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CE4-related: An encoder switch for forcing temporal MV to zero in SbTMVP

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Overall Summary

- Add a high-level switch for forcing the temporal MV to zero in the SbTMVP
 - Remove the clipping operations at encoder side
 - Fetch collected MV memory regularly
 - Achieve lower complexity encoder when preserve most coding gain of SbTMVP

Over VTM-6.0 (%)		Y	U	V	EncT	DecT	
1	Proposed method with setting the switch to 1	RA	0.06	0.08	0.04	101%	100%
		LB	0.05	0.12	-0.07	100%	99%

Introduction

- With temporal MV (motion shift), position clipping is needed to guarantee that the location is in “position clipping area”
 - 16x16 luma CB: 5 (1 for luma CB and 4 for luma subblocks)
 - 128x128 luma CB: 257 (1 for luma CB and 256 for luma subblocks)
 - One position clipping operation needs four comparisons
- To lower the encoder complexity, propose to add a switch for forcing temporal MV to zero

Proposed Method

- Picture parameter set RBSP syntax

constant_slice_header_params_enabled_flag	u(1)
if(constant_slice_header_params_enabled_flag) {	
...	
pps_temporal_mvp_enabled_idc	u(2)
pps_mvd_l1_zero_idc	u(2)
pps_collocated_from_l0_idc	u(2)
pps_sbtmvp_zero_temporal_mv_idc	u(2)

- General slice header syntax

if(sps_temporal_mvp_enabled_flag && !pps_temporal_mvp_enabled_idc)	
slice_temporal_mvp_enabled_flag	u(1)
if(slice_type == B && !pps_mvd_l1_zero_idc)	
mvd_l1_zero_flag	u(1)
if(slice_temporal_mvp_enabled_flag) {	
if(slice_type == B && !pps_collocated_from_l0_idc)	
collocated_from_l0_flag	u(1)
if(sps_sbtmvp_enabled_flag && !pps_sbtmvp_zero_temporal_mv_idc)	
sbtmvp_zero_temporal_mv_flag	u(1)
}	

Proposed Method

- Follow constant_slice_header_params_enabled_flag (O0238) style, add flag at PPS and slice header levels
 - If sbtmvp_zero_temporal_mv_flag is 1, force temporal MV to zero
 - If pps_sbtmvp_zero_temporal_mv_idc is ...
 - 2: sbtmvp_zero_temporal_mv_flag = 1
 - 1: sbtmvp_zero_temporal_mv_flag = 0
 - 0: sbtmvp_zero_temporal_mv_flag is present in slice header
- Simplify the SbTMVP implementation in cost-effective hardware encoders by turning on the switch
 - Remove the position clipping operations
 - Fetch collected MV memory regularly

Simulation Results

- Proposed method with setting the switch to 1
- Preserve ~90% SbTMVP coding gain

SbTMVP off
from AHG13

	Random access Main10					Random access		
	Over VTM-6.0					Over VTM-6.0		
	Y	U	V	EncT	DecT	Y	U	V
Class A1	0.08%	-0.01%	0.04%	101%	100%	0.61%	0.43%	0.53%
Class A2	0.06%	0.13%	0.03%	101%	100%	0.41%	0.30%	0.36%
Class B	0.01%	0.07%	0.04%	101%	100%	0.36%	0.36%	0.30%
Class C	0.10%	0.14%	0.07%	101%	100%	0.65%	0.52%	0.54%
Class E								
Overall	0.06%	0.08%	0.04%	101%	100%	0.50%	0.40%	0.42%
Class D	-0.01%	0.03%	0.07%	100%	100%	0.59%	0.43%	0.48%
Class F	0.03%	0.01%	0.02%	100%	99%	0.38%	0.32%	0.38%

	Low delay B Main10					Low delay B		
	Over VTM-6.0					Over VTM-6.0		
	Y	U	V	EncT	DecT	Y	U	V
Class A1								
Class A2								
Class B	0.04%	0.00%	-0.21%	100%	100%	0.27%	0.21%	0.06%
Class C	0.03%	0.02%	-0.08%	100%	99%	0.41%	0.71%	0.41%
Class E	0.08%	0.44%	0.20%	100%	98%	1.83%	1.95%	2.32%
Overall	0.05%	0.12%	-0.07%	100%	99%	0.71%	0.81%	0.74%
Class D	0.04%	0.70%	0.56%	100%	99%	0.45%	0.59%	0.41%
Class F	-0.01%	-0.02%	1.23%	100%	99%	0.29%	0.58%	0.91%

Conclusions

- Proposed a high-level switch for forcing temporal MV to zero in SbTMVP
 - Achieve SbTMVP with lower complexity at encoder side
 - Preserve most coding gain of SbTMVP
- Thanks to Tencent for cross-checking