

JVET-AH0161: AHG9: Region packing information SEI

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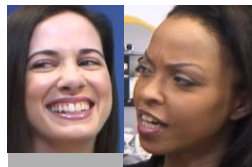
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Region packing information SEI

- Pack rectangular regions of interest (ROIs) from a larger picture into a smaller resolution coded picture
- Use of a smaller coded picture size reduces bitrate and pixel rate and reduces complexity of the video decoder and any post-processing operations, i.e., AI use cases



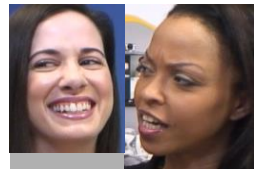
Original picture with selected ROIs



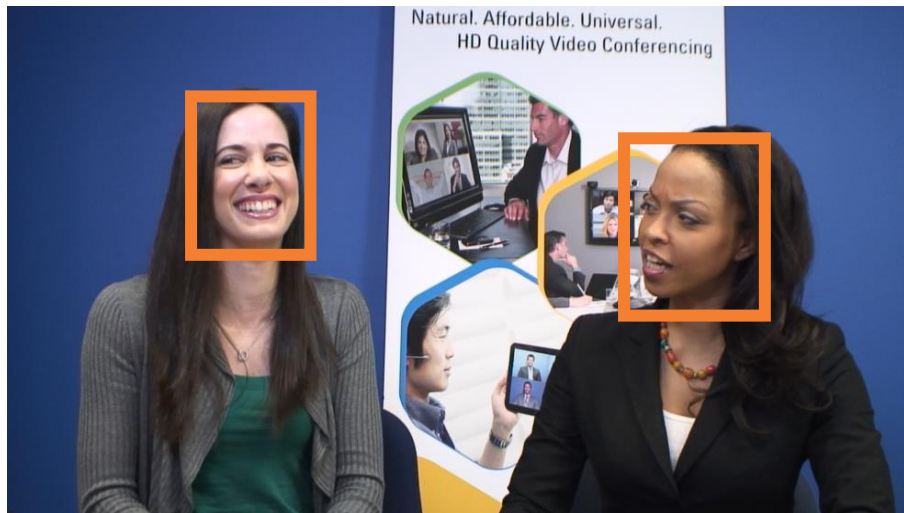
Coded picture

Target picture

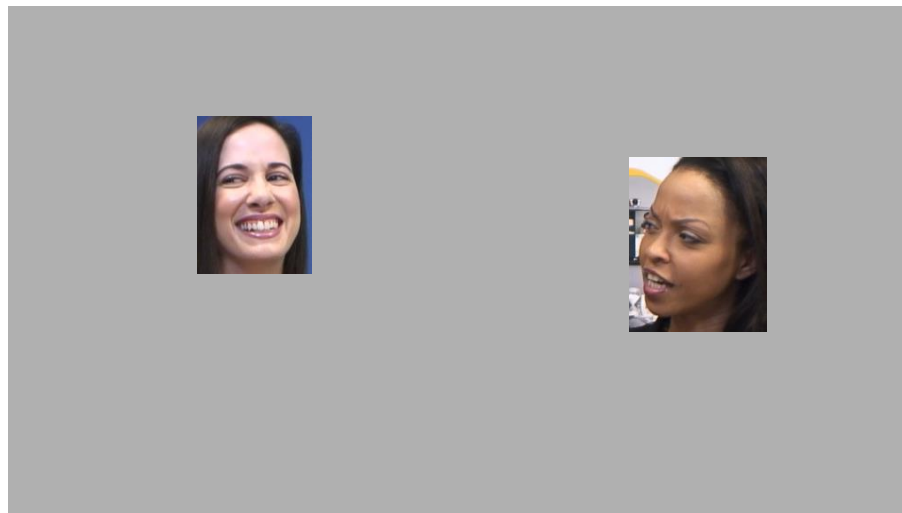
- Enable optional reconstruction of a target picture from the specified regions of the decoded picture



Coded picture



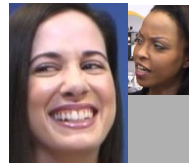
Original picture with selected ROIs



Target picture

Region resampling

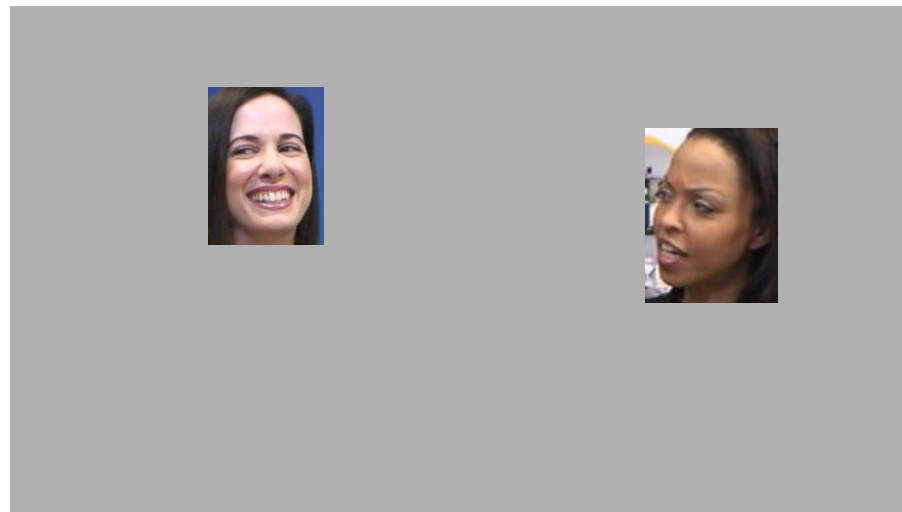
- Optionally resample regions, using list of resampling ratios



Coded picture



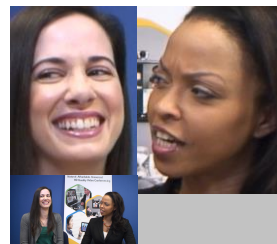
Original picture with selected ROIs



Reconstructed target picture
with background resampling

Region precedence

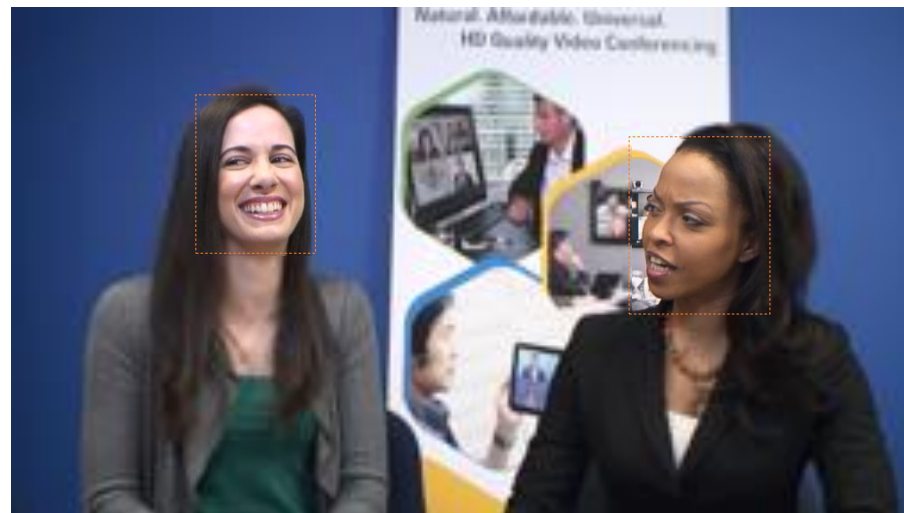
- Region ID or index determines precedence in target picture
- Enables coding of background region, e.g. at lower resolution



Coded picture



Original picture with selected ROIs



Reconstructed target picture
with background resampling

Summary of proposed features

1. A region ID is optionally signalled for each region
2. For each region, the top left (x,y) position and (width, height) in the coded picture are signalled in “units”, with unit size signalled as a power of 2
3. A flag indicates whether the position and size of a region are with respect to the picture dimensions of the current cropped decoded picture signalled in the PPS, or with respect to the max cropped picture dimensions signalled in the SPS, e.g. when adaptive picture resolution is used
4. The resolution of the target picture is optionally signalled, to enable optional reconstruction of the target picture
5. The top left location of each region within the target picture is optionally signalled
6. A list of resampling ratios as ratio of integers (numerator, denominator) is optionally signalled, with a selected resampling ratio signalled per region
7. In the target picture reconstruction process, sample values are initialized to mid-gray
8. Regions in the target picture may overlap. The region with the higher region ID has precedence in the reconstruction of the target picture.
9. Persistence flag and cancel flags are signalled to specify persistence

Proposed Syntax

packed_regions_info(payloadSize)	Descriptor
pri_cancel_flag	u(1)
if (!pri_cancel_flag) {	
pri_persistence_flag	u(1)
pri_num_regions_minus1	ue(v)
pri_use_max_dimensions_flag	u(1)
pri_log2_unit_size	u(4)
pri_region_size_len_minus1	u(4)
pri_region_id_present_flag	u(1)
pri_target_pic_params_present_flag	u(1)
if(pri_target_pic_params_present_flag) {	
pri_target_pic_width_minus1	u(16)
pri_target_pic_height_minus1	u(16)
}	
pri_num_resampling_ratios_minus1	ue(v)
for(i = 1; i <= pri_num_resampling_ratios_minus1; i++) {	
pri_resampling_width_num_minus1[i]	ue(v)
pri_resampling_width_denom_minus1[i]	ue(v)
pri_fixed_aspect_ratio_flag[i]	u(1)
if(!pri_fixed_aspect_ratio_flag[i]) {	
pri_resampling_height_num_minus1[i]	ue(v)
pri_resampling_height_denom_minus1[i]	ue(v)
}	
}	
for(i = 0; i <= pri_num_regions_minus1; i++) {	
if(pri_region_id_present_flag)	
pri_region_id[i]	ue(v)
pri_region_top_left_in_units_x[i]	u(v)
pri_region_top_left_in_units_y[i]	u(v)
pri_region_width_in_units_minus1[i]	u(v)
pri_region_height_in_units_minus1[i]	u(v)
if(pri_num_resampling_ratios_minus1 > 0)	
pri_resampling_ratio_idx[i]	u(v)
if(pri_target_pic_params_present_flag)	
pri_target_region_top_left_x[i]	u(v)
pri_target_region_top_left_y[i]	u(v)
}	
}	
}	

Discussion

- Proposed SEI differs from Annotated regions SEI which just identifies regions and does not change the coded picture
- Some AI use cases need only ROIs and don't require entire pictures, but may benefit from ROI location information
- Resolution requirements of individual regions may differ
- Use of reference picture resampling supported, without requiring re-signalling of region sizes and locations
- Recommend to adopt Region Packing SEI into TMuC for VSEI

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