

**Joint Video Experts Team (JVET)
of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC
29/WG 11**

Document: JVET-V0108-v6

MPEG: m56520

22nd Meeting, by teleconference, 20-28 Apr. 2021

Title: AHG9: Colour Transform Information SEI message

Status: Input document to JVET

Purpose: Proposal

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Source: InterDigital

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Abstract

This contribution describes additional study of a new SEI message named Colour Transform Information (CTI) SEI message, proposed in JVET-U0078. The SEI message signals mapping parameters that can apply to the decoded pictures. The mapping can operate intra-component (for luma and chroma) or inter-component (for chroma). In this contribution, the CTI has been tested as a mandatory process for out-of-loop mapping for HDR-PQ content. D-rate variations compared to VTM12.0, for the CTCs HDR PQ content, are reported in the table below, for AI, RA LB configurations.

Introduction

This contribution is a follow-up of JVET-U0078, where a new SEI message, named Colour Transform Information (CTI) SEI message, was proposed. The CTI SEI message signals mapping parameters that can apply to the reconstructed pictures after the decoding process. CTI can be used as a tool for out-of-loop content mapping, in order to get improved coding performance. This feature can be of interest for some use cases or content types. For HDR PQ cases, it is observed that the CTI using the same fixed mapping function as LMCS leads to compression gains compared to VTM anchors.

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JVET-V0108

<http://vexpertise.stbit.ru/documents/JVET-V0108>

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AHGS: Colour Transform Information SEI message

Authors:

ABSTRACT

MEETING NOTES

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sei_cti_v01.cfg

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VTM12.0_V0108.zip

MEETING NOTES

external meeting notes

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Joint Video Experts Team (JVET)
of ITU-T SG21 WP3/21 and ISO/IEC JTC 1/SC 29
22nd Meeting: by teleconference, April 2021

Document: JVET-V0108

Title

Status

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1 Summary

Meeting Report of the 41st Meeting of the Joint Video Experts Team

Report document from the chair of JVET

Report

MEETING NOTES

[JVET-V0108](#) AHG9: Colour Transform Information SEI message [E. François, M. Radosavljević, P. de Lagrange, F. Le Léannec (InterDigital)]

This contribution was discussed in session 16b at 2330 on Friday 23 April 2021 (chaired by GJS).

This contribution describes additional study of a new SEI message named colour transform information (CTI) SEI message, proposed in JVET-U0078. The SEI message signals mapping parameters that can apply to the decoded pictures. The mapping can operate intra-component (for luma and chroma) or inter-component (for chroma). In this contribution, the CTI has been tested as a mandatory process for out-of-loop mapping for HDR-PQ content. Tests without and with LMCS were reported. The best results were reportedly obtained with CTI and LMCS both applied. BD-rate variations compared to VTM12.0, for the CTCs HDR PQ content, are reported in the table below, for AI, RA, LB and LP configurations.

	DE100	PSNR-L	wPsnrY	wPsnrU	wPsnrV	psnrY	psnrU	psnrV	EncT	DecT
AI	-0.46%	-0.91%	-0.30%	-5.27%	-6.21%	0.40%	-1.79%	-2.15%	106%	99%
RA	-2.30%	-3.31%	-1.74%	-5.65%	-7.35%	-1.06%	-1.32%	-1.99%	102%	96%
LB	-5.85%	-3.96%	-2.57%	-9.52%	-14.06%	-1.89%	0.69%	-3.25%	100%	92%
LP	-6.68%	-3.83%	-2.49%	-9.90%	-14.50%	-1.86%	1.18%	-3.40%	103%	100%

* LB and LP configuration is not part of the HDR CTCs. (This was suggested to be just to make the simulations faster.) It was pointed out that the two LD configurations are not included in some of the other “specialized” CTC, such as 360, 444.

The proponent emphasized that low delay is an important use case.

No benefit (or not much benefit) was reported for HLG content and SDR content.

This uses a static mapping function (non-varying in time). LMCS, as tested, has a mapping function that varies over time. This is operated outside the loop.

It was noted that we do not have the CRI SEI message in VVC/VSEI. This proposal is inspired from CRI but includes cross-component operations that are not available in CRI. It is somewhat of a superset of CRI.

The CTI mapping function used that was designed for HDR PQ in LMCS. It uses a static mapping function based on a QP mapping function in the HM (since 2015). The LMCS mapping function in HDR mode was reported to be transfer function based (BT.2020 to SMPTE 2084).

When tested in combination with LMCS, the LMCS is configured in SDR mode, reportedly since the preprocessing reportedly converts the signal statistics to something resembling SDR.

The joint session at the previous meeting concluded that, regarding extensions, e.g., normative post-processing (e.g., JVET-U0078, JVET-U0100) – investigation can proceed in JVET.

It was commented that this seems really more like a coding tool proposal than an SEI message proposal.

The proposal could also be used without the preprocessing. It is somewhat analogous to CRI.

There are two possible applications:

- Display adaptation, e.g., SDR to HDR mapping or vice versa (e.g. as investigated with somewhat different technology in 2016 – e.g., as with CRI already standardized)
- Coding gain with preprocessing (in which scenario, it becomes basically mandatory for the decoder to support – this was also somewhat discussed circa 2016).

The non-technical aspects were further discussed in joint meeting on Tuesday.

It was agreed that we could specify such an SEI message with a similar status and usage description as the CRI SEI message in HEVC – described as a post-decoding remapping for such purposes as display adaptation without describing a coding efficiency transformation usage.

Future study would be needed to consider whether it could be part of a profile requirement.

Follow-up discussion in JVET session 23:

The SEI proposal is considered technically mature and provides benefit beyond the CRI SEI. Additional question that had been put by the last meeting (combination with in-loop LMCS, complexity analysis) have been answered satisfactory.

Support was also expressed by non-proponents

Decision: Adopt JVET-V0108 for VSEI v2. Payload type might be considered to signal this as a superset of CRI. Software is attached with the proposal, this should include all components required to make it “ready to use”.

CITATION

E. François, M. Radosavljevic, P. de Lagrange, F. Leleannec, "AHG9: Colour Transform Information SEI message", JVET-V0108, 22nd Meeting: by teleconference, April 2021.

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1. [K. Misra, F. Bossen, A. Segall, N. Hu, J. Dong, V. Seregin, M. Karczewicz, P. Onno, C. Gisquet, G. Laroche, J. Li, C.S. Lim, C.-W. Kuo, J. Nam, J. Choi, J. Lim, S. Kim, O. Chubach, C.-Y. Lai, C.-Y. Chen, T.-D. Chuang, Y.-W. Huang, S.-M. Lei, "CE5-related: On the design of CC-ALF", JVET-P1008, 16th Meeting: Geneva, October 2019.](#)
2. [A. Segall, E. François, W. Husak, S. Iwamura, D. Rusanovskyy, "JVET common test conditions and evaluation procedures for HDR/WCG video", JVET-T2011, 20th Meeting: by teleconference, October 2020.](#)
3. [E. François, P. de Lagrange, F. Le Léannec, "AHG9: Out-of-loop luma mapping with chroma scaling using APS or SEI message parameters signalling", JVET-U0078, 21st Meeting: by teleconference, January 2021.](#)