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JCTVC-J0185:

On Short_term_ref_pic_set

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Agenda

- Problem Statement
- Proposed Change in Syntax & Semantics
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Problem Statement [1/]

- Short term references pictures are defined by "short_term_ref_pic_set (idx)".
  - Syntax elements in short_term_rps can be coded with or without prediction.
  - Sets of all pictures contained in a GOP are transmitted in SPS.
  - It can be overwritten in SliceHeader.
- It contains the following redundancies
  - inter_ref_pic_set_prediction_flag is transmitted even if idx=0, where inter_ref_pic_set_prediction cannot be applied.
  - In common test condition the value of delta_idx_minus1 remains 0 for all idx values but is transmitted for all idx values

Coding Order:

GOP structure

Parameters to be encoded

Frame 1 | inter_ref_pic_set_prediction_flag = 0

Frame 2 | inter_ref_pic_set_prediction_flag = 1
delta_idx_minus1 = 0

Frame 8 | inter_ref_pic_set_prediction_flag = 1
delta_idx_minus1 = 0
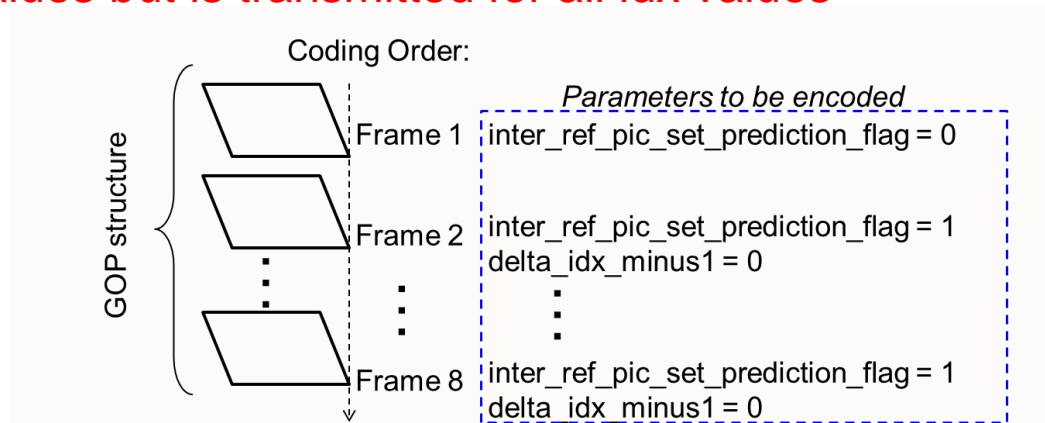
e.g., Random access condition from HE 7.0 CTC

Problem Statement [2/]

Problem 1:
When idx=0 it should always be 0 and no need to be transmitted

Problem 2:
In CTC delta_rps_minus1 always equals 0. Sending it for all idx is redundant

short_term_ref_pic_set(idx) {	Descriptor
inter_ref_pic_set_prediction_flag	u(1)
if(inter_ref_pic_set_prediction_flag) {	
delta_idx_minus1	ue(v)
delta_rps_sign	u(1)
abs_delta_rps_minus1	ue(v)
for(j = 0; j <= NumDeltaPocs[RIdx]; j++) {	
used_by_curr_pic_flag[j]	u(1)
if(!**used_by_curr_pic_flag**[j])	
use_delta_flag[j]	u(1)
}	
}	
else {	
num_negative_pics	ue(v)
num_positive_pics	ue(v)
for(i = 0; i < num_negative_pics; i++) {	
delta_poc_s0_minus1[i]	ue(v)
used_by_curr_pic_s0_flag[i]	u(1)
}	
for(i = 0; i < num_positive_pics; i++) {	
delta_poc_s1_minus1[i]	ue(v)
used_by_curr_pic_s1_flag[i]	u(1)
}	
}	
}	

Coding w/ RPS Prediction

Coding w/o RPS Prediction

Problem Statement [3/]

seq_parameter_set_rbsp( ) {	Descriptor
...	
seq_loop_filter_across_slices_enabled_flag	u(1)
asymmetric_motion_partitions_enabled_flag	u(1)
nsrqt_enabled_flag	u(1)
sample_adaptive_offset_enabled_flag	u(1)
adaptive_loop_filter_enabled_flag	u(1)
if(adaptive_loop_filter_enabled_flag)	
alf_coef_in_slice_flag	u(1)
if(pcm_enabled_flag)	
pcm_loop_filter_disable_flag	u(1)
sps_temporal_id_nesting_flag	u(1)
[Ed. (BB): x y padding syntax missing here, present in HM software]	
if(log2_min_coding_block_size_minus3 = = 0)	
inter_4x4_enabled_flag	u(1)
num_short_term_ref_pic_sets	ue(v)
for(i = 0; i < num_short_term_ref_pic_sets; i++)	
short_term_ref_pic_set(i)	
long_term_ref_pics_present_flag	u(1)
sps_temporal_mvp_enable_flag	u(1)
...	
}	

Basically all short_term_rps are sent at SPS

Problem Statement [4/]

short_term_rps can be overwritten at sliceheader →

slice_header( ) {	Descriptor
...	
if(!IdrPicFlag) {	
pic_order_cnt_lsb	u(v)
short_term_ref_pic_set_sps_flag	u(1)
if(!short_term_ref_pic_set_sps_flag)	
short_term_ref_pic_set(num_short_term_ref_pic_sets)	
else	
short_term_ref_pic_set_idx	u(v)
if(long_term_ref_pics_present_flag) {	
num_long_term_pics	ue(v)
for(i = 0; i < num_long_term_pics; i++) {	
poc_lsb_lt[i]	u(v)
delta_poc_msb_present_flag[i]	u(1)
if(delta_poc_msb_present_flag[i])	
delta_poc_msb_cycle_lt[i]	ue(v)
used_by_curr_pic_lt_flag[i]	u(1)
}	
}	
}	
...	
}	

Proposed change in Syntax & Semantics [1/]

- To solve the problem it is proposed
  - inter_ref_pic_set_prediction_flag is transmitted only if idx!=0
  - unified_delta_idx_minus1, which is applied for short_term_ref_pic_sets with all idx values, can be transmitted in SPS

Proposed change in Syntax & Semantics [2/]

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SPS syntax

seq_parameter_set_rbsp( ) {	Descriptor
…	
num_short_term_ref_pic_sets	ue(v)
disable_rps_prediction_flag	u(1)
if (! disable_rps_present_flag) {	
unified_rps_prediction_control_present_flag	u(1)
if (unified_rps_prediction_control_present_flag)	
unified_delta_idx_minus1	ue(v)
}	
for(i = 0; i < num_short_term_ref_pic_sets; i++)	
short_term_ref_pic_set(i)	
…	
}	

short_term_ref_pic_set syntax

short_term_ref_pic_set(idx) {	Descriptor
if (disable_rps_prediction_flag)	
inter_ref_pic_set_prediction_flag = 0	
else	
inter_ref_pic_set_prediction_flag	u(1)
if (inter_ref_pic_set_prediction_flag){	
if(unified_rps_prediction_control_present_flag)	
delta_idx_minus1 = unified_delta_idx_minus1	
else	
delta_idx_minus1	ue(v)
…	
}	
else {	
… }	
}	

Proposed change in Syntax & Semantics [3/]

Semantics

disable_rps_prediction_flag equals to 1 specifies that the operation of rps prediction shall be disabled and disable_rps_prediction_flag equals to 0 specify that the operation of rps prediction can be used.

unified_rps_prediction_control_present_flag equals to 1 specifies that unified_delta_idx_minus1 shall be used for all frames using rps prediciton in one GOP structure and unified_rps_prediction_control_present_flag equals to 0 specifies that parameters of frames using rps prediciton in one GOP structure shall be used respectively.

unified_delta_idx_minus1 plus 1 specifies the common value of difference between the index of the reference picture set of the current picture and the index of the reference picture set used for rps prediction.

Conclusion

- To remove redundancies associated with short_term_ref_pic_set (idx), the following modifications are proposed
  - inter_ref_pic_set_prediction_flag is transmitted only if idx!=0
  - unifed_delta_idx_minus1, which is applied for short_term_ref_pic_sets with all idx values, can be transmitted in SPS
  - Use one flag disable_rps_prediction_flag to disable rps prediction function for all.
- It is recommended to adopt these modifications into HEVC DIS.

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