

JVET-AH0162: AHG9: Constituent Rectangles SEI

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Constituent Rectangles SEI

- Enable description of pictures formed by composition of multiple constituent rectangles
- Coded picture may contain constituent rectangles of different content types, such as texture, depth, alpha, or object mask, or may contain multiple constituent rectangles of the same type



Example picture with texture and depth constituent rectangles



Example picture with multiple texture views

Signaling size and position of constituent rectangles

- Several options for signalling rectangle size and position, for efficient coding for variety of use cases, as selected by the encoder
 - Subpicture partitioning parameters may be used to identify size and location of rectangles, when available
 - When all rectangles are same size, signal number of rows x columns of rectangle grid
 - Explicitly signal size and position for each constituent rectangle, in a signalled unit size (power of 2)
 - Rectangle positions may not overlap, e.g. a sample may be in only one rectangle
 - Not required that all samples in a coded picture be contained within a rectangle
- SEI message persists for entire CLVS
- If used with reference picture resampling (RPR), size and position parameters refer to max picture size signalled in SPS

Rectangle type, ID, and description

- Rectangle types are optionally signalled, and values can be inferred from previous rectangle
- Optional rectangle ID, with length explicitly signalled
- Optional text description of rectangle as st(v)

cr_rect_type_idc[i]	Name	Type of constituent rectangle
0	SPT_TEXTURE	Texture
1	SPT_ALPHA	Alpha plane
2	SPT_DEPTH	Depth picture
3	SPT_OBJECT_MASK	Object mask
4 .. 127		Reserved
128..254		Unspecified
255	SPT_EMPTY	Empty

Empty rectangle type

- Empty rectangle type is defined, especially to use to fill in gaps when “same size” rectangle signalling used



Summary of proposed features

1. A rect type is optionally signalled per constituent rectangle
2. Locations and sizes of the constituent rectangles can be signalled through the following options:
 - a. Subpic parameters signalled in the SPS may be used to identify the constituent rectangle locations and sizes
 - b. Optional signalling of number of columns and rows when all constituent rectangles are the same size, with derivation of constituent rectangle locations and sizes
 - c. Explicit signalling of constituent rectangle location and sizes, in any order
3. Each sample location in the coded picture may be included in at most one constituent rectangle, e.g. rectangles in the coded picture do not overlap
4. Samples in the coded picture are not required to be in a constituent rectangle
5. An “empty” rect type can be signalled for a rectangular region, especially useful for vacant areas using “same size” signalling
6. A rect ID is optionally signalled per constituent rectangle
7. A rect description is optionally signalled per constituent rectangle
8. SEI persists for an entire CLVS
9. If adaptive resolution change is used, signalled constituent rectangle sizes and locations are for max pic width/height signalled in SPS, and current picture sizes and locations are calculated

Proposed syntax

constituent_rectangles(payloadSize) {	Descriptor
cr_num_rects_minus1	u(12)
cr_rect_id_present_flag	u(1)
if (cr_rect_id_present_flag)	
cr_rect_id_len	u(4)
cr_rect_type_enabled_flag	u(1)
cr_rect_type_descriptions_enabled_flag	u(1)
cr_subpics_partitioning_flag	u(1)
if(!cr_subpics_partitioning_flag) {	u(1)
cr_rect_same_size_flag	u(1)
if (cr_rect_same_size_flag) {	
cr_num_cols_minus1	ue(v)
cr_num_rows_minus1	ue(v)
} else {	
cr_log2_unit_size	u(4)
cr_rect_size_len_minus1	u(4)
}	
for(i = 0; i <= cr_num_rects_minus1; i++) {	
if (cr_rect_type_enabled_flag) {	
cr_rect_type_present_flag[i]	u(1)
if (cr_rect_type_present_flag[i])	
cr_rect_type_idc[i]	u(8)
}	

if (cr_rect_type_idc[i] != 255) {	
if (cr_rect_id_present_flag)	
cr_rect_id[i]	u(v)
if (cr_rect_type_description_enabled_flag)	
cr_rect_type_description_present_flag[i]	u(1)
}	
if(!cr_subpics_partitioning_flag && !cr_rects_same_size_flag) {	
cr_rect_top_left_in_units_x[i]	u(v)
cr_rect_top_left_in_units_y[i]	u(v)
cr_rect_width_in_units_minus1[i]	u(v)
cr_rect_height_in_units_minus1[i]	u(v)
}	
}	
if(cr_rect_type_descriptions_enabled_flag) {	
while(!byte_aligned())	
cr_bit_equal_to_zero /* equal to 0 */	f(1)
for(i = 0; i <= cr_num_rects_minus1; i++)	
if(rect_type_description_present_flag[i])	
cr_rect_type_description[i]	st(v)
}	
}	

Discussion

- Multi-layer bitstreams and auxiliary pictures can support many of the use cases, but some applications may prefer to use single layer bitstreams to simplify system timing and utilize existing VVC Main 10 profile encoders and decoders
- Flexible standardized solution to support wide range of use cases using pictures formed from composition of constituent rectangles
- Recommend to adopt Region Packing SEI into TMuC for VSEI

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