

AHG7:

**High-level syntax for explicit memory
bandwidth restriction**

JCTVC-I0558

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1. Overview

Overview

- Based contribution
 - JCTVC-I0106 (Sony)
 - JCTVC-I0297 proposal 1 (JVC Kenwood)
- Algorithm
 - High level syntax from JCTVC-I0106
 - Extend the high level syntax for level definition
 - Bi-pred restriction from JCTVC-I0297 proposal 1



2. Algorithm

Proposed high level syntax

- PU / bi-pred restriction is controlled by “interpreted_restriction_idc”
 - Control restriction of inter prediction and/or bi-prediction for small PUs
 - “inter_4x4_enabled_flag” is replaced to “interpreted_restriction_idc” in SPS
 - 4x4 inter PU is permanently disabled
 - Ability of definition for HM6.0anchor, R2, R3 and R4 in JCTVC-I0106
 - Minimum value can be restricted corresponding to level definition
 - Flexibility for restriction on encoder implementation

	PU restriction	Bi-prediction restriction	
interpreted_restriction_idc	4x8,8x4	Bi-4x8,Bi-8x4	Bi-8x8
0 (HM anchor)			
1 (case R2 in I0106)		X	
2 (case R3 in I0106)		X	X
3 (case R4 in I0106)	X	X	X

Proposed memory bandwidth control method

- Bi-prediction restriction for 4x8, 8x4 and 8x8 PUs
 - Convert bi-pred to uni-pred for merge/AMVP **after motion information derivation process** (as in JCTVC-I0297 proposal 1)
- PU restriction for 4x8 and 8x4 PUs
 - **“part_mode” is not signaled** in 8x8 inter CU

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3. Experiments

Experiments

“interpreted_restriction_idc” = 1 (case R2 in JCTVC-I0106)

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	0.1%	0.0%	0.4%	0.0%	0.2%	0.1%
Class B	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%
Class C	0.4%	0.4%	0.4%	0.3%	0.3%	0.2%
Class D	0.6%	0.5%	0.7%	0.5%	0.5%	0.4%
Class E						
Overall	0.3%	0.3%	0.4%	0.2%	0.3%	0.2%
	0.3%	0.3%	0.4%	0.2%	0.3%	0.2%
Class F	0.1%	0.3%	0.2%	0.1%	0.2%	0.2%
Enc Time[%]	94%			95%		
Dec Time[%]	98%			101%		

	Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	0.2%	-0.2%	-0.1%	0.2%	-0.1%	0.0%
Class C	0.5%	0.6%	0.4%	0.4%	0.6%	0.5%
Class D	0.6%	0.3%	0.8%	0.6%	0.2%	-0.2%
Class E	0.2%	0.3%	0.0%	0.1%	0.0%	0.1%
Overall	0.4%	0.2%	0.2%	0.3%	0.1%	0.1%
	0.4%	0.3%	0.3%	0.3%	0.2%	0.1%
Class F	0.2%	0.4%	1.2%	0.2%	0.0%	0.5%
Enc Time[%]	92%			93%		
Dec Time[%]	99%			99%		

“interpreted_restriction_idc” = 2 (case R3 in JCTVC-I0106)

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	0.5%	0.5%	0.8%	0.3%	0.5%	0.3%
Class B	0.9%	0.5%	0.5%	0.7%	0.4%	0.4%
Class C	1.2%	1.3%	1.5%	0.9%	1.0%	1.2%
Class D	1.6%	1.5%	1.8%	1.4%	1.3%	1.5%
Class E						
Overall	1.0%	0.9%	1.1%	0.8%	0.8%	0.8%
	1.1%	0.9%	1.1%	0.8%	0.8%	0.8%
Class F	0.5%	0.7%	0.7%	0.4%	0.6%	0.7%
Enc Time[%]	91%			93%		
Dec Time[%]	97%			99%		

	Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	0.8%	-0.2%	0.1%	0.6%	-0.1%	-0.2%
Class C	1.3%	1.2%	1.1%	1.1%	1.3%	1.3%
Class D	1.6%	0.6%	1.2%	1.5%	0.4%	0.7%
Class E	0.6%	0.6%	0.8%	0.2%	0.8%	0.2%
Overall	1.1%	0.5%	0.7%	0.9%	0.5%	0.5%
	1.1%	0.5%	0.8%	0.9%	0.5%	0.5%
Class F	0.6%	0.6%	0.7%	0.6%	0.6%	1.0%
Enc Time[%]	88%			90%		
Dec Time[%]	97%			98%		

“interpreted_restriction_idc” = 3 (case R4 in JCTVC-I0106)

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	0.9%	1.4%	1.4%	0.5%	1.2%	1.0%
Class B	1.3%	1.1%	1.1%	0.9%	0.8%	0.8%
Class C	2.4%	3.1%	3.3%	1.7%	2.1%	2.3%
Class D	3.7%	4.2%	4.5%	2.8%	3.4%	3.3%
Class E						
Overall	2.0%	2.4%	2.5%	1.4%	1.8%	1.8%
	2.0%	2.3%	2.5%	1.4%	1.8%	1.8%
Class F	2.5%	3.0%	3.1%	1.9%	2.1%	2.2%
Enc Time[%]	75%			79%		
Dec Time[%]	98%			99%		

	Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	1.4%	0.4%	0.5%	0.9%	0.3%	0.6%
Class C	3.1%	3.6%	3.6%	2.2%	2.4%	2.6%
Class D	4.7%	4.7%	5.6%	3.5%	3.5%	3.4%
Class E	1.5%	0.8%	1.4%	0.6%	0.7%	0.6%
Overall	2.7%	2.4%	2.7%	1.8%	1.7%	1.8%
	2.7%	2.4%	2.8%	1.8%	1.7%	1.8%
Class F	4.3%	4.5%	4.8%	3.3%	4.2%	4.0%
Enc Time[%]	73%			76%		
Dec Time[%]	98%			97%		



4. Conclusion

Conclusion

- Benefits
 - Explicit memory bandwidth restriction
 - Gradual memory bandwidth control
 - Encoder flexibility

- Recommendation
 - Introduce high level syntax '**interpreted_restriction_idc**' for gradual memory bandwidth restriction
 - Introduce bi-pred restriction method as in JCTVC-I0297

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