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| *Title:* | **Improved inside-view motion prediction for 3D-AVC** | | |
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# Abstract

In the current 3D-AVC, inside-view motion prediction (IVMP) is employed for depth coding. When the co-located macroblock (MB) in the texture view is intra-coded, the reference index and motion vectors of the current depth block are set zero. In this contribution, as a follow-up of JCT3V-C0091, the motion information from several candidate blocks is used to further improve the coding performance of IVMP for the cases when co-located MB is intra coded or partitioned into four 8x8 MB partitions. Experimental results show that the proposed method achieves average 0.08% coding gain on synthesized views for texture first coding configuration.

1. **Introduction**

In current IVMP method in 3D-AVC, an unconstrained IVMP process in JCT3V-C0136 [1] is adopted. When the co-located MB in the texture view is inter-coded with P8x8 mode, the current depth block utilizes the same rule for the P16x8 and P8x16 modes to get the motion information. When the co-located MB in the texture view is intra-coded, the current depth block is always set to SMB8x8 mode with zero motion vectors. To further improve the coding performance, in this proposal, the methods proposed for motion inheritance in JCT3V-C0091 [2] are further tested on ATM v7.0 for intra mode and P8x8 mode separately.

1. **Proposed Method**

For an 8x8 MB partition with partition index i, where i=0, 1, 2, 3, in depth view, if it corresponds to one texture MB, the followings are applied for motion parameter inheritance,

When the corresponding texture MB is coded by P8x8 mode, ONLY the MB partition with the same color, as shown in Figure 1, is used for motion inheritance, as described by the followings,

* The reference index of MB partition with partition index 3-i in co-located texture MB is inherited by current 8x8 depth MB partition.
* The scaled motion vector with the maximum value of Abs(mv[0])+ Abs(mv[1]) in the MB partition with partition index 3-i in co-located texture MB is inherited by current 8x8 depth MB partition.
* The sub-partition mode of current 8x8 MB partition in depth view is set as SMB8x8.



(a) Four co-located texture MBs

(b) One depth MB

Figure 1: Texture 8x8 MB partition to be used directly for depth partition.

When the corresponding texture MB is coded by intra mode, the followings are applied, to inherit motion information for the current 8x8 depth MB partition:

* If only one of the four corresponding texture MBs, denoted as T, is inter-coded, motion information of the 4x4 block in T, which is closest to the center of the four corresponding texture MBs, is inherited by the current block.
* Otherwise, the median filtering is applied to the three 4x4 blocks that are closest to the center of the four corresponding texture MBs but not within the current corresponding texture MB, to derive the motion information of the current 8x8 block.
* If four co-located texture MBs of current depth MB are all intra-coded, it is handled the same as in the current 3D-AVC.

In the above proposed method, when saying motion vector cost, it refers to the sum of absolute values of horizontal and vertical components if the motion vector available, otherwise the cost is set as -1.

1. **Compression Performance**

The proposed method is implemented on top of 3D-ATM v7.0 with bug fix as provided by JCT3V-D0189, and the anchor used in simulations is 3D-ATM v7.0 with also the bug fix. Both common test conditions [4] and texture-first test condition are used in simulations. For texture-first test condition, the coding order is configured to be “T0D0T1D1T2D2”, and BVSP is turned off since current 3D-ATM v7.0 does not support BVSP for texture-first coding order.

Table 1 provides the results under texture-first test condition. The average BD-rate gain for total coded views and synthesized views are -0.06% and -0.08%, respectively.

Table 1: Coding performance under texture first test condition

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Texture Coding | | Depth Coding | | Total  (Coded PSNR) | | Total  (Syn. PSNR) | | Complexity estimate  (ratio to anchor) | | |
|  | dBR  % | dPSNR  dB | dBR  % | dPSNR  dB | dBR  % | dPSNR  dB | dBR  % | dPSNR  dB | Enc. Time  % | Dec. Time  % | Ren.Time  % |
| S01 | 0.00 | 0.00 | -0.84 | 0.04 | -0.04 | 0.00 | -0.05 | 0.00 | 89.9% | 88.0% | 92.6% |
| S02 | 0.00 | 0.00 | -0.58 | 0.03 | -0.04 | 0.00 | -0.05 | 0.00 | 89.2% | 85.9% | 87.5% |
| S03 | 0.00 | 0.00 | -1.47 | 0.12 | -0.08 | 0.00 | -0.16 | 0.01 | 83.4% | 85.2% | 83.1% |
| S04 | 0.00 | 0.00 | -1.51 | 0.09 | -0.10 | 0.00 | -0.12 | 0.00 | 99.9% | 97.3% | 97.6% |
| S05 | 0.00 | 0.00 | -0.45 | 0.02 | -0.06 | 0.00 | -0.07 | 0.00 | 94.7% | 91.6% | 94.1% |
| S06 | 0.00 | 0.00 | -0.49 | 0.02 | -0.04 | 0.00 | -0.04 | 0.00 | 101.1% | 98.4% | 100.9% |
| S08 | 0.00 | 0.00 | -0.45 | 0.02 | -0.04 | 0.00 | -0.08 | 0.00 | 94.5% | 93.5% | 93.7% |
| Average | 0.00 | 0.00 | -0.83 | 0.05 | -0.06 | 0.00 | -0.08 | 0.00 | 93.2% | 91.4% | 92.8% |

Table 2 provides the results under common test conditions. The average BD-rate gain for total coded views and synthesized views are -0.02% and -0.04%, respectively.

Table 2: Coding performance under common test conditions

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Texture Coding | | Depth Coding | | Total  (Coded PSNR) | | Total  (Syn. PSNR) | | Complexity estimate  (ratio to anchor) | | |
|  | dBR  % | dPSNR  dB | dBR  % | dPSNR  dB | dBR  % | dPSNR  dB | dBR  % | dPSNR  dB | Enc. Time  % | Dec. Time  % | Ren.Time  % |
| S01 | 0.07 | 0.00 | -0.19 | 0.00 | 0.04 | 0.00 | -0.01 | 0.00 | 90.2% | 90.3% | 89.7% |
| S02 | 0.00 | 0.00 | -0.44 | 0.02 | -0.04 | 0.00 | -0.04 | 0.00 | 97.4% | 97.0% | 99.9% |
| S03 | 0.01 | 0.00 | -0.68 | 0.06 | -0.03 | 0.00 | -0.14 | 0.00 | 84.7% | 80.4% | 83.5% |
| S04 | 0.02 | 0.00 | -1.07 | 0.06 | -0.07 | 0.00 | -0.08 | 0.00 | 100.2% | 101.9% | 101.7% |
| S05 | 0.01 | 0.00 | -0.26 | 0.01 | -0.01 | 0.00 | 0.00 | 0.00 | 97.9% | 97.8% | 98.5% |
| S06 | 0.01 | 0.00 | -0.45 | 0.02 | -0.04 | 0.00 | -0.06 | 0.00 | 101.9% | 99.4% | 101.5% |
| S08 | 0.00 | 0.00 | -0.15 | 0.01 | -0.01 | 0.00 | 0.01 | 0.00 | 98.2% | 95.9% | 97.6% |
| Average | 0.02 | 0.00 | -0.47 | 0.03 | -0.02 | 0.00 | -0.04 | 0.00 | 95.8% | 94.7% | 96.1% |

1. **References**
2. J.-L. Lin, Y.-W. Chen, Y.-W. Huang, S. Lei, "Unconstrained inside-view motion prediction in 3D video coding," ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11, JCT3V-C0136, 3rd Meeting: Geneva, CH, 17–23 Jan. 2013.
3. K-J. Oh, H.-C. Wey, D.-S. Park, L. He, L. Zhang, "Improved inside-view motion prediction for 3D-AVC," ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11, JCT3V-C0091, 3rd Meeting: Geneva, CH, 17–23 Jan. 2013.
4. X. Zhao, L. Zhang, Y. Chen. M. Karczewicz, "Bug fix and simplifications for ATM IVMP," ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11, JCT3V-D0189, 4th Meeting: Incheon, KR, 20–26 Apr. 2013.
5. D. Rusanovskyy, K. Müller, A. Vetro, "Common Test Conditions of 3DV Core Experiments," ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11, JCT3V-C1100, 3rd Meeting: Geneva, CH, 17–23 Jan. 2013.
6. **Patent rights declaration(s)**

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