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| *Title:* | **CE6: Test B.5 – Escape colour prediction** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

This proposal reports the simulation results with escape color prediction method (CE6 Test B.5) to improve palette coding. The escape color is predicted from previous coded escape color list or the palette table, and the residual is coded. Compared to CE6 anchors, the proposed technologies achieve total bit-rate saving up to 1.3%, 0.7%, 0.6% for lossless AI, RA and LDB coding for Y component excluding categories of animation and camera captured. For screen content only, the proposed technologies achieve 3.3%, 2.3%, 2.1% for lossless AI, RA and LD coding.

# Introduction

The escape color prediction technology was first proposed in JCTVC-Q0037 [4], and tested in last SCCE3 [3]. It is proposed to improve escape color coding in palette coding of current SCC design [2]. This method is improved further by using previous coded escape colors in addition to those major colors in palette table for escape color prediction. The encoder will decide if the escape color is coded with prediction or not, and signal a flag pred\_flag shown in Figure 1. The predictor can be either from previous coded escape color list or from the palette table of current coding unit. The index value of the list entry used for prediction, along with the prediction difference (including absolute difference and the sign bit), are coded. The reconstructed escape color will be inserted to the coded escape color list if it does not exist in the list. Figure 1 shows the escape color coding with escape color prediction.



Figure . Escape color coding with prediction

# Simulation results

The compression performance is measured using BD rate compared with CE6 anchors, using the CE6 test conditions [1]. Table 1 and Table 2 give the detailed average BD rate reduction for lossless and lossy coding with escape color prediction method compared with CE6 anchors, respectively. The full test results are provided with the accompanying spreadsheets for details.

As shown in Table 1, compared with CE6 anchors, the lossless coding achieves total bit-rate saving of 4.1%, 2.6% and 2.4% for the category (YUV, text & graphics with motion, 1080p) for AI, RA and LDB, respectively.

Table 1. Average BD rate reduction for lossless coding compared with CE6 anchors

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **All Intra** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 2.5% | 2.4% | 1.5% | 3.6% |
| RGB, text & graphics with motion,720p | 1.0% | 0.8% | 0.2% | 1.5% |
| RGB, mixed content, 1440p | 0.6% | 0.6% | 0.5% | 0.6% |
| RGB, mixed content, 1080p | 0.4% | 0.4% | 0.4% | 0.4% |
| 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 | 4.1% | 4.0% | 1.8% | 6.1% |
| YUV, text & graphics with motion,720p | 1.3% | 1.0% | 0.3% | 2.1% |
| YUV, mixed content, 1440p | 0.5% | 0.6% | 0.3% | 0.8% |
| YUV, mixed content, 1080p | 0.4% | 0.4% | 0.4% | 0.4% |
| 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[%] | 122% | | | |
| Dec Time[%] | 102% | | | |

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| --- | --- | --- | --- | --- |
|  | **Random Access** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 2.0% | 1.3% | 0.8% | 2.1% |
| RGB, text & graphics with motion,720p | 0.3% | 0.3% | 0.1% | 0.5% |
| RGB, mixed content, 1440p | 0.1% | 0.1% | 0.1% | 0.1% |
| 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 | 2.6% | 2.4% | 0.9% | 3.9% |
| YUV, text & graphics with motion,720p | 0.2% | 0.4% | 0.1% | 0.8% |
| YUV, mixed content, 1440p | 0.1% | 0.1% | 0.1% | 0.1% |
| 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[%] | 106% | | | |
| 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 | 1.9% | 1.1% | 0.3% | 2.0% |
| RGB, text & graphics with motion,720p | 0.2% | 0.2% | 0.1% | 0.5% |
| RGB, mixed content, 1440p | 0.0% | 0.0% | 0.0% | 0.1% |
| RGB, mixed content, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| 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 | 2.4% | 2.1% | 0.3% | 3.6% |
| YUV, text & graphics with motion,720p | 0.2% | 0.3% | 0.1% | 0.7% |
| YUV, mixed content, 1440p | 0.0% | 0.0% | 0.0% | 0.0% |
| 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[%] | 106% | | | |
| Dec Time[%] | 105% | | | |

Table 2. Average BD rate reduction for lossly coding compared with CE6 anchors

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -0.2% | -0.1% | -0.1% |
| RGB, text & graphics with motion,720p | -0.2% | -0.1% | -0.1% |
| RGB, mixed content, 1440p | -0.1% | 0.0% | -0.1% |
| RGB, mixed content, 1080p | -0.1% | 0.0% | 0.0% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -0.1% | -0.2% | -0.2% |
| YUV, text & graphics with motion,720p | 0.0% | 0.0% | 0.0% |
| YUV, mixed content, 1440p | 0.0% | 0.0% | 0.0% |
| YUV, mixed content, 1080p | 0.0% | 0.0% | -0.1% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 113% | | |
| Dec Time[%] | 101% | | |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Random Access** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -0.1% | 0.0% | -0.1% |
| RGB, text & graphics with motion,720p | -0.1% | -0.1% | -0.1% |
| RGB, mixed content, 1440p | -0.2% | -0.2% | -0.1% |
| RGB, mixed content, 1080p | -0.1% | -0.3% | -0.2% |
| RGB, Animation, 720p | 0.1% | 0.1% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -0.1% | -0.1% | -0.1% |
| YUV, text & graphics with motion,720p | 0.0% | 0.0% | 0.0% |
| YUV, mixed content, 1440p | 0.0% | 0.2% | 0.0% |
| YUV, mixed content, 1080p | -0.1% | -0.1% | 0.0% |
| YUV, Animation, 720p | 0.1% | -0.1% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 105% | | |
| Dec Time[%] | 102% | | |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Low delay B** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -0.1% | 0.0% | -0.1% |
| RGB, text & graphics with motion,720p | -0.2% | -0.1% | -0.1% |
| RGB, mixed content, 1440p | -0.2% | -0.2% | -0.1% |
| RGB, mixed content, 1080p | -0.4% | 0.1% | -0.1% |
| RGB, Animation, 720p | -0.1% | 0.2% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -0.1% | -0.1% | -0.1% |
| YUV, text & graphics with motion,720p | 0.0% | 0.0% | 0.0% |
| YUV, mixed content, 1440p | 0.0% | -0.1% | -0.1% |
| YUV, mixed content, 1080p | 0.1% | -0.1% | 0.1% |
| YUV, Animation, 720p | 0.0% | -0.5% | 0.1% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 104% | | |
| Dec Time[%] | 101% | | |

# Patent rights declaration(s)

**InterDigital Communications, Inc. may have IPR 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).**

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