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MPEG VIDEO CODING

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Title: **[MIV] VPS MIV edition 2 extension**
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Abstract

This proposal proposes syntax and semantics for ISO/IEC 23090-12 *MPEG immersive video 2nd edition* to fix the backwards compatibility with the 1st edition. This proposal has a related WG 7 proposal.

Version 4 avoids a parsing dependency between the VPS and the common atlas sub-bitstream. The changesd since version 3 have been tracked.

1 Introduction

The flag `casme_decoder_side_depth_estimation_flag` in the CASPS MIV extension in WD1 of *ISO/IEC 23090-12 MPEG immersive video 2nd edition* [N 0340] breaks compatibility with ISO/IEC FDIS 23090-12 *MPEG immersive video*. Unfortunately, there are no reserved flags in the ~~VPS~~ CASPS MIV extension and there is no good place to move this flag to.

This proposal together with a related proposal in WG 7 [m63656] addresses this problem by introducing a CASPS MIV edition 2 extension and a VPS MIV edition 2 extension.

The `casme_decoder_side_depth_estimation_flag` moves to the new CASPS MIV 2 extension. An equivalent `vme_decoder_side_depth_estimation_flag` flag is added to the VPS MIV 2 extension to allow for clients to take a decision based on the VPS.

The new VPS extension includes the VPS MIV extension such that only one extension needs to be signalled. The motivation for that is that MIV edition 2 is an evolution of edition 1, and the overhead for signalling another VPS extension is more than the size of the VPS MIV extension.

The CASPS extension mechanism has less overhead, and it is acceptable to signal both the CASPS MIV extension and the CASPS MIV edition 2 extension.

To prevent a similar problem when adding a flag to a hypothetical third edition of MIV, the proposed extensions include~~s~~ reserved zero bits for future ISO/IEC use.

2 Proposed syntax changes

8.3.2.5 Common atlas sequence parameter set MIV extension syntax

casps_miv_extension( ) {	Descriptor
casme_depth_low_quality_flag	u(1)
casme_depth_quantization_params_present_flag	u(1)
casme_vui_params_present_flag	u(1)
if(casme_vui_params_present_flag)	
vui_parameters( )	
~~**casme_decoder_side_depth_estimation_flag**~~	~~u(1)~~
}	

~~**8.3.2.6.2 MIV view parameters list syntax**~~

~~miv_view_params_list( ) {~~	~~Descriptor~~
~~**mvp_num_views_minus1**~~	~~u(16)~~
~~**mvp_explicit_view_id_flag**~~	~~u(1)~~
~~if(mvp_explicit_view_id_flag)~~	
~~for(v = 0; v <= mvp_num_views_minus1; v++)~~	
~~**mvp_view_id**[v]~~	~~u(16)~~
~~for(v = 0; v <= mvp_num_views_minus1; v++) {~~	
~~camera_extrinsics(v)~~	
~~**mvp_inpaint_flag**[v]~~	~~u(1)~~
~~}~~	
~~**mvp_intrinsic_params_equal_flag**~~	~~u(1)~~
~~for(v = 0; v <= mvp_intrinsic_params_equal_flag ? 0 : mvp_num_views_minus1; v++)~~	
~~camera_intrinsics(v)~~	
~~if(casme_depth_quantization_params_present_flag) {~~	
~~**mvp_depth_quantization_params_equal_flag**~~	~~u(1)~~
~~for(v = 0; v <= mvp_depth_quantization_params_equal_flag ? 0 : mvp_num_views_minus1; v++)~~	
~~depth_quantization(v)~~	
~~}~~	
~~**mvp_pruning_graph_params_present_flag**~~	~~u(1)~~
~~if (mvp_pruning_graph_params_present_flag)~~	
~~for(v = 0; v <= mvp_num_views_minus1; v++)~~	
~~pruning_parents(v)~~	
~~if(vme_decoder_side_depth_estimation_flag)~~	
~~**mvp_depth_reprojection_flag**~~	~~u(1)~~
~~}~~	

8.3.2.8 V3C parameter set MIV edition 2 extension syntax

vps_miv_2_extension( ) {	Descriptor
vps_miv_extension( )	
vme_reserved_zero_8bits	u(8)

vme_decoder_side_depth_estimation_flag	u(1)
}	

8.3.2.9 Common atlas sequence parameter set MIV edition 2 extension syntax

casps miv 2 extension( ) {	Descriptor
casme_reserved_zero_8bits	u(8)
casme_decoder_side_depth_estimation_flag	u(1)
}	

3 Proposed semantics changes

8.4.2.5 Common atlas sequence parameter set MIV extension semantics

casme_depth_low_quality_flag equal to 1 indicates that the depth fidelity confidence in geometry video sub-bitstreams is low. casme_depth_low_quality_flag equal to 0 indicates that the depth fidelity confidence is unknown. When not present, the value of casme_depth_low_quality_flag is inferred to be equal to 0.

NOTE – Low depth fidelity indicates inconsistency in depth values between views. The encoder can set this flag to 1 for depth estimated on a natural content with an image-based depth estimation method. The encoder can set this flag to 0 for depth derived from a 3D model on a computer generated content.

casme_depth_quantization_params_present_flag equal to 1 indicates that the depth quantization parameters are present in the caf_miv_extension( )syntax structure. casme_depth_quantization_params_present_flag equal to 0 indicates that the depth quantization parameters are not present in the caf_miv_extension( ) syntax structure. When not present, the value of casme_depth_quantization_params_present_flag is inferred to be equal to 1.

casme_vui_params_present_flag equal to 1 indicates that the vui_parameters( ) syntax structure is present in the casps_miv_extension( ) syntax structure. casme_vui_params_present_flag equal to 0 indicates that the vui_parameters( ) syntax structure is not present in the casps_miv_extension( ) syntax structure. It is a requirement of bitstream conformance that the value of casme_vui_params_present_flag shall be equal to 0 for all non-IRAP access units.

~~**casme_decoder_side_depth_estimation_flag** equal to 1 specifies that the V3C bitstream contains either no geometry sub-bitstream or geometry sub-bitstream with the geometry samples that are not intended to be used for view rendering. When not present, the value of casme_decoder_side_depth_estimation_flag is inferred to be equal to 0.~~

~~NOTE – A decoder should perform a depth estimation or refinement process to obtain geometry samples that are used for view rendering.~~

8.4.2.8 V3C parameter set MIV 2 extension semantics

vme_reserved_zero_8bits, when present, shall be equal to 0 in bitstreams conforming to this version of this document. Other values for vme_reserved_zero_8bits are reserved for future use by ISO/IEC. Decoders shall ignore the value of vme_reserved_zero_8bits.

vme_decoder_side_depth_estimation_flag equal to 1 specifies that the V3C bitstream contains either no geometry sub-bitstream or geometry sub-bitstream with the geometry samples that are not intended to be used for view rendering. When not present, the value of vme_decoder_side_depth_estimation_flag is inferred to be equal to 0.

NOTE – A decoder should perform a depth estimation or refinement process to obtain geometry samples that are used for view rendering.

8.4.2.9 Common atlas sequence parameter set MIV 2 extension semantics

casme_reserved_zero_8bits, when present, shall be equal to 0 in bitstreams conforming to this version of this document. Other values for casme_reserved_zero_8bits are reserved for future use by ISO/IEC. Decoders shall ignore the value of casme_reserved_zero_8bits.

casme_decoder_side_depth_estimation_flag equal to 1 specifies that the V3C bitstream contains either no geometry sub-bitstream or geometry sub-bitstream with the geometry samples that are not intended to be used for view rendering. When not present, the value of casme_decoder_side_depth_estimation_flag is inferred to be equal to 0.

It is a requirement of bitstream conformance that casme_decoder_side_depth_estimation_flag shall be equal to vme_decoder_side_depth_estimation_flag.

NOTE – A decoder should perform a depth estimation or refinement process to obtain geometry samples that are used for view rendering.

4 Proposed profile changes

Table A-1 — Allowable values of syntax element values for the MIV toolset profile components

	Profile name									
Syntax element	MIV Main		MIV Extended						MIV Geometry Absent	
					Restricted Geometry		Decoder-Side Depth Estimation			
		Still		Still		Still		Still		Still
ptc_one_v3c_frame_only_flag	0, 1	1	0, 1	1	0, 1	1	0, 1	1	0, 1	1
vuh_unit_type	V3C_VPS, V3C_AD, V3C_GVD, V3C_AVD, or V3C_CAD		V3C_VPS, V3C_AD, V3C_OVD, V3C_GVD, V3C_AVD, V3C_PVD, or V3C CAD		V3C_VPS, V3C_AD, V3C_AVD, V3C_PVD, or V3C CAD		V3C_VPS, V3C_AD, V3C_OVD, V3C_GVD, V3C_AVD, V3C_PVD, or V3C CAD		V3C_VPS, V3C_AD, V3C_AVD, or V3C CAD	
ptl_profile_toolset_idc	64		65						66	
ptl_profile_reconstruction_idc	255		255						255	

ptc_restricted_geometry_flag	N/A	0	1	0	N/A
VpsMivExtensionPresentFlag	1	1	1	0	1
VpsMiv2ExtensionPresentFlag	0	0	0	1	0
VpsPackingInformationPresentFlaga	0	0, 1	0, 1	0, 1	0
vps_map_count_minus1[atlasID]	0	0	0	0	0
vps_auxiliary_video_present_flag[atlasID]	0	0	0	0	0
vps_occupancy_video_present_flag[atlasID]	0	0, 1	0	0, 1	0
vps_geometry_video_present_flag[atlasID]	1	0, 1	0	0, 1	0
vps_packed_video_present_flag[atlasID]	0	0, 1	0, 1	0, 1	0
vme_embedded_occupancy_enabled_flag	1	0, 1	0	0, 1	0
vme_decoder_side_depth_estimation_flag	-	-	-	1	-
oi_occupancy_msb_align_flag[atlasID]	0	0	0	0	0
gi_geometry_msb_align_flag[atlasID]	0	0	0	0	0
ai_attribute_count[atlasID]	0, 1	0, 1, 2	2	0, 1	1
ai_attribute_type_id[atlasID][attrIdx]	ATTR_TEXTURE	ATTR_TEXTURE, ATTR_TRANSPARENCY	ATTR_TEXTURE, ATTR_TRANSPARENCY	ATTR_TEXTURE	ATTR_TEXTURE
ai_attribute_dimension_minus1[atlasID] [attrTextureIdx]	2	2	2	2	2

ai_attribute_dimension_minus1[atlasID] [attrTransparencyIdx]	N/A	0	0	N/A	N/A
ai_attribute_dimension_partitions_minus1[atlasID] [attrIdx]	0	0	0	0	0
ai_attribute_msb_align_flag[atlasID][attrIdx]	0	0	0	0	0
pin_attribute_count[atlasID]	N/A	0, 1, 2	2	0, 1	N/A
pin_attribute_type_id[atlasID][attrIdx]	N/A	ATTR_TEXTURE, ATTR_TRANSPARENCY	ATTR_TEXTURE, ATTR_TRANSPARENCY	ATTR_TEXTURE	N/A
pin_attribute_dimension_minus1[atlasID] [attrTextureIdx]	N/A	2	2	2	N/A
pin_attribute_dimension_minus1[atlasID] [attrTransparencyIdx]	N/A	0	0	N/A	N/A
pin_attribute_dimension_partitions_minus1[atlasID] [attrIdx]	N/A	0	0	0	N/A
pin_attribute_msb_align_flag[atlasID][attrIdx]	N/A	0	0	0	N/A
asps_raw_3d_offset_bit_count_explicit_mode					
asps_max_dec_atlas_frame_buffering_minus1	0	0	0	0	0
asps_long_term_ref_atlas_frames_flag	0	0	0	0	0
asps_pixel_deinterleaving_enabled_flag	0	0	0	0	0

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asps_patch_precedence_order_flag	0	0	0	0	0
asps_raw_patch_enabled_flag	0	0	0	0	0
asps_eom_patch_enabled_flag	0	0	0	0	0
asps_plr_enabled_flag	0	0	0	0	0
asps_vpcc_extension_present_flag	0	0	0	0	0
asme_patch_constant_depth_flag	0	0, 1	1	0	0
vps_geometry_video_present_flag[atlasID] || pin_geometry_present_flag[atlasID] || asme_patch_constant_depth_flag	N/A	1	1	0, 1	N/A
afps_lod_mode_enabled_flag	0	0	0	0	0
afps_raw_3d_offset_bit_count_explicit_mode_flag	0	0	0	0	0
afti_single_tile_in_atlas_frame_flag	1	0, 1	0, 1	0, 1	0, 1
dq_quantization_law[v]	0	0	0	0	0
ath_type	I_TILE	I_TILE	I_TILE	I_TILE	I_TILE
atdu_patch_mode[tileID][patchIdx]	I_INTRA	I_INTRA	I_INTRA	I_INTRA	I_INTRA
aaps_vpcc_extension_present_flag	0	0	0	0	0
asps_atlas_sequence_parameter_set_id	0..63, inclusive	0..63, inclusive	0..63, inclusive	0..63, inclusive	0..63, inclusive
afps_atlas_frame_parameter_set_id	0..63, inclusive	0..63, inclusive	0..63, inclusive	0..63, inclusive	0..63, inclusive
afps_atlas_sequence_parameter_set_id	0..63, inclusive	0..63, inclusive	0..63, inclusive	0..63, inclusive	0..63, inclusive

5 Conclusions

WD1 inherits the 1st edition profiles and adds the MIV Extended DSDE sub-profile. With this proposal all profiles of the 2nd and subsequent editions will restrict:

- *VpsMivExtensionFlag = 0*
- *VpsMiv2ExtensionFlag* = 1

The proponents recommend:

- Recommend to WG 7 to adopt the related proposal [m63656].
- Adopt this proposal conditional on the adoption of the WG 7 proposal.
- Integrate into TMIV ahead of MPEG 143 to test the proposal.
- Re-enable continuous conformance testing of TMIV.
- Add continuous parsing tests of V-PCC conformance bitstreams.