|  |  |
| --- | --- |
| **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-S0074 |

|  |  |  |  |
| --- | --- | --- | --- |
| *Title:* | **CE6: Results for Test B3 on Improved Palette Index Coding with Contextualization** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
| *Author(s) or Contact(s):* | T. Laude (Leibniz Universitaet Hannover) Institut fuer Informationsverarbeitung Leibniz Universitaet Hannover Appelstrasse 9a  30167 Hannover  Germany | Tel: Email: | +49 511 762 19588 [laude@tnt.uni-hannover.de](mailto:laude@tnt.uni-hannover.de) |
| *Source:* | Institut fuer Informationsverarbeitung, Leibniz Universitaet Hannover | | |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Abstract

This contribution presents results for the modified palette index coding method of Core Experiment 6 Test B3. In particular, it is reported that the most significant bin (MSB) of the *palette\_index* syntax element is coded using contextualization rather than using the CACAC bypass mode. The modified palette index coding reportedly shows Y/G BD-rate changes of {-0.1%, -0.1%, 0.0%, 0.0%, 0.0%, 0.0%, -0.1%, 0.0%, 0.0%, 0.0%, 0.0%, 0.0%}, {0.0%, 0.1%, 0.0%, 0.1%, 0.0%, -0.1%, -0.1%, 0.0%, 0.1%, 0.0%, 0.0%} and {-0.1%, -0.1%, 0.0%, -0.1%, 0.0%, 0.0%, 0.0%, -0.2%, -0.1%, -0.1%, -0.1%, 0.0%} for AI, RA and LD compared to the SCM-2.0 anchor under SCC common test conditions.

# Introduction

CE 6 studied Palette Mode Improvements [1]. A modified palette index coding method, originally proposed as JCT-VC R0113 [2], has been tested in Test B3. Results for this test are reported in this document.

It is worth noting, that the coding gains reported in the original proposal have been significantly reduced by changing the palette index binarization scheme from binary to truncated binary as decision of the Sapporo meeting. As it can be observed in Figure 1, the average code word length for the truncated binary binarization almost reaches the entropy. Thus, the problem addressed by JCT-VC R0113 has already been solved by this mean.

Figure 1: Average Code Word Length for different Binarization Schemes

# Text Specification

| Table 9‑43 – Assignment of ctxInc to syntax elements with context coded bins | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Syntax element** | **binIdx** | | | | | |
| **0** | **1** | **2** | **3** | **4** | **>= 5** |
| … |  |  |  |  |  |  |
| palette\_index | 0 | bypass | bypass | bypass | bypass | bypass |
| palette\_run | 0 | 1 | 2 | bypass | bypass | bypass |
| … |  |  |  |  |  |  |

# Experimental results

Lossy:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -0.1% | -0.1% | -0.1% |
| RGB, text & graphics with motion,720p | -0.1% | 0.0% | 0.0% |
| RGB, mixed content, 1440p | 0.0% | 0.0% | 0.0% |
| RGB, mixed content, 1080p | 0.0% | 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% | -0.1% | -0.1% |
| YUV, text & graphics with motion,720p | 0.0% | -0.1% | 0.0% |
| YUV, mixed content, 1440p | 0.0% | 0.0% | 0.0% |
| YUV, mixed content, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 102% | | |
| Dec Time[%] | 99% | | |
|  |  |  |  |
|  | **Random Access** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | 0.0% | 0.0% | 0.0% |
| RGB, text & graphics with motion,720p | 0.1% | 0.0% | 0.1% |
| RGB, mixed content, 1440p | 0.0% | 0.0% | -0.1% |
| RGB, mixed content, 1080p | 0.1% | 0.0% | -0.1% |
| RGB, Animation, 720p | -0.1% | 0.0% | -0.1% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.1% |
| YUV, text & graphics with motion, 1080p | -0.1% | -0.1% | -0.1% |
| YUV, text & graphics with motion,720p | -0.1% | -0.1% | -0.1% |
| YUV, mixed content, 1440p | 0.0% | -0.1% | 0.0% |
| YUV, mixed content, 1080p | 0.1% | -0.3% | 0.0% |
| YUV, Animation, 720p | 0.0% | 0.1% | 0.2% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | -0.1% |
| Enc Time[%] | 98% | | |
| Dec Time[%] | 99% | | |
|  |  |  |  |
|  | **Low delay B** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -0.1% | -0.1% | 0.0% |
| RGB, text & graphics with motion,720p | -0.1% | -0.2% | -0.1% |
| RGB, mixed content, 1440p | 0.0% | -0.1% | 0.0% |
| RGB, mixed content, 1080p | -0.1% | 0.0% | 0.2% |
| RGB, Animation, 720p | 0.0% | 0.1% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.1% |
| YUV, text & graphics with motion, 1080p | 0.0% | -0.1% | 0.0% |
| YUV, text & graphics with motion,720p | -0.2% | 0.0% | -0.1% |
| YUV, mixed content, 1440p | -0.1% | 0.0% | -0.1% |
| YUV, mixed content, 1080p | -0.1% | -0.5% | -0.6% |
| YUV, Animation, 720p | -0.1% | -0.2% | -0.1% |
| YUV, camera captured, 1080p | 0.0% | -0.1% | 0.0% |
| Enc Time[%] | 97% | | |
| Dec Time[%] | 97% | | |

Lossless:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **All Intra** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 0.2% | 0.2% | 0.1% | 0.2% |
| RGB, text & graphics with motion,720p | 0.1% | 0.0% | 0.0% | 0.1% |
| 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 | 0.1% | 0.1% | 0.1% | 0.2% |
| YUV, text & graphics with motion,720p | 0.0% | 0.0% | 0.0% | 0.1% |
| YUV, mixed content, 1440p | 0.0% | 0.0% | 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[%] | 72% | | | |
| Dec Time[%] | 74% | | | |
|  |  |  |  |  |
|  | **Random Access** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 0.1% | 0.1% | 0.0% | 0.1% |
| RGB, text & graphics with motion,720p | 0.0% | 0.0% | 0.0% | 0.0% |
| 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 | 0.0% | 0.1% | 0.0% | 0.1% |
| YUV, text & graphics with motion,720p | 0.0% | 0.0% | 0.0% | 0.0% |
| 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[%] | 70% | | | |
| Dec Time[%] | 63% | | | |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  | **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 | 0.1% | 0.1% | 0.0% | 0.1% |
| RGB, text & graphics with motion,720p | 0.0% | 0.0% | 0.0% | 0.0% |
| 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 | 0.0% | 0.1% | 0.0% | 0.1% |
| YUV, text & graphics with motion,720p | 0.0% | 0.0% | 0.0% | 0.0% |
| 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[%] | 73% | | | |
| Dec Time[%] | 72% | | | |

Runtimes are not reliable.

# References

[1] Y.-W. Huang, P. Onno, R. Cohen, V. Seregin, X. Xiu, and Z. Ma, *JCT-VC R1106: Description of Core Experiment 6 (CE6): Palette Mode Improvements. 18th Meeting of the Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11. Sapporo, JP*. 2014.

[2] T. Laude, *JCT-VC R0113: Non-SCCE3: Improved Palette Index Coding with Contextualization. 18th Meeting of the Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11. Sapporo, JP*. 2014.

# Patent rights declaration(s)

**Institut fuer Informationsverarbeitung, Leibniz Universitaet Hannover may have current or pending patent rights 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).**