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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**  36th Meeting: Gothenburg, SE, 6–12 July 2019 | Document: JCTVC-AJ0025-v1 |

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| *Title:* | **GOP-based temporal filter setting for low-delay coding** | | |
| *Status:* | Input document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

This contribution proposes a configuration value change for low-delay coding when enabling GOP-based temporal filter from JCTVC-AI0023 in HM. The value of TemporalFilterStrengthFrame4 is proposed to be set to 0.40 instead of 0.95. The HM source code is not modified.

The new setting was reportedly tested for the LDB and LDP configurations and compared to HM-16.20. The average Y/U/V BD-rates are reported to be -1.1%/-1.0%/-1.4% (LDB) and -2.0%/-1.8%/-1.9% (LDP).

This can be compared to the -0.2%/-0.9%/-1.5% (LDB) and -1.4%/-1.8%/-2.2% (LDP) that was reported in JCTVC-AI0023.

It is proposed that the value for TemporalFilterStrengthFrame4 in the two configuration files encoder\_lowdelay\_P\_main10.cfg and encoder\_lowdelay\_main10.cfg is set to 0.40.

# Introduction

At the 35th JCT-VC meeting, the encoder-only algorithm GOP-based temporal filtering was introduced in JCTVC-AI0023 [1]. The algorithm is using future pictures for random-access coding and showed significant coding gains for that encoder configuration setting. However, for low-delay encoding where future pictures are not used, the performance of the algorithm was lower.

Experiments showed that the filter strength used for low delay was too strong, so this document proposes a weaker configuration setting.

# Proposal

The overall filtering strength so previously set to 0.95 for every fourth frame in low-delay coding is proposed to be set to 0.40 instead.

The corresponding change to the low-delay HM configuration files when using GOP-based temporal filtering looks as follows:

#=========== TemporalFilter =================

TemporalFilter : 1 # Enable/disable GOP Based Temporal Filter

TemporalFilterFutureReference : 0 # Enable/disable reading future frames

TemporalFilterStrengthFrame4 : 0.40 # Enable filter at every 4th frame with strength

# Results

The proposed setting was implemented in and compared to HM-16.20. Note that the encoding and decoding times are not reliable due to use of heterogenous machines.

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|  | **Low delay B Main 10 (CTC)** | | |
|  | **Over HM-16.20** | | |
|  | Y | U | V |
| Class A1 |  |  |  |
| Class A2 |  |  |  |
| Class B | -1.7% | -1.3% | -1.8% |
| Class C | 0.1% | 0.3% | -0.2% |
| Class E | -1.7% | -2.1% | -2.4% |
| **Overall** | -1.1% | -1.0% | -1.4% |
| Class D | 0.9% | 0.3% | -0.3% |
| Class F | 0.2% | 0.3% | 0.2% |
| Enc Time[%] | 112% | | |
| Dec Time[%] | 116% | | |
|  |  |  |  |
|  | **Low delay P Main 10 (CTC)** | | |
|  | **Over HM-16.20** | | |
|  | Y | U | V |
| Class A1 |  |  |  |
| Class A2 |  |  |  |
| Class B | -3.0% | -2.3% | -2.4% |
| Class C | -0.3% | 0.1% | -0.3% |
| Class E | -2.6% | -3.3% | -3.3% |
| **Overall** | -2.0% | -1.8% | -1.9% |
| Class D | 0.5% | 0.5% | -0.5% |
| Class F | 0.0% | 0.9% | 0.4% |
| Enc Time[%] | 132% | | |
| Dec Time[%] | 132% | | |

The results for using a strength of 0.95 is reported for information below. Those numbers can also be found in JCTVC-AI0023.

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|  | **Low delay B Main 10 (CTC)**  **JCTVC-AI0023** | | |
|  | **Over HM-16.20** | | |
|  | Y | U | V |
| Class A1 |  |  |  |
| Class A2 |  |  |  |
| Class B | -0.7% | -0.9% | -1.9% |
| Class C | 1.5% | 1.1% | 0.5% |
| Class E | -1.7% | -3.5% | -3.3% |
| **Overall** | -0.2% | -0.9% | -1.5% |
| Class D | 3.1% | 1.0% | 0.5% |
| Class F | 1.2% | 0.8% | 1.5% |
| Enc Time[%] | 102% | | |
| Dec Time[%] | 102% | | |

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| --- | --- | --- | --- |
|  | **Low delay P Main 10 (CTC)**  **JCTVC-AI0023** | | |
|  | **Over HM-16.20** | | |
|  | Y | U | V |
| Class A1 |  |  |  |
| Class A2 |  |  |  |
| Class B | -2.5% | -2.2% | -2.9% |
| Class C | 1.0% | 0.6% | 0.4% |
| Class E | -2.9% | -4.3% | -4.4% |
| **Overall** | -1.4% | -1.8% | -2.2% |
| Class D | 2.4% | 0.7% | 0.4% |
| Class F | 1.0% | 1.4% | 1.1% |
| Enc Time[%] | 104% | | |
| Dec Time[%] | 102% | | |

# Conclusion

In this document an improved configuration setting was proposed for using HM encoding with GOP-based temporal filter. We recommend adopting the proposed updated config files into the HM software.

# References

[1] P. Wennersten, J. Östrand, R. Sjöberg, “Encoder-only GOP-based temporal filter”, Input document to JCT-VC 35th meeting in Geneva, March 2019

# Patent rights declaration(s)

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