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| *Title:* | **Cross-check report on Description of SCC technology proposal by MERL (JCTVC-Q0036)** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Information | | |
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# Abstract

This contribution reports the cross-check results performed by Huawei on JCTVC-Q0036. For some sequences, the first frame will consume 16 more bits than those reported by the proponent, which results from the absence of level specification in the configuration file. After the deduction of these 16 bits, our test results matched, in terms of bitrates, those presented in the contribution documents.

# Description

In JCTVC-Q0036, four additional tools are proposed: Inter-Component prediction (ICP), histogram correction (HC) mode for SAO, independent uniform prediction (IUP), and palette mode. 1). ICP could further reduce inter-component redundancy for screen contents. 2). HC mode was added as an alternative to Band Offset(BO) and Edge Offset(EO), which can reduce the coding distortion and improve the perceptual image quality. 3). IUP will compute a small set of global predictors for regions that have more commonly-occurring colors which are common in a computing environment. 4) Palette mode is based on JCTVC-P0303.

# Results

The simulations were run on a 64-bit Windows cluster. In our simulations, for sequences Flyinggraphics RGB/YUV, Desktop RGB/YUV, SocialNetworkMap RGB/YUV, Console YUV, “Level: 6.2” in the per-sequence configuration files was not specified, which will result in 16 extra bits in the bitstream size. After the 16 bits were deducted from the bitstreams for these sequences, our results matched, in terms of bitrate, those reported by the proponents. Regardless of the bitrates, all the PSNR value for the lossy case match, and the decoder SEI MD5 hash values match that from the encoder. The anchors and Q0036 cross-check results were computed on different computer systems. Therefore the encoding and decoding time for the two cases are not comparable. The complete cross-check results are provided in the accompanying spreadsheets including both the original spreadsheets and corrected spreadsheets. Below shows the summary of the test results from the corrected spreadsheets.

(Notes: RA tests have the same QP setting with the RA tests showing in the Appendix of Q0036).

## Lossless results

Table 1 Results of cross-check of Q0036 for lossless coding

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **AI** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 30.0% | 31.8% | 21.8% | 43.3% |
| RGB, text & graphics with motion,720p | 16.3% | 17.2% | 3.5% | 32.0% |
| RGB, mixed content, 1440p | 5.4% | 5.7% | 4.6% | 6.8% |
| RGB, mixed content, 1080p | 10.7% | 9.7% | 7.1% | 12.3% |
| RGB, Animation, 720p | 4.5% | 4.5% | 4.5% | 4.5% |
| YUV, text & graphics with motion, 1080p | 28.9% | 30.4% | 17.5% | 45.8% |
| YUV, text & graphics with motion,720p | 14.1% | 16.3% | 1.8% | 37.0% |
| YUV, mixed content, 1440p | 3.2% | 3.5% | 1.9% | 5.0% |
| YUV, mixed content, 1080p | 8.7% | 7.7% | 5.3% | 10.1% |
| YUV, Animation, 720p | 2.6% | 2.6% | 2.6% | 2.6% |
| Enc Time[%] | 276% | | | |
| Dec Time[%] | 93% | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **RA** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 20.1% | 28.5% | 19.1% | 41.3% |
| RGB, text & graphics with motion,720p | 7.9% | 14.0% | 5.8% | 28.2% |
| RGB, mixed content, 1440p | 8.2% | 8.2% | 7.1% | 9.2% |
| RGB, mixed content, 1080p | 11.1% | 9.9% | 8.6% | 11.3% |
| RGB, Animation, 720p | 7.3% | 7.3% | 7.3% | 7.3% |
| YUV, text & graphics with motion, 1080p | 12.6% | 20.9% | 11.6% | 34.6% |
| YUV, text & graphics with motion,720p | 4.9% | 11.2% | 1.6% | 31.7% |
| YUV, mixed content, 1440p | 1.8% | 1.8% | 1.4% | 2.1% |
| YUV, mixed content, 1080p | 6.8% | 4.5% | 1.8% | 7.1% |
| YUV, Animation, 720p | 2.0% | 2.0% | 2.0% | 2.0% |
| Enc Time[%] | 145% | | | |
| Dec Time[%] | 112% | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **LB** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 20.5% | 28.3% | 19.9% | 40.7% |
| RGB, text & graphics with motion,720p | 8.2% | 12.6% | 6.3% | 21.2% |
| RGB, mixed content, 1440p | 9.2% | 9.2% | 8.2% | 10.2% |
| RGB, mixed content, 1080p | 11.1% | 10.3% | 9.4% | 11.2% |
| RGB, Animation, 720p | 7.7% | 7.7% | 7.7% | 7.7% |
| YUV, text & graphics with motion, 1080p | 11.8% | 17.7% | 11.3% | 26.6% |
| YUV, text & graphics with motion,720p | 4.2% | 8.2% | 1.6% | 22.6% |
| YUV, mixed content, 1440p | 1.9% | 1.8% | 1.3% | 2.4% |
| YUV, mixed content, 1080p | 6.8% | 4.2% | 1.4% | 7.1% |
| YUV, Animation, 720p | 1.9% | 1.9% | 1.9% | 1.9% |
| Enc Time[%] | 138% | | | |
| Dec Time[%] | 117% | | | |

## Lossy results

Table 2 Results of cross-check of Q0036 for lossy coding

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra** | | |
|  | Y | U | V |
| RGB, text & graphics with motion, 1080p | -27.0% | -28.0% | -27.6% |
| RGB, text & graphics with motion,720p | -19.1% | -19.3% | -20.0% |
| RGB, mixed content, 1440p | -11.0% | -10.9% | -11.0% |
| RGB, mixed content, 1080p | -13.4% | -13.6% | -13.4% |
| RGB, Animation, 720p | -8.2% | -10.4% | -8.0% |
| YUV, text & graphics with motion, 1080p | -25.5% | -27.7% | -27.6% |
| YUV, text & graphics with motion,720p | -14.6% | -19.6% | -22.4% |
| YUV, mixed content, 1440p | -8.3% | -12.8% | -12.5% |
| YUV, mixed content, 1080p | -11.5% | -13.8% | -13.7% |
| YUV, Animation, 720p | -1.8% | -6.4% | -5.8% |
| Enc Time[%] | 282% | | |
| Dec Time[%] | 92% | | |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Random Access** | | |
|  | Y | U | V |
| RGB, text & graphics with motion, 1080p | -14.6% | -15.5% | -15.2% |
| RGB, text & graphics with motion,720p | -16.6% | -16.6% | -17.7% |
| RGB, mixed content, 1440p | -7.7% | -8.1% | -8.3% |
| RGB, mixed content, 1080p | -7.7% | -8.1% | -7.9% |
| RGB, Animation, 720p | -4.2% | -5.8% | -4.5% |
| YUV, text & graphics with motion, 1080p | -13.2% | -16.8% | -16.9% |
| YUV, text & graphics with motion,720p | -11.9% | -17.1% | -20.7% |
| YUV, mixed content, 1440p | -5.6% | -12.3% | -12.0% |
| YUV, mixed content, 1080p | -6.4% | -10.0% | -9.7% |
| YUV, Animation, 720p | -0.7% | -5.1% | -4.8% |
| Enc Time[%] | 189% | | |
| Dec Time[%] | 131% | | |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Low delay B** | | |
|  | Y | U | V |
| RGB, text & graphics with motion, 1080p | -9.4% | -10.2% | -9.7% |
| RGB, text & graphics with motion,720p | -10.2% | -10.1% | -10.7% |
| RGB, mixed content, 1440p | -5.0% | -5.1% | -5.2% |
| RGB, mixed content, 1080p | -6.3% | -6.0% | -6.0% |
| RGB, Animation, 720p | -2.3% | -2.9% | -2.1% |
| YUV, text & graphics with motion, 1080p | -8.1% | -10.4% | -10.6% |
| YUV, text & graphics with motion,720p | -7.3% | -10.3% | -13.5% |
| YUV, mixed content, 1440p | -3.6% | -10.2% | -10.1% |
| YUV, mixed content, 1080p | -4.4% | -7.2% | -6.8% |
| YUV, Animation, 720p | 0.0% | -2.4% | -2.3% |
| Enc Time[%] | 174% | | |
| Dec Time[%] | 133% | | |

# Conclusions

Our verification test results confirmed the reported coding efficiency gain in JCTVC-Q0036 in the condition specified above.