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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11**  19th Meeting: Strasbourg, FR, 17–24 Oct 2014 | Document: JCTVC-S0207 |

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| --- | --- | --- | --- |
| *Title:* | **Crosscheck of block vector predictor (JCTVC-S0087)** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Report | | |
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# Abstract

This documents reports the crosscheck results for JCTVC-S0087—block vector predictor. The source code provided by the proponents was verified to be consistent with the description in the proposal. The rate-distortion performance was evaluated for CTC and matches the one provided in JCTVC-S0087.

# Introduction

JCTVC-S0087 [1] describes a technique where the block vector predictor candidate list construction is changed. The two spatial candidates in SCM-2.0 are replaced using 5 spatial merge candidates in HEVC. The other parts of the BVP in SCM-2.0 remain the same. An encoder optimization is also proposed to use full RDO check for the non-constant BV predictors.

# Simulation results

The performance of the JCTVC-S0087 is cross-checked according to CTC [2] and is summarized below. The detailed results can be found in the attached excel datasheets. In Test 1, the encoder optimization is performed; in Test 2, both encoder optimization and the proposed change in BV predictor candidate list are enabled.

Table 1. Average BD rate reduction for Test 1 lossless coding

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **All Intra** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 1.7% | 1.7% | 1.2% | 2.4% |
| RGB, text & graphics with motion,720p | 0.3% | 0.3% | 0.0% | 0.6% |
| RGB, mixed content, 1440p | 1.2% | 1.0% | 0.2% | 1.9% |
| RGB, mixed content, 1080p | 1.2% | 1.2% | 1.2% | 1.2% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 0.5% | 0.5% | 0.4% | 0.5% |
| YUV, text & graphics with motion,720p | 0.1% | 0.1% | 0.0% | 0.3% |
| YUV, mixed content, 1440p | 1.0% | 0.9% | 0.1% | 1.7% |
| YUV, mixed content, 1080p | 0.8% | 0.8% | 0.8% | 0.8% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 113% | | | |
| Dec Time[%] | 97% | | | |
|  |  |  |  |  |
|  | **Random Access** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 1.1% | 1.6% | 1.0% | 2.3% |
| RGB, text & graphics with motion,720p | 0.1% | 0.2% | 0.1% | 0.4% |
| RGB, mixed content, 1440p | 0.2% | 0.2% | 0.0% | 0.4% |
| RGB, mixed content, 1080p | 0.2% | 0.2% | 0.2% | 0.2% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 0.7% | 1.1% | 0.6% | 1.7% |
| YUV, text & graphics with motion,720p | 0.0% | 0.1% | 0.0% | 0.2% |
| YUV, mixed content, 1440p | 0.2% | 0.2% | 0.0% | 0.4% |
| YUV, mixed content, 1080p | 0.1% | 0.1% | 0.1% | 0.1% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 100% | | | |
| Dec Time[%] | 101% | | | |
|  |  |  |  |  |
|  |  |  |  |  |
|  | **Low Delay B** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 1.2% | 1.7% | 1.2% | 2.7% |
| RGB, text & graphics with motion,720p | 0.1% | 0.1% | 0.0% | 0.3% |
| RGB, mixed content, 1440p | 0.1% | 0.1% | 0.0% | 0.2% |
| RGB, mixed content, 1080p | 0.1% | 0.1% | 0.1% | 0.1% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 0.6% | 1.3% | 0.5% | 2.5% |
| YUV, text & graphics with motion,720p | 0.0% | 0.1% | 0.0% | 0.3% |
| YUV, mixed content, 1440p | 0.1% | 0.1% | 0.0% | 0.1% |
| YUV, mixed content, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 100% | | | |
| Dec Time[%] | 101% | | | |

Table 2. Average BD rate reduction for Test 1 lossy coding

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -2.6% | -2.6% | -2.6% |
| RGB, text & graphics with motion,720p | -0.9% | -1.0% | -0.9% |
| RGB, mixed content, 1440p | -1.3% | -1.2% | -1.4% |
| RGB, mixed content, 1080p | -1.1% | -1.1% | -1.1% |
| RGB, Animation, 720p | -0.1% | -0.1% | -0.1% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -0.6% | -0.7% | -0.7% |
| YUV, text & graphics with motion,720p | -0.5% | -0.5% | -0.5% |
| YUV, mixed content, 1440p | -0.7% | -0.8% | -0.9% |
| YUV, mixed content, 1080p | -0.6% | -0.6% | -0.7% |
| YUV, Animation, 720p | -0.2% | -0.2% | -0.2% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 120% | | |
| Dec Time[%] | 99% | | |
|  |  |  |  |
|  | **Random Access** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -2.4% | -2.2% | -2.3% |
| RGB, text & graphics with motion,720p | -0.6% | -0.8% | -0.7% |
| RGB, mixed content, 1440p | -0.8% | -0.9% | -1.1% |
| RGB, mixed content, 1080p | -0.8% | -1.0% | -1.2% |
| RGB, Animation, 720p | -0.1% | -0.1% | -0.1% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -2.1% | -2.1% | -2.1% |
| YUV, text & graphics with motion,720p | -0.3% | -0.4% | -0.3% |
| YUV, mixed content, 1440p | -0.7% | -0.7% | -0.8% |
| YUV, mixed content, 1080p | -0.6% | -0.8% | -0.9% |
| YUV, Animation, 720p | -0.1% | -0.2% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.1% | 0.0% |
| Enc Time[%] | 101% | | |
| Dec Time[%] | 100% | | |
|  |  |  |  |
|  | **Low delay B** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -2.4% | -2.1% | -2.1% |
| RGB, text & graphics with motion,720p | -0.5% | -0.4% | -0.4% |
| RGB, mixed content, 1440p | -0.7% | -0.7% | -0.8% |
| RGB, mixed content, 1080p | -0.6% | -0.1% | -0.2% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.1% |
| RGB, camera captured, 1080p | -0.1% | 0.0% | 0.1% |
| YUV, text & graphics with motion, 1080p | -2.3% | -2.2% | -2.1% |
| YUV, text & graphics with motion,720p | -0.5% | -0.2% | -0.3% |
| YUV, mixed content, 1440p | -0.7% | -0.3% | -0.3% |
| YUV, mixed content, 1080p | -0.7% | 0.0% | -0.7% |
| YUV, Animation, 720p | 0.0% | -0.2% | -0.1% |
| YUV, camera captured, 1080p | 0.0% | -0.2% | 0.0% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 100% | | |

Table 3. Average BD rate reduction for Test 2 lossless coding

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **All Intra** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 2.7% | 2.8% | 2.2% | 3.1% |
| RGB, text & graphics with motion,720p | 0.5% | 0.6% | 0.1% | 1.1% |
| RGB, mixed content, 1440p | 1.6% | 1.4% | 0.4% | 2.4% |
| RGB, mixed content, 1080p | 1.5% | 1.5% | 1.5% | 1.5% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 1.4% | 1.4% | 1.0% | 1.7% |
| YUV, text & graphics with motion,720p | 0.4% | 0.5% | 0.1% | 0.9% |
| YUV, mixed content, 1440p | 1.5% | 1.3% | 0.3% | 2.2% |
| YUV, mixed content, 1080p | 1.2% | 1.2% | 1.2% | 1.2% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 118% | | | |
| Dec Time[%] | 98% | | | |
|  |  |  |  |  |
|  | **Random Access** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 1.9% | 2.4% | 1.9% | 3.3% |
| RGB, text & graphics with motion,720p | 0.2% | 0.3% | 0.1% | 0.7% |
| RGB, mixed content, 1440p | 0.3% | 0.3% | 0.0% | 0.6% |
| RGB, mixed content, 1080p | 0.3% | 0.3% | 0.3% | 0.3% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 1.5% | 1.8% | 1.4% | 2.6% |
| YUV, text & graphics with motion,720p | 0.1% | 0.3% | 0.1% | 0.5% |
| YUV, mixed content, 1440p | 0.2% | 0.3% | 0.0% | 0.5% |
| YUV, mixed content, 1080p | 0.2% | 0.2% | 0.2% | 0.2% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 101% | | | |
| Dec Time[%] | 103% | | | |
|  |  |  |  |  |
|  |  |  |  |  |
|  | **Low Delay B** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 2.1% | 2.4% | 1.7% | 3.4% |
| RGB, text & graphics with motion,720p | 0.1% | 0.2% | 0.0% | 0.4% |
| RGB, mixed content, 1440p | 0.2% | 0.2% | 0.0% | 0.3% |
| RGB, mixed content, 1080p | 0.1% | 0.1% | 0.1% | 0.1% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 1.4% | 2.0% | 1.3% | 3.2% |
| YUV, text & graphics with motion,720p | 0.1% | 0.2% | 0.1% | 0.5% |
| YUV, mixed content, 1440p | 0.1% | 0.1% | 0.0% | 0.2% |
| YUV, mixed content, 1080p | 0.1% | 0.1% | 0.1% | 0.1% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 100% | | | |
| Dec Time[%] | 99% | | | |

Table 4. Average BD rate reduction for Test 2 lossy coding

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -3.8% | -3.8% | -3.8% |
| RGB, text & graphics with motion,720p | -1.9% | -2.0% | -2.0% |
| RGB, mixed content, 1440p | -2.0% | -2.0% | -2.1% |
| RGB, mixed content, 1080p | -1.8% | -1.7% | -1.8% |
| RGB, Animation, 720p | -0.1% | -0.1% | -0.1% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -1.8% | -1.9% | -1.9% |
| YUV, text & graphics with motion,720p | -1.5% | -1.6% | -1.5% |
| YUV, mixed content, 1440p | -1.4% | -1.4% | -1.6% |
| YUV, mixed content, 1080p | -1.3% | -1.2% | -1.4% |
| YUV, Animation, 720p | -0.2% | -0.3% | -0.3% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 125% | | |
| Dec Time[%] | 98% | | |
|  |  |  |  |
|  | **Random Access** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -3.2% | -3.0% | -3.1% |
| RGB, text & graphics with motion,720p | -1.2% | -1.4% | -1.3% |
| RGB, mixed content, 1440p | -1.3% | -1.3% | -1.4% |
| RGB, mixed content, 1080p | -1.3% | -1.4% | -1.5% |
| RGB, Animation, 720p | 0.0% | -0.1% | -0.1% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -2.9% | -2.8% | -2.8% |
| YUV, text & graphics with motion,720p | -1.0% | -1.1% | -1.0% |
| YUV, mixed content, 1440p | -1.1% | -1.1% | -1.0% |
| YUV, mixed content, 1080p | -1.2% | -0.9% | -1.2% |
| YUV, Animation, 720p | 0.0% | -0.2% | 0.0% |
| YUV, camera captured, 1080p | 0.1% | 0.1% | 0.0% |
| Enc Time[%] | 102% | | |
| Dec Time[%] | 100% | | |
|  |  |  |  |
|  | **Low delay B** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -3.0% | -2.7% | -2.8% |
| RGB, text & graphics with motion,720p | -0.7% | -0.6% | -0.6% |
| RGB, mixed content, 1440p | -1.0% | -1.1% | -1.0% |
| RGB, mixed content, 1080p | -0.9% | -0.3% | 0.2% |
| RGB, Animation, 720p | -0.1% | -0.1% | 0.1% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -3.0% | -2.9% | -2.9% |
| YUV, text & graphics with motion,720p | -0.8% | -0.5% | -1.2% |
| YUV, mixed content, 1440p | -1.2% | -0.8% | -0.7% |
| YUV, mixed content, 1080p | -0.9% | -0.5% | -0.9% |
| YUV, Animation, 720p | 0.1% | -0.4% | 0.3% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.1% |
| Enc Time[%] | 100% | | |
| Dec Time[%] | 99% | | |

# References

1. B. Li and J. Xu, “On block vector predictor”, JCTVC-S0087, Oct. 2014.
2. H. Yu, R. Cohen, K. Rapaka, J. Xu, “Common conditions for screen content coding tests” JCTVC-R1015, Sapporo, JP, 30 June – 9 July 2014.