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Abstract

The document summarizes the activities of the AHG on Encoding algorithm optimizations between the 15th meeting in Gothenburg, SE (3-12, July 2019) and the 16th meeting in Geneva, CH (1-11, October 2019).

Introduction

At the 15th JVET meeting, the AHG on Encoding algorithm optimizations was established with the following mandates:

Study the impact of using techniques such as GOP structures and perceptually optimized adaptive quantization for encoder optimization.

Study the impact of adaptive quantization on individual tools in the test model.

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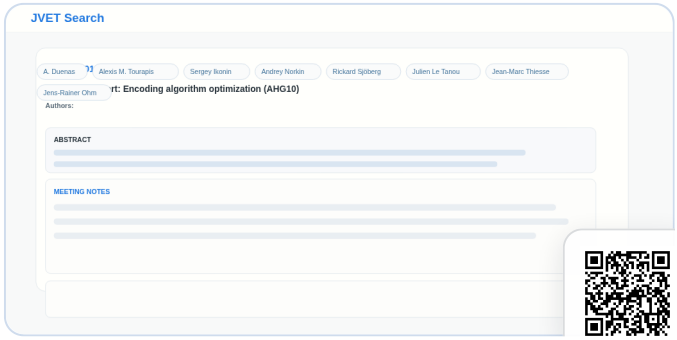
LINKS

CARD

JVET-P0010

http://vexpertise.stbit.ru/documents/JVET-P0010



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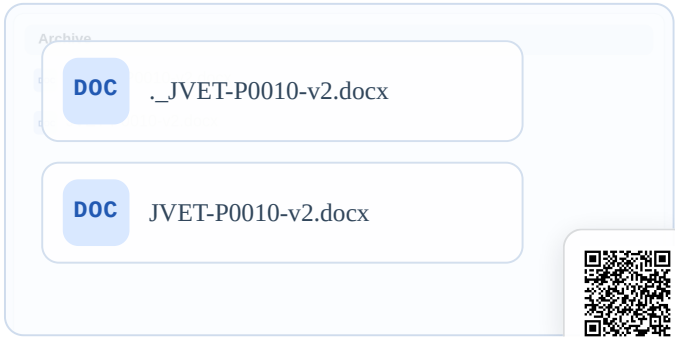
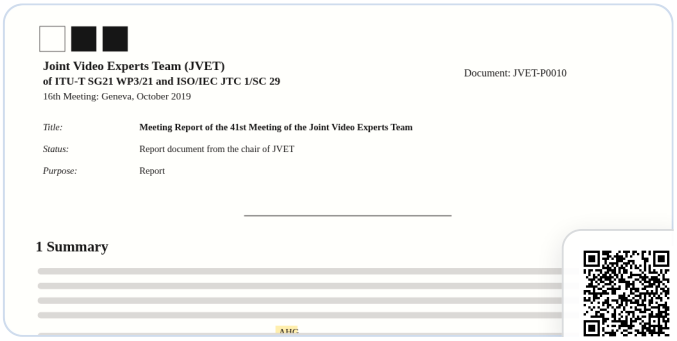


MEETING NOTES

external meeting notes

https://www.itu.int/wftp3/av-arch/jvet-site/2019_10_P_Geneva/JVET-P_Notes_dG.docx



MEETING NOTES

JVET-P0010 JVET AHG report: Encoding algorithm optimization (AHG10) A. Duenas, A. Tourapis, S. Ikonin, A. Norkin, R. Sjöberg, J. Le Tanou, J.-M. Thiesse]

This AHG report was discussed Thursday 3 October (chaired by JRO).

No e-mail related to AHG10 activity was sent to the JVET reflector during the AHG period.

The following input documents were identified to be related to the AHG:

- JVET-P0328: AHG10: Performance of the GOP-based temporal filter in VTM-6.1

> The encoder-only GOP-based temporal filter proposed in JVET-O0549 was adopted in the previous meeting in Gothenburg. This contribution provides performance numbers by enabling the filter on top of VTM-6.1. The average Y/U/V BD-rates for the common test conditions (CTC) for the filter on top of VTM-6.1 are reported to be −3.91%/−6.63%/−6.56% (RA), −0.96%/−1.30%/−2.18% (LDB) and −1.48%/−1.61%/−2.23% (LDP). This can be compared to the numbers compared in JVET-O0549-v2: −3.49%/−6.96%/−6.53% (RA), −1.00%/−1.24%/−2.24% (LDB) and −1.47%/−1.95%/−2.78% (LDP).

The proponents were willing to arrange a subjective viewing at the meeting.

- JVET-P0570: AHG10/Non-CE5: Performance of encoder-side deblocking optimization in VTM-6.0

The encoder-only deblocking optimization is tested on top of VTM-6.0. The average Y/U/V BD-rates and encoding time for the common test conditions for the filter on top of VTM-6.0 are reported to be −0.77%/−1.53%/−1.56%/105% for all intra, −0.92%/−1.94%/−1.93%/103% for random access and −0.78%/−0.90%/−0.88%/102% for low delay B.

- JVET-P0163: CE5-related: SAO encoder-only improvements

In this contribution, three encoder-only improvements for sample adaptive offset (SAO) are reported. First, the greedy SAO merge encoding algorithm, which is in VTM6.0 but disabled in common test conditions (CTC), is enabled to optimize SAO parameters for multiple coding tree units (CTUs) within one CTU row. Second, to explore more SAO merge possibilities across CTU rows, a picture-based SAO merge encoding algorithm is proposed. For each picture, the best SAO parameters, derived by either the picture-based SAO merge encoding algorithm or the greedy SAO merge encoding algorithm, are signalled. Third, the SAO picture-level on-off decision algorithm for the current picture using statistics from a previous picture, which is enabled in VTM6.0CTC, is disabled, and it is proposed to further allow changing the picture-level decision from on to off after SAO is tested for all CTUs in the picture. YCbCr BD-rates (using the AHG13 YCbCr BD-rate calculation method: (BD-Rate_Y*8+ BD-Rate_U+ BD-Rate_V)/10) under adaptive loop filter (ALF) on/off cases are summarized as follows.

Anchor: VTM6.0 + SAO off + ALF on

Test: anchor + SAO on

AI: -0.04%; RA: -0.13%; LB: -0.24%; LP: -0.26%

Anchor: VTM6.0 + SAO off + ALF on

Test: anchor + SAO on + SAO encoder-only improvements

AI: -0.15%; RA: -0.29%; LB: -0.52%; LP: -0.52%

Anchor: VTM6.0 + SAO off + ALF off

Test: anchor + SAO on

AI: -0.36%; RA: -0.78%; LB: -1.21%; LP: -2.74%

Anchor: VTM6.0 + SAO off + ALF off

Test: anchor + SAO on + SAO encoder-only improvements

AI: -0.56%; RA: -1.10%; LB: -1.70%; LP: -3.35%

It is known that SAO and ALF overlap in coding gains. Small coding losses are observed by disabling SAO when ALF is on, while large coding losses are observed by disabling SAO when ALF is off. Given that SAO has low complexity and is deployed in one billion HEVC devices per year, it is asserted that keeping SAO is beneficial for VVC, especially for real-time low complexity encoding applications.

- JVET-P0345: Low-Delay B encoder configuration proposal

The coding gain of VVC over HEVC much higher in random access configuration than in low-delay B. This contribution proposes a new low-delay B encoder configuration, targeting improved coding efficiency. Basically, the GOP size is extended to 8 instead of 4. The proposed LDB GOP structure reportedly leads to -4.87%, -5.87%, -5.56% BD-rate gain in Y, Cb and Cr components respectively, over the current CTC LDB configuration.

- JVET-P0445: Non-CE4: Encoder optimization for subblock-based merge candidate search

In this contribution, an encoder optimization method is proposed to separate luma and chroma components in motion compensation process. With this support, chroma motion compensation can be avoided during luma SATD based subblock merge candidate search so that encoding time is reduced. It is asserted that the proposed changes do not have any impact in coding performance. The proposed method was implemented based on VTM-6.0, and simulations were conducted with common test conditions. It is reported that there's no BD-rate change with 98% encoding time for RA, and 99% encoding time for LB.

The AHG recommended that the related input contributions be reviewed and to further continue the study of encoding algorithm optimizations in JVET.

> It was suggested to perform subjective viewing on some of the contributions (if possible).

CITATION

A. Duenas, A. Tourapis, S. Ikonin, A. Norkin, R. Sjöberg, J. Le Tanou, J.-M. Thiesse, "JVET AHG report: Encoding algorithm optimization (AHG10)", JVET-P0010, 16th Meeting: Geneva, October 2019.

REFERENCES

1. P. Wennersten, R. Sjöberg, J. Enhorn, "AHG10: Encoder-only GOP-based temporal filter", JVET-O0549, 15th Meeting: Gothenburg, SE, July 2019.
2. C.-Y. Lai, C.-Y. Chen, T.-D. Chuang, O. Chubach, Y.-W. Huang, S.-M. Lei, "CE5-related: SAO encoder-only improvements", JVET-P0163, 16th Meeting: Geneva, October 2019.
3. J. Enhorn, R. Sjöberg, J. Ström, P. Wennersten, "AHG10: Performance of the GOP-based temporal filter in VTM-6.1", JVET-P0328, 16th Meeting: Geneva, October 2019.
4. F. Le Leannec, R. Jullian, E. Francois, "Low-Delay B encoder configuration proposal", JVET-P0345, 16th Meeting: Geneva, October 2019.
5. G. Li, X. Li, X. Xu, S. Liu, "Non-CE4: Encoder optimization for subblock-based merge candidate search", JVET-P0445, 16th Meeting: Geneva, October 2019.
6. N. Hu, V. Seregin, M. Karczewicz, "AHG10/Non-CE5: Performance of encoder-side deblocking optimization in VTM-6.0", JVET-P0570, 16th Meeting: Geneva, October 2019.