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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11**  32nd Meeting: Ljubljana, SI, 12–18 July 2018 | Document: JCTVC-AF0022-v2 |

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| *Title:* | **Additional report on the performance of raster search with regard to JCTVC-AE0029** | | |
| *Status:* | Input document | | |
| *Purpose:* | Report | | |
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# Abstract

This contribution reports the performance change in HM when raster search is turned off as similar as JCTVC-AE0029 does with newly updated sequences. When turning it off, a 0.3% increase for RA case were reported on average in Y BD-rate. At the same time, turning off raster search reduced the encoding time to 84% for RA, on average, in comparison with HM 16.18.

# Introduction

In the previous 31st JCT-VC meeting, it was reported in JCTVC-AE0029 that a 10% speed improvement was possible without much of an impact on coding efficiency [1]. In the report document, however, test sequences of two classes (Classes A and F) were not tested. Moreover, as the common test condition for HM was recently changed with regard to CfP of VVC, it would be helpful to evaluate the performance of raster search with newly updated sequences. Thus, in this document, test sequences of Classes A and F are also tested, including other sequences in common test condition (CTC) [2]. The detailed information for the experiment and associated results are described in the following section.

# Experiments

Two sets were tested: one is anchor, and the other turning off raster search in HM 16.18. Tests were conducted based on JCTVC-AE1100, particularly 4:2:0 test condition with random access (RA) main, RA main 10 (RA10), low-delay (LD) main, and low-delay 10 (LD10) configurations. Test material in this experiments is Class A, Class B, Class C, Class D, Class E and Class F. For the simplicity, 10-bit source sequences was encoded by RA10 or LD10 configuration, and 8-bit source sequences by RA main or LD main configuration. For instance, *MarketPlace* and *RitualDance* sequences were encoded by RA10 or LD10.

Overall results for RA is shown in Table 1. Detailed data is in the attached excel sheet. For RA case, it was reported on average that a 0.3% increase was occurred in BD-rate of Y and a 16% decrease was occurred in encoding time, when raster search was turned off. Note that in Table 1, the results of block-colored average are the average of Classes A, B, and C, and the gray-colored results are the average of all sequences including Classes D and F.

**Table 1.** BD-rates of raster search off against HM 16.18 in RA case

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Y** | **U** | **V** |
| Class A1 | 0.4% | 0.7% | 0.8% |
| Class A2 | 0.4% | 0.8% | 0.7% |
| Class B | 0.2% | 0.3% | 0.3% |
| Class C | 0.3% | 0.4% | 0.5% |
| Class E |  |  |  |
| **Average** | 0.3% | 0.5% | 0.5% |
|  | 0.3% | 0.5% | 0.5% |
| Class D | 0.1% | 0.1% | 0.1% |
| Class F | 0.5% | 0.6% | 0.8% |
| Enc Time[%] | 84% | | |
|  | 87% | | |
| Dec Time[%] | #NUM! | | |

Overall results for LD is shown in Table 2. Detailed data is in the attached excel sheet. For LD case, it was reported on average that a 02% increase was occurred in BD-rate of Y and a 2% decrease was occurred in encoding time, when raster search was turned off. Note that in Table 2, the results of average are the average of all Classes.

**Table 1.** BD-rates of raster search off against HM 16.18 in LD case

|  |  |  |  |
| --- | --- | --- | --- |
|  | Y | U | V |
| Class A1 |  |  |  |
| Class A2 |  |  |  |
| Class B | 0.1% | 0.1% | 0.0% |
| Class C | 0.1% | 0.1% | 0.1% |
| Class D | 0.0% | 0.0% | -0.1% |
| Class E | 0.0% | 0.0% | -0.5% |
| Class F | 0.9% | 1.1% | 1.0% |
| **Average** | 0.2% | 0.3% | 0.1% |
|  | 0.2% | 0.3% | 0.1% |
| Enc Time[%] | 98% | | |
| Dec Time[%] | #NUM! | | |

To know the worst case of performance, results per sequence are presented as shown in Table 3. The worst case in terms of BD-rate loss is *SlideShow* sequence, showing a 1.1% increase in luma sample. On the other hand, the best case in terms of encoding time reduction is *Tango2* sequence, showing a 26% decrease of encoding time. In general, Class A sequences showed the most time reduction when turning off raster search.

**Table 3.** Results per sequence in RA case: red color denotes the worst case per each column

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Class** | **Sequence** | **Configuration** | **BD-rate (piecewise cubic)** | | | **Enc. Time** |
| Y | U | V |
| Class A1 | Tango2 | RA10 | 0.5% | 1.2% | 0.9% | 74% |
| FoodMarket4 | RA10 | 0.7% | 0.7% | 0.9% | 78% |
| Campfire | RA10 | 0.1% | 0.2% | 0.5% | 86% |
| Class A2 | CatRobot1 | RA10 | 0.2% | 0.5% | 0.3% | 84% |
| DaylightRoad2 | RA10 | 0.8% | 1.5% | 1.4% | 84% |
| ParkRunning3 | RA10 | 0.3% | 0.3% | 0.4% | 79% |
| Class B | MarketPlace | RA10 | 0.1% | 0.2% | 0.3% | 81% |
| RitualDance | RA10 | 0.1% | 0.5% | 0.4% | 78% |
| Cactus | RA | 0.1% | 0.2% | 0.2% | 87% |
| BasketballDrive | RA | 0.2% | 0.5% | 0.5% | 80% |
| BQTerrace | RA | 0.2% | 0.2% | 0.3% | 96% |
| Class C | BasketballDrill | RA | 0.3% | 0.5% | 0.7% | 88% |
| BQMall | RA | 0.1% | 0.1% | -0.2% | 89% |
| PartyScene | RA | 0.1% | 0.2% | 0.1% | 93% |
| RaceHorses | RA | 0.5% | 0.9% | 1.2% | 84% |
| Class D | BasketballPass | RA | 0.1% | -0.1% | 0.3% | 89% |
| BQSquare | RA | 0.0% | 0.1% | -0.2% | 99% |
| BlowingBubbles | RA | 0.1% | 0.1% | -0.1% | 97% |
| RaceHorses | RA | 0.2% | 0.2% | 0.3% | 90% |
| Class F | BasketballDrillText | RA | 0.2% | 0.2% | 0.4% | 89% |
| ChinaSpeed | RA | 0.3% | 0.4% | 0.6% | 84% |
| SlideEditing | RA | 0.5% | 0.5% | 0.5% | 98% |
| SlideShow | RA | 1.1% | 1.3% | 1.7% | 91% |
| Class A1 | | | 0.4% | 0.7% | 0.8% | 79% |
| Class A2 | | | 0.4% | 0.8% | 0.7% | 82% |
| Class B | | | 0.2% | 0.3% | 0.3% | 84% |
| Class C | | | 0.3% | 0.4% | 0.5% | 88% |
| Class D | | | 0.1% | 0.1% | 0.1% | 94% |
| Class F | | | 0.5% | 0.6% | 0.8% | 90% |
| **Average** | | | 0.3% | 0.5% | 0.5% | 87% |
| **Average (except D and F)** | | | 0.3% | 0.5% | 0.5% | 84% |

# References

[1] G. J. Sullivan, “Meeting Report of the 31st JCT-VC Meeting,” JCTVC-AE1000, San Diego, US, 13-20 April, 2018.

[2] K. Sharman, K. Suehring, “Common test conditions,” JCTVC-AE1100, San Diego, US, 13-20 April, 2018.

# Patent rights declaration(s)

**To the knowledge of the authors, Yonsei University does not have current or pending patent rights relating to the technology described in this contribution.**