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| *Title:* | **SCCE3: Test A.6 - Palette table generation** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

This proposal reports the simulation results for palette table generation (SCCE3 Test A.6). The technologies were originally proposed in the response of SCC CfP (JCTVC-Q0037) from InterDigital. The palette table is generated based on clustering according to nearest neighboring and rate-distortion optimization method by considering the palette table predictive coding. Compared to SCCE3 full frame IntraBC anchors, the proposed technologies achieve average BD rate gain up to -1.9%, -1.7%, -1.3% for lossy AI, RA and LDB coding for Y component excluding categories of animation and camera captured.

# Introduction

Palette table generation method was first proposed in JCTVC-Q0037 [2]. In SCCE3 anchor software, the palette table is derived based on histogram, and the first appearing color is selected as representative color for each cluster. It does not consider the distortion caused by representative color selection and the overhead of palette color coding itself.

There are three steps for the palette table generation method proposed in SCCE3 test A.6. The first step is to apply clustering all colors in current CU with nearest neighboring to get the most compact clusters. After clustering, the center of each cluster will be calculated by averaging all colors in the cluster.

The second step is to decide the representative color for each cluster. The optimal representative color for each cluster is selected from the center and all possible predictors. The RDO cost “J” of color “c” for the cluster “r” is calculated as Equation (1).

J(r, c) = D(r, c) + lambda\*R(c) (1)

The candidates of representative color include (1) center of cluster, (2) all colors in the palette dictionary used for palette table prediction. The best color with minimal RD cost J will be selected as the representative color.

The step three is to merge those clusters with same representative color.

# Simulation results

The compression performance is measured using BD rate compared with SCCE3 anchors, using the SCCE3 test conditions [1]. Table 1 gives the detailed average BD rate reduction for lossy coding with proposed palette palette table generation method compared with SCCE3 full frame IntraBC anchors, respectively. The full test results are provided with the accompanying spreadsheets for details.

As shown in Table 1, the lossy coding achieves average {Y, U, V} BD rate gain of {-2.7%, -3.8%, -3.4%}, {-1.5%, -2.7%, -2.4%} and {-1.0%, -1.8%, -1.7%} for the category (YUV, text & graphics with motion, 1080p) for AI, RA and LDB, respectively.

Table 1. Average BD rate reduction for lossy coding compared with SCCE3 full frame IntraBC anchors

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -2.7% | -2.5% | -2.4% |
| RGB, text & graphics with motion,720p | -2.5% | -2.1% | -1.9% |
| RGB, mixed content, 1440p | -1.6% | -1.2% | -1.3% |
| RGB, mixed content, 1080p | -1.5% | -1.6% | -1.6% |
| RGB, Animation, 720p | 0.0% | -0.2% | -0.2% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -2.7% | -3.8% | -3.4% |
| YUV, text & graphics with motion,720p | -1.5% | -2.8% | -3.4% |
| YUV, mixed content, 1440p | -1.1% | -3.0% | -3.1% |
| YUV, mixed content, 1080p | -1.5% | -4.0% | -4.0% |
| YUV, Animation, 720p | 0.0% | -0.3% | -0.4% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 94% | | |
| Dec Time[%] | 96% | | |
|  |  |  |  |
|  | **Random Access** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -1.6% | -1.6% | -1.5% |
| RGB, text & graphics with motion,720p | -2.7% | -2.1% | -2.2% |
| RGB, mixed content, 1440p | -2.1% | -1.6% | -1.7% |
| RGB, mixed content, 1080p | -1.8% | -1.7% | -1.6% |
| RGB, Animation, 720p | 0.0% | -0.4% | -0.2% |
| RGB, camera captured, 1080p | 0.2% | 0.2% | 0.2% |
| YUV, text & graphics with motion, 1080p | -1.5% | -2.7% | -2.4% |
| YUV, text & graphics with motion,720p | -1.4% | -2.8% | -4.2% |
| YUV, mixed content, 1440p | -1.1% | -3.9% | -4.2% |
| YUV, mixed content, 1080p | -1.4% | -4.7% | -4.4% |
| YUV, Animation, 720p | 0.1% | -0.5% | -0.6% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 94% | | |
| Dec Time[%] | 98% | | |
|  |  |  |  |
|  | **Low delay B** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -1.3% | -1.3% | -1.3% |
| RGB, text & graphics with motion,720p | -1.9% | -1.5% | -1.6% |
| RGB, mixed content, 1440p | -2.2% | -1.7% | -1.8% |
| RGB, mixed content, 1080p | -1.2% | -1.6% | -1.3% |
| RGB, Animation, 720p | -0.1% | -0.1% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.1% |
| YUV, text & graphics with motion, 1080p | -1.0% | -1.8% | -1.7% |
| YUV, text & graphics with motion,720p | -0.7% | -1.4% | -2.1% |
| YUV, mixed content, 1440p | -1.3% | -2.9% | -3.5% |
| YUV, mixed content, 1080p | -1.2% | -4.4% | -4.4% |
| YUV, Animation, 720p | -0.1% | -0.4% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 96% | | |
| Dec Time[%] | 97% | | |

# Conclusions

In this proposal, we reported the simulation results SCCE3 test A.6 compared to SCCE3 anchors. With encoder optimization, the palette coding is improved.

# 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.
2. X. Xiu, C.-M. Tsai, Y. He, Y. Ye, “Description of screen content coding technology proposal by InterDigital”, JCTVC-Q1014, Apr. 2014.