separately, according to (HTM‑9.0r1-F0122 (rev747)). All simulation tests are performed based on the common test conditions, including VSO ON for both 3D-HEVC and MV-HEVC.

The performance of MV-HEVC with depth coding vs. 3D-HEVC is shown in Table 1.

Table 1: Coding performance of MV-HEVC with (single-view) depth coding vs. 3D-HEVC

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 | -0,1% | 54,7% | 52,3% | 18,8% | 22,6% | 23,5% | 135,0% | 82,4% | 105,7% |
| Kendo | -0,1% | 47,3% | 51,7% | 17,7% | 23,0% | 26,3% | 141,6% | 93,2% | 112,1% |
| Newspapercc | -0,1% | 29,3% | 27,0% | 10,0% | 13,8% | 21,1% | 128,2% | 75,9% | 97,9% |
| GhostTownFly | 0,0% | 52,1% | 50,0% | 10,8% | 17,1% | 28,3% | 139,9% | 78,9% | 97,3% |
| PoznanHall2 | -0,1% | 32,4% | 33,9% | 12,0% | 14,1% | 21,8% | 164,4% | 73,9% | 96,9% |
| PoznanStreet | 0,0% | 24,6% | 25,5% | 7,1% | 10,6% | 14,1% | 153,1% | 73,0% | 98,2% |
| UndoDancer | 0,0% | 34,0% | 34,3% | 8,7% | 12,5% | 25,4% | 140,7% | 82,5% | 105,5% |
| Shark | 0,0% | 48,8% | 46,3% | 9,6% | 19,5% | 37,8% | 152,5% | 82,4% | 104,3% |
| 1024x768 | -0,1% | 43,8% | 43,7% | 15,5% | 19,8% | 23,6% | 135,0% | 83,8% | 105,2% |
| 1920x1088 | 0,0% | 38,4% | 38,0% | 9,6% | 14,8% | 25,5% | 150,1% | 78,1% | 100,4% |
| **average** | 0,0% | 40,4% | 40,1% | 11,8% | 16,7% | 24,8% | 144,4% | 80,3% | 102,2% |

The performance of 3D-HEVC vs. MV-HEVC with depth coding is shown in Table 2.

Table 2: Coding performance of 3D-HEVC vs. MV-HEVC with (single-view) 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 | 0,1% | -35,4% | -34,4% | -15,8% | -18,4% | -19,0% | 74,1% | 121,3% | 94,6% |
| Kendo | 0,1% | -32,1% | -34,1% | -15,0% | -18,7% | -20,8% | 70,6% | 107,4% | 89,2% |
| Newspapercc | 0,1% | -22,7% | -21,3% | -9,1% | -12,2% | -17,5% | 78,0% | 131,8% | 102,2% |
| GhostTownFly | 0,0% | -34,2% | -33,3% | -9,8% | -14,6% | -22,0% | 71,5% | 126,8% | 102,7% |
| PoznanHall2 | 0,1% | -24,5% | -25,3% | -10,7% | -12,4% | -17,9% | 60,8% | 135,4% | 103,2% |
| PoznanStreet | 0,0% | -19,8% | -20,3% | -6,6% | -9,6% | -12,3% | 65,3% | 137,0% | 101,9% |
| UndoDancer | 0,0% | -25,4% | -25,5% | -8,0% | -11,1% | -20,3% | 71,1% | 121,3% | 94,8% |
| Shark | 0,0% | -32,8% | -31,7% | -8,7% | -16,3% | -27,4% | 65,6% | 121,4% | 95,9% |
| 1024x768 | 0,1% | -30,0% | -29,9% | -13,3% | -16,4% | -19,1% | 74,2% | 120,2% | 95,3% |
| 1920x1088 | 0,0% | -27,3% | -27,2% | -8,8% | -12,8% | -20,0% | 66,8% | 128,4% | 99,7% |
| **average** | 0,0% | -28,3% | -28,2% | -10,5% | -14,2% | -19,7% | 69,6% | 125,3% | 98,1% |

The encoding, decoding and rendering estimates of the proposed scheme are calculated on the Linux cluster; these estimates may not be accurate due to parallel simulations.

# Conclusion and Recommendation

The results show significant coding gain of 3D-HEVC versus MV-HEVC of 20% on average, or vice versa, a coding loss of 25% of MV-HEVC versus 3D-HEVC. Accordingly, we propose that the 3D-HEVC working draft progress to Proposed Draft Amendment (PDAM), as planned at the previous 6th JCT-3V meeting.

Additionally, the results are available for informal subjective viewing at this meeting. It is recommended that the operating points be confirmed and that more formal assessment of subjective quality be planned, similar to the tests being done for 3D codecs based on AVC.

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