

JCTVC-S0172

Non-CE2: Unification of IntraBC mode with inter mode

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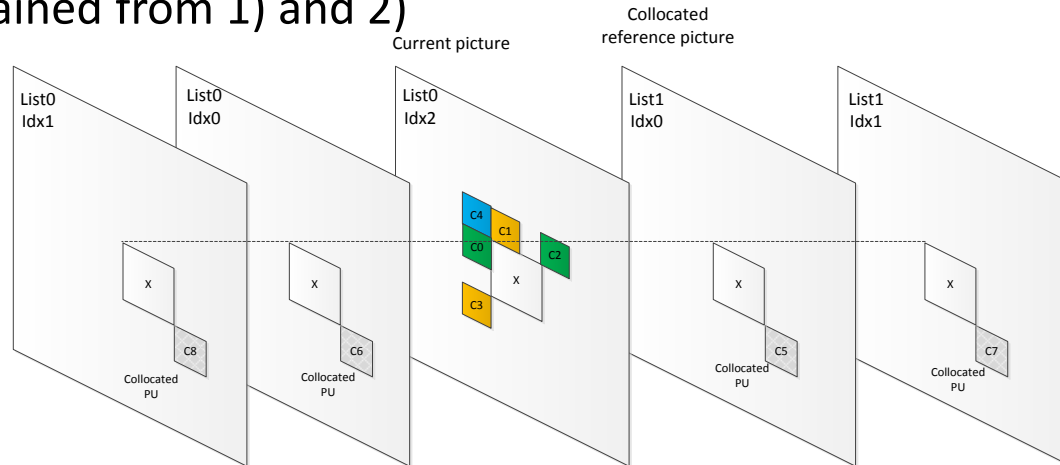
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Introduction

- Combine block vector derivation in CE2 Test3 and unification of IntraBC and inter mode in CE2 Test5b
 - IntraBC merge process is separated from inter merge process using `intra_bc_flag`
 - The derived BVs from CE2 Test3 are added as IntraBC merge candidate if the number of IntraBC merge candidates is less than 5

Introduction

- IntraBC merge candidate list is constructed with valid and unique BVs from the following possible candidates in order
 - 1) Five spatial BVs from neighboring blocks (C0 to C4)
 - 2) One temporal BV from collocated blocks in temporal reference pictures
 - Setting 1: using collocated reference picture only (C5) , same as TMVP
 - Setting 2: using the first two reference pictures in each list (C5-C8)
 - 3) If the candidate list is not full, apply block vector derivation for each BV in the list obtained from 1) and 2)



Performance evaluation for setting 1, lossy coding

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-5.5%	-6.9%	-6.8%	-5.9%	-7.8%	-7.6%	-5.8%	-7.4%	-7.1%
RGB, text & graphics with motion,720p	-3.1%	-4.0%	-3.9%	-2.3%	-3.6%	-3.6%	-1.5%	-2.7%	-2.9%
RGB, mixed content, 1440p	-2.7%	-2.9%	-3.1%	-2.0%	-2.9%	-3.1%	-1.6%	-2.4%	-2.6%
RGB, mixed content, 1080p	-2.4%	-2.9%	-2.9%	-2.0%	-3.2%	-3.3%	-1.8%	-3.1%	-3.4%
RGB, Animation, 720p	-0.2%	-0.2%	-0.2%	0.0%	-0.2%	-0.2%	0.0%	-0.1%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-3.5%	-5.0%	-4.9%	-5.3%	-7.1%	-7.2%	-5.5%	-7.1%	-6.9%
YUV, text & graphics with motion,720p	-2.8%	-3.5%	-3.8%	-1.8%	-3.3%	-3.4%	-1.6%	-2.5%	-3.3%
YUV, mixed content, 1440p	-1.9%	-2.6%	-2.8%	-1.6%	-3.1%	-3.0%	-1.5%	-3.0%	-3.0%
YUV, mixed content, 1080p	-2.0%	-3.3%	-3.3%	-1.8%	-4.5%	-4.4%	-1.5%	-4.8%	-6.3%
YUV, Animation, 720p	-0.4%	-0.5%	-0.6%	-0.1%	-0.7%	-0.6%	0.1%	-0.5%	0.1%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.2%
Enc Time[%]	118%			101%			98%		
Dec Time[%]	96%			89%			91%		

Performance evaluation for setting 1, lossless coding

	All Intra				Random Access				Low Delay B			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
RGB, text & graphics with motion, 1080p	3.2%	3.2%	2.8%	3.5%	4.7%	4.1%	2.9%	5.0%	5.1%	4.2%	2.5%	5.5%
RGB, text & graphics with motion,720p	0.7%	0.8%	0.2%	1.2%	0.4%	0.5%	0.3%	1.0%	0.3%	0.4%	0.2%	0.8%
RGB, mixed content, 1440p	2.0%	1.7%	0.4%	3.0%	0.4%	0.4%	0.1%	0.8%	0.2%	0.2%	0.0%	0.5%
RGB, mixed content, 1080p	1.7%	1.7%	1.7%	1.7%	0.4%	0.4%	0.4%	0.4%	0.2%	0.2%	0.2%	0.2%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	2.2%	2.1%	1.5%	2.6%	4.4%	3.5%	2.0%	4.8%	4.5%	3.8%	1.9%	5.0%
YUV, text & graphics with motion,720p	0.6%	0.6%	0.2%	0.9%	0.3%	0.5%	0.3%	0.9%	0.2%	0.4%	0.2%	0.9%
YUV, mixed content, 1440p	1.9%	1.7%	0.5%	2.9%	0.4%	0.4%	0.1%	0.8%	0.2%	0.2%	0.0%	0.4%
YUV, mixed content, 1080p	1.4%	1.4%	1.4%	1.4%	0.4%	0.4%	0.4%	0.4%	0.2%	0.2%	0.2%	0.2%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	117%				105%				106%			
Dec Time[%]	102%				98%				103%			

Performance evaluation for setting 2, lossy coding

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-5.5%	-6.9%	-6.8%	-6.2%	-8.1%	-7.9%	-6.2%	-7.8%	-7.6%
RGB, text & graphics with motion, 720p	-3.1%	-4.0%	-3.9%	-2.3%	-3.7%	-3.7%	-1.5%	-2.8%	-3.0%
RGB, mixed content, 1440p	-2.7%	-2.9%	-3.1%	-2.0%	-2.9%	-3.2%	-1.6%	-2.3%	-2.6%
RGB, mixed content, 1080p	-2.4%	-2.9%	-2.9%	-2.0%	-3.2%	-3.4%	-1.7%	-3.2%	-3.4%
RGB, Animation, 720p	-0.2%	-0.2%	-0.2%	0.0%	-0.2%	-0.2%	0.1%	-0.1%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-3.5%	-5.0%	-4.9%	-5.6%	-7.5%	-7.5%	-5.9%	-7.5%	-7.3%
YUV, text & graphics with motion, 720p	-2.8%	-3.5%	-3.8%	-1.8%	-3.4%	-3.5%	-1.7%	-2.6%	-3.3%
YUV, mixed content, 1440p	-1.9%	-2.6%	-2.8%	-1.7%	-3.2%	-3.0%	-1.5%	-2.9%	-2.8%
YUV, mixed content, 1080p	-2.0%	-3.3%	-3.3%	-1.8%	-4.5%	-4.4%	-1.6%	-4.8%	-6.3%
YUV, Animation, 720p	-0.4%	-0.5%	-0.6%	-0.1%	-0.7%	-0.6%	0.0%	-0.6%	0.1%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.3%
Enc Time[%]	118%			106%			105%		
Dec Time[%]	97%			94%			96%		

Performance evaluation for setting 2, lossless coding

	All Intra				Random Access				Low Delay B			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
RGB, text & graphics with motion, 1080p	3.2%	3.2%	2.8%	3.5%	5.0%	4.3%	3.0%	5.3%	5.4%	4.4%	2.6%	5.8%
RGB, text & graphics with motion, 720p	0.7%	0.8%	0.2%	1.2%	0.4%	0.5%	0.3%	1.1%	0.3%	0.4%	0.2%	0.8%
RGB, mixed content, 1440p	2.0%	1.7%	0.4%	3.0%	0.4%	0.4%	0.1%	0.8%	0.2%	0.3%	0.0%	0.5%
RGB, mixed content, 1080p	1.7%	1.7%	1.7%	1.7%	0.4%	0.4%	0.4%	0.4%	0.2%	0.2%	0.2%	0.2%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	2.2%	2.1%	1.5%	2.6%	4.6%	3.7%	2.1%	5.1%	4.9%	4.0%	2.0%	5.3%
YUV, text & graphics with motion, 720p	0.6%	0.6%	0.2%	0.9%	0.3%	0.5%	0.3%	0.9%	0.3%	0.4%	0.2%	0.9%
YUV, mixed content, 1440p	1.9%	1.7%	0.5%	2.9%	0.4%	0.4%	0.1%	0.8%	0.2%	0.2%	0.0%	0.4%
YUV, mixed content, 1080p	1.4%	1.4%	1.4%	1.4%	0.4%	0.4%	0.4%	0.4%	0.2%	0.2%	0.2%	0.2%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	117%				106%				105%			
Dec Time[%]	101%				98%				101%			

Conclusions

- This contribution proposes the combination of block vector derivation in CE2 Test3 and unification of IntraBC and inter mode in CE2 Test5
 - IntraBC merge process is separated from inter merge process using `intra_bc_flag`
 - The derived BVs from CE2 Test3 are added as IntraBC merge candidate if the number of IntraBC merge candidates is less than 5
- For “RGB, text & graphics with motion, 1080p” in the test with setting 1
 - AI: {-5.5%, -6.9%, -6.8%}
 - RA: {-5.9%, -7.8%, -7.6%}
 - LD: {-5.8%, -7.4%, -7.1%}

Thanks Qualcomm for cross-checking!
(JCTVC-S0262)