Title:	**JCT-3V AHG report: MV-HEVC / 3D-HEVC Test Model editing (AHG3)**
Status:	AHG report input to JCT-3V
Purpose:	AHG report

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Source:	AHG		

Abstract

This document reports on the work of the JCT-3V ad hoc group on MV-HEVC / 3D-HEVC Test Model editing (AHG3) between the 5th JCT-3V meeting in Vienna and the 6th meeting in Geneva.

1 Mandates

Title and Email Reflector	Chairs	Mtg
MV-HEVC / 3D-HEVC Test Model editing (AHG3) (jct-3v@lists.rwth-aachen.de) • Produce and finalize JCT3V-E1005 3D-HEVC Test Model 5. • Produce and finalize JCT3V-E1004 MV-HEVC Draft Text 5. • Produce and finalize JCT3V-E1001 3D-HEVC Draft Text 1. • Gather and address comments for refinement of these documents. • Coordinate with the 3D-HEVC Software Integration AhG to address issues relating to mismatches between software and text.	G. Tech, K. Wegner (co-chairs), J. Boyce, Y. Chen, M. Hannuksela, T. Suzuki, S. Yea, J.-R. Ohm, G. Sullivan (vice chairs)	N

2 Introduction

The first 3D-HEVC draft, the fifth 3D-HEVC Test Model and the fifth MV-HEVC draft were developed from the fourth 3D-HEVC Test Model and the fourth MV-HEVC draft following the decisions taken at the 4th JCT-3V meeting in Incheon.

Three editorial teams were formed to work on the two documents that were to be produced:

- JCT3V-E1005 3D-HEVC Test Model 5

  - Li Zhang, Gerhard Tech, Krzysztof Wegner, Sehoon Yea

- JCT3V-E1001 3D-HEVC Draft Text 1

  - Gerhard Tech, Ying Chen, Krzysztof Wegner, Sehoon Yea

- JCT3V-E1004 MV-HEVC Draft Text 5

  - Gerhard Tech, Miska Hannuksela, Ying Chen, Jill Boyce, Krzysztof Wegner

  - Moreover Ye-Kui Wang, Jianle Chen, Gary Sullivan and Jens-Rainer Ohm joint the editing meeting subsequent to the Vienna meeting.

3 Status

3.1 3D-HEVC Test Model

One version of JCT3V-E1005 has been published by the editing AHG following the 5th JCT-3V meeting in Vienna. The 3D-HEVC draft text has been removed from the 3D-HEVC Test Model document and is available in a separate document.

3.1.1 Incorporated changes

All adoptions of the last meeting have been incorporated. Moreover existing text has been revised and improved and missing text from previous meeting has been added.

Changes (14) of JCT3V-E1005 relative to JCT3V-D1005 are:

VSP (1)
- E0207 + E0208 Adaptive block partitioning for VSP and clipping

Disparity vector derivation (3)
- E0141 Clipping in depth-based disparity vector derivation
- E0142 + E0190: Simplified NBDV and improved disparity vector derivation
- E0172 DVMCP Fix

Inter-view/motion prediction (4)
- E0170 Motion data buffer reduction (first scheme)
- E0126 Merge candidates derivation from vector shifting.
- E0182 A bug-fix for the texture merging candidate
- E0046 Resampling in IC parameter derivation and 4x4 Chroma removal

Depth bi-partition modes (3)
- E0146 DMM simplification and signalling. Remove DMM2.
- E0204 Simplified Binarization for depth_intra_mode
- E0159 Removal of Overlap between DMM1 and DMM3

SDC(3)
- E0156 Simplified Inter Mode Coding of Depth Decision
- E0117 Simplified DC calculation for SDC
- E0158 Removal of DC from SDC Mode

3.2   3D-HEVC Draft 1

Three versions of JCT3V-E1001 have been published by the editing AHG following the 5th JCT-3V meeting in Vienna. The 3D-HEVC draft text was developed from the draft text of fourth 3D-HEVC test model and has been updated to be aligned with HEVC version 1 and MV-HEVC draft 5.

3.2.1 Incorporated changes

All adoptions of the last meeting have been incorporated. Moreover existing text has been revised and improved and missing text from previous meeting has been added.

Changes (33) of JCT3V-E1005 relative to JCT3V-D1005 are:

View synthesis prediction (2)
- E0207 + JCT3V-E0208 CE1: Adaptive block partitioning for VSP and clipping.
- E0172/Items 3+4 CE2: VSP Fix

Disparity vector derivation (4)
- E0172/Item 5 CE2: Disparity inter-view motion vector derivation
- E0172/Item 7 CE2: DVMCP Fix
- E0142 + E0190 CE2: Simplified NBDV and improved disparity vector derivation
- E0141 CE2: Clipping in depth-based disparity vector derivation

Inter-view/motion prediction (3)
- E0170 CE3: Motion data buffer reduction for 3D(first scheme)
- E0182 CE3: A bug-fix for the texture merging candidate
- E0126 CE3: Merge candidates derivation from vector shifting.

Illumination Compensation (2)
- E0168 CE4: Complexity reduction of bi-prediction for illumination compensation
- E0046 CE4: Resampling in IC parameter derivation and 4x4 Chroma removal

Depth bi-partition modes (4)
- E0242 CE5: On DMM simplification
- E0146 CE5: DMM simplification and signalling. Remove DMM2.
- E0204 CE5: Simplified Binarization for depth_intra_mode
- E0159 CE5: Removal of Overlap between DMM1 and DMM3

SDC (3)
- E0117 CE6: Simplified DC calculation for SDC
- E0158 CE6: Removal of DC from SDC Mode
- E0156 CE6: Simplified Inter Mode Coding of Depth Decision

HLS (6)
- E0034 HLS: Revision of the Alternative Depth Info SEI message
- E0160 HLS: Make 3D-HEVC Compatible with MV-HEVC Adopt (solution 2)
- E0134 HLS: Signalling of camera parameters.
- E0057 HLS: On parameter sets. Adopt View Id aspect
- E0104 HLS: Only portion that swaps multiview and depth flag in scalability dimension
- E0163 HLS: Camera parameter presence indication.

Fixes (9)
- Tickets #35, #30, #32, #33, #34, #37, #41, #42, #43

Editorial changes
- Update to HEVC version 1

3.2.2 Open issues

General issues:

Text is missing or not sufficient for the following adoptions, AHG3 kindly asks proponents to provide further input:

- For region boundary chain coding the reconstruction process of edges is not sufficiently specified (#3, JCT3V-A0070).

- The specification of a table related to DMMs is missing (#8, JCT3V-B0039).

A list of other minor issues is listed in the bug tracking system.

3.3   MV-HEVC Draft Text

Six versions of JCT3V-E1004 were published by the AHG following the 5th JCT-3V meeting in Vienna. The last version corresponds to the text submitted to MPEG secretariat as ISO/IEC DAM text.

3.3.1   Incorporated changes

All adoptions of the last meeting have been incorporated. Moreover existing text has been revised and improved and missing text from previous meeting has been added.

Changes (33) of JCT3V-E1004 relative to JCT3V-D1004 are:

Generic (1)
- (GEN/JCTVC-N0244/POC), #27 Adopt to use a reserved slice header bit for a POC reset flag, plus signal POC LSB in enhancement layer IRAP pictures from JCTVC-N0065, to maintain POC alignment between layers when IRAP pictures are not aligned.[During joint session discussion, decided to align with (JCTVC-N0147/VPS IRAP aligned flag), and only require inclusion of the slice flag when the VPS alignment flag indicates non-aligned IRAPs possible.]

Tiles and parallel processing (2)
- (T PP/N0160/ilp_restricted_ref_layers_flag) #19 Move num_ilp_restricted_ref_layers and related offset delay syntax elements from SPS VUI to VPS VUI, and change to a num_ilp_restricted_ref_layers flag per direct dependent layer for each layer.
- (T PP/N0199/N0160/move tile boundaries alignment) #20 Adopt proposal 2 variant 2 (also in JCTVC-N0160) to move tile boundaries alignment flag from the SPS VUI to the VPS VUI, and also signal the flag per direct dependent layer for each layer.

Random access, layer switching structures and cross-layer alignment of pictures types (4)
- (RA LSS CLA/E0306/TSA STSA align) If a higher layer pic is a TSA/STSA, lower layer inter-layer reference layer pictures in the same access unit shall also be TSA/STSA.
- (RA LSS CLA/E0306/picture marking) It was asked whether IDR/BLA in base layer but not in EL, the IDR in the BL causes marking of the EL pics as unused for reference (in other layers)? No, but need to figure out how/whether this is expressed in the text.
- (RA LSS CLA/N0147/VPS IRAP aligned flag) #25 Add a flag in VPS extension to indicate if all IRAP pictures are aligned in set of dependent layers.
- (RA LSS CLA/N0066/layerwise startup) #26 Adopt version 2 layer-wise start up decoding process.

Parameter sets (8)
- (PS/N0085/VPS VUI) #18 Add a VPS VUI section and put bit rate and picture rate information in it.
- (PS/N0085/ SPS,PPS IDs) #31 To establish that SPS/PPS IDs with different values of nuh_layer_id share the same "value space" such that different layers may share the same SPS/PPS. It is proposed to let them share the same value space.
- (PS/N0085/Req. vui_timing_info_present_flag) No timing and HRD information in VUI for SPS with nuh_layer_id > 0: Require the flag in the SPS VUI to indicate that this data is not present.
- (PS/N0085/Editorial suggestions) #3 Editorial changes – delegated to editors for consideration.
- (PS/N0085/vps nuh_layer_id) #2 Add a restriction "The value of nuh_layer_id of a VPS NAL unit shall be equal to 0." (for bitstreams conforming to specified proposals, and decoder shall ignore VPS NALUs with other values of nuh_layer_id.
- (PS/N0085/vps_extension_offset) #1 Semantics of vps_extension_offset: It is proposed to clearly specify that emulation prevention bytes are counted.
- (RF/N0092/Rep. format information in VPS) #12 Adopt (with the u(4) adjustment)

- (EPSPS/N0371/Scaling list prediction) #5 Adopting scaling list prediction in SPS and PPS (harmonization of JCTVC-N0162 and JCTVC-N0200 variant 3)

SEI (2)
- (SEI/JCTVC-N0383/Add inter-layer constrained tile sets) #24
- (SEI/N0173/Remove Layer Dependency SEI) #8 Layer dependency change SEI message be removed from specification. If the SEI message does remain, to adopt JCTVC-N0174 (with some editorial improvements).

Signalling of TMVP and collocated pictures (1)
- (TMVP COL//N0107/Col ind) #13 On collocated picture indication and inter_layer_sample_pred_only_flag) Remove the slice header syntax elements alt_collocated_indication_flag, collocated_ref_layer_idx, and inter_layer_sample_pred_only_flag.

Signalling for inter-layer dependency and inter-layer prediction reference (6)
- (SL ILP/N0120/max_tid_il_ref_pics_plus1_present_flag) #11 BoG Adopt with a minor editorial change to move location of inference.
- (RPLC/N0316/L0 L1 inter-layer rps) #10 BoG Exact decoding process might require slight modification based upon review of contributions related to view_id.
- (RPLC/N0082/Init RPL) #4 The BoG recommends adopting initialization process of reference picture lists.
- (IL RPS/N0195/splitting_flag constraint) #9 Add constraint when splitting_flag is used, that the sum of the lengths be less than or equal to 6, from JCTVC-N0195 5th proposal.
- (IL RPS/N0195/ilp_slice_signaling_flag) #7 Adopt an Inter Layer Reference Picture (ILRP) presence flag in the VPS, conditioning the presence of ILRP syntax elements in the slice segment header, similar to JCTVC-N0195 proposal 2.
- (IL RPS/N0081,N0195,N0154,N0217/inter_pred_layer_idc) #6 Adopt a condition on signaling inter_layer_pred_layer_idc[i], to avoid sending when NumDirectRefLayers equals NumActiveRefLayerPics, and instead infer values.

MV related only (7)
- (3D/E0038/View_id) #16 Adopt (merge with E0057). Revisions to integration of E0057
- (3D/Res. Constraint) #28 Support different spatial resolutions for different views but disable inter-view prediction in such a case.
- (3D/E0310/Levels) #29 Preliminary level definitions for stereo profile.
- (3D/E0240/3D reference display information SEI) #22 Persistence scope On 3D reference displays information SEI Decision
- (3D/E0057/ViewId) #16 Adopt (similar to E0038)
- (3D/E0104/Swap scalability dimensions) #15 Adopt, only portion that swaps multiview and depth flag in scalability dimension
- (3D/E0101/stereo profile avc_base_layer_flag) #14 Stereo profile definition the avc_base_flag which exists should be disabled.

Others (2)
- (E0110) Restructuring of Annxes
- Removal resolved and old editor's comments

3.3.2 Open issues

Open issues in JCT3V-E1004:

- Some text bugs reported in the bug tracking system or indicated by editor's comments.

4 Recommendations

The recommendations of the MV-HEVC / 3D-HEVC Test Model editing AHG are to:

- Approve the edited documents JCT3V-E1001, JCT3V-E1004 and JCT3V-E1005 as JCT-3V outputs.

- Continue to edit documents to ensure that all agreed elements of 3D- and MV-HEVC are fully described.

- Compare the documents with the HTM-software and resolve any discrepancies that may exist, in collaboration with the Software AHG.

- Continue to improve the overall editorial quality of the documents.

- Ensure that properly drafted candidate text is available prior to making any decision to change the specifications.

- Discuss reported open issues.

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