

JVET-Q0377

AHG12: On “tile-fraction” slices and signaling of slices per subpicture

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Introduction

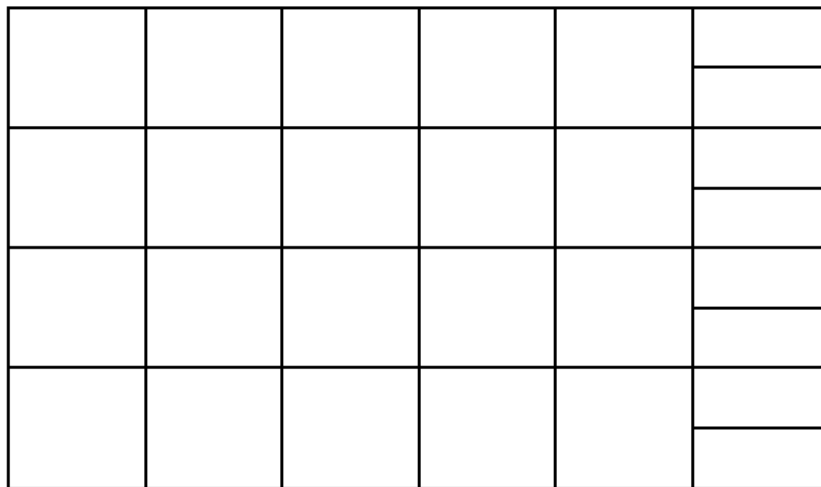
- **This contribution relates to the signalling of the slice partition in the PPS**
- **In VVC7, syntax describing the slice partition is made relatively to the tile structure**
 - without reference to subpictures
- **However, slices partition is constrained by subpicture layout**
 - Subpictures must contain one or more slices
 - The index of the slice is relative to its subpicture
 - It was discussed to disallow that a subpicture contains one slice from a first tile and a second slice which covers a part of a second tile
- **Current syntax is not enforcing these constraints which is prone to generate bitstreams which are not in conformance with VVC**

Introduction

■ Requirement to define multiple slices within a tile

- Addresses OMAF use cases that require particular patterns of regions for bitstream extraction and merging operations
- Each "tile-fraction" slice would be probably in different subpictures
- Having a subpicture containing one complete tile with multiple "tile-fraction" slices is not efficient in terms of compressions efficiency
- Tile-fraction slices are not allowed in raster scan slice mode

➤ Multiple slices within a tile is envisaged for subpicture based merging approaches



Example of patterns of regions for OMAF

■ We think it is not necessary to define subpicture containing several tile-fraction slices.

Proposal

■ Signal the slice partitioning per subpicture in the PPS

- `num_slices_in_subpic_minus1[i]` specifies the number of slices in the i-th subpicture
- `num_slices_in_pic_minus1`, `num_slices_in_tile_minus1[i]` and `slice_height_in_ctu_minus1[i]` are removed
- Slice width and height in tile units

<code>rect_slice_flag</code>	u(1)
<code>if(rect_slice_flag) {</code>	
<code>single_slice_per_subpic_flag</code>	u(1)
<code>if(rect_slice_flag && !single_slice_per_subpic_flag) {</code>	
<code>num_slices_in_pic_minus1</code>	ue(v)
<code>tile_idx_delta_present_flag</code>	u(1)
<code>for(i = 0; i <= pps_num_subpic_minus1; i++) {</code>	
<code>num_slices_in_subpic_minus1[i]</code>	ue(v)
<code>for(i = 0; i < num_slices_in_subpic_minus1; i++) {</code>	
<code>slice_width_in_tiles_minus1[i][j]</code>	ue(v)
<code>slice_height_in_tiles_minus1[i][j]</code>	ue(v)
<code>if(slice_width_in_tiles_minus1[i] == 0 && slice_height_in_tiles_minus1[i] == 0) {</code>	
<code>num_slices_in_tile_minus1[i]</code>	ue(v)
<code>for(j = 0; j < num_slices_in_tile_minus1[i]; j++)</code>	
<code>slice_height_in_ctu_minus1[i++]</code>	ue(v)
<code>}</code>	
<code>if(tile_idx_delta_present_flag && i < num_slices_in_subpic_minus1)</code>	
<code>tile_idx_delta[i][j]</code>	se(v)
<code>}</code>	
<code>}</code>	
<code>}</code>	
<code>}</code>	

■ When a subpicture represents a part of tile

- Constrained to contain a single slice of size equal to the subpicture size

■ A "tile-fraction" slice is allowed when it covers a complete subpicture which is also a fraction of a tile.

Proposal

- The number of subpicture is present in the PPS when `pps_subpic_id_signaling_present_flag` is equal to 1
- It is proposed to signal `pps_num_subpics_minus1` independently of `pps_subpic_id_signaling_present_flag`

<code>pic_parameter_set_rbsp() {</code>	Descriptor
<code>pps_pic_parameter_set_id</code>	<code>ue(v)</code>
<code>[...]</code>	
<code>pps_num_subpics_minus1</code>	<code>ue(v)</code>
<code>if(pps_subpic_id_signalling_present_flag) {</code>	
<code>pps_num_subpics_minus1</code>	<code>ue(v)</code>
<code>pps_subpic_id_len_minus1</code>	<code>ue(v)</code>
<code>[...]</code>	
<code>}</code>	

Conclusion

- **This contribution proposed the following changes:**

- Signal the slice partitioning per subpicture in the PPS
 - Removes three syntax elements from the PPS
 - One new syntax element that indicates the number of slices for each subpicture
- Limit the usage of slices representing a fraction of tiles in combination with subpictures

- **The PPS syntax is simplified and less prone to generate non conformant bitstreams**

- **Slice partition coding size is expected to improve when multiple slices are used per tiles**

- Since inferred from subpicture size