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| *Title:* | **SCCE3: Test B.11 – Escape color 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 (SCCE3 Test B.11) for palette coding. The technology was originally proposed in the response of SCC CfP (JCTVC-Q0037) from InterDigital. The escape color was predicted from the palette table and the residual is coded. Compared to SCCE3 2CTU IntraBC anchors, the proposed technologies achieve total bit-rate saving up to 0.9%, 0.4%, 0.3% for lossless AI, RA and LDB coding for Y component excluding categories of animation and camera captured.

# Introduction

The escape color prediction method was first proposed in JCTVC-Q0037 [2]. It is used to encode the escape colors efficiently. A flag is signaled to indicate if all color components of the current escape color pixel is the same as that of the previous escape color pixel or not. And if not the same, the current escape color value is predicted from an entry in the palette table. The index value of the table entry used for prediction, along with the prediction difference (including absolute difference and the sign bit), are coded.

# Simulation results

The compression performance is measured using BD rate compared with SCCE3 anchors, using the SCCE3 test conditions [1]. Table 1 and Table 2 gives the detailed average BD rate reduction for lossless coding with escape color prediction method compared with SCCE3 2CTU and full frame IntraBC anchors, respectively. The full test results are provided with the accompanying spreadsheets for details.

As shown in Table 1, compared with SCCE3 2CTU IntraBC anchors, the lossless coding achieves total bit-rate saving of 2.4%, 1.5% and 1.2% for the category (YUV, text & graphics with motion, 1080p) for AI, RA and LDB, respectively. As shown in Table 2, compared with SCCE3 full frame IntraBC anchors, the lossless coding achieves total bit-rate saving of 2.0%, 1.1% and 0.9% 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 SCCE3 2CTU IntraBC 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 | 0.9% | 0.7% | 0.0% | 2.1% |
| RGB, text & graphics with motion,720p | 0.7% | 0.5% | 0.0% | 1.2% |
| RGB, mixed content, 1440p | 0.8% | 0.7% | 0.1% | 1.2% |
| 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 | 2.4% | 2.5% | 0.4% | 4.1% |
| YUV, text & graphics with motion,720p | 1.4% | 1.0% | 0.0% | 2.8% |
| YUV, mixed content, 1440p | 0.5% | 0.5% | 0.4% | 0.7% |
| 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[%] | 99% | | | |
| 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 | 0.9% | 0.3% | 0.0% | 1.0% |
| RGB, text & graphics with motion,720p | 0.1% | 0.1% | 0.0% | 0.4% |
| RGB, mixed content, 1440p | 0.1% | 0.1% | 0.0% | 0.2% |
| 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 | 1.5% | 1.3% | 0.2% | 2.1% |
| YUV, text & graphics with motion,720p | 0.2% | 0.3% | 0.0% | 1.1% |
| 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[%] | 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 | 0.8% | 0.3% | -0.1% | 0.9% |
| RGB, text & graphics with motion,720p | 0.1% | 0.1% | 0.0% | 0.4% |
| RGB, mixed content, 1440p | 0.0% | 0.0% | 0.0% | 0.0% |
| 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 | 1.2% | 1.0% | 0.1% | 1.7% |
| YUV, text & graphics with motion,720p | 0.1% | 0.3% | 0.0% | 0.9% |
| 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[%] | 103% | | | |
| Dec Time[%] | 100% | | | |

Table 2. Average BD rate reduction for lossless coding compared with SCCE3 full frame IntraBC 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 | 0.7% | 0.6% | 0.0% | 1.7% |
| RGB, text & graphics with motion,720p | 0.6% | 0.4% | 0.0% | 1.2% |
| RGB, mixed content, 1440p | 0.3% | 0.2% | 0.1% | 0.4% |
| 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 | 2.0% | 2.1% | 0.4% | 3.5% |
| YUV, text & graphics with motion,720p | 1.2% | 0.8% | 0.0% | 2.8% |
| YUV, mixed content, 1440p | 0.2% | 0.2% | 0.1% | 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[%] | 106% | | | |
| Dec Time[%] | 104% | | | |
|  |  |  |  |  |
|  | **Random Access** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 0.7% | 0.3% | 0.0% | 0.8% |
| RGB, text & graphics with motion,720p | 0.1% | 0.1% | 0.0% | 0.4% |
| 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 | 1.1% | 1.0% | 0.2% | 1.7% |
| YUV, text & graphics with motion,720p | 0.2% | 0.3% | 0.0% | 1.0% |
| 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[%] | 108% | | | |
| 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 | 0.6% | 0.2% | 0.0% | 0.7% |
| RGB, text & graphics with motion,720p | 0.1% | 0.1% | 0.0% | 0.3% |
| RGB, mixed content, 1440p | 0.0% | 0.0% | 0.0% | 0.0% |
| 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 | 0.9% | 0.7% | 0.1% | 1.3% |
| YUV, text & graphics with motion,720p | 0.1% | 0.2% | 0.0% | 0.8% |
| 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[%] | 103% | | | |
| Dec Time[%] | 102% | | | |

# 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).**

# References

1. Y.-W. Huang, P. Onno, R. Joshi, R. Cohen, X. Xiu, Z. Ma, “HEVC Screen Content Core Experiment 3 (SCCE3): Palette mode”, JCTVC-Q1123, Apr. 2014.
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