

JCTVC-L0278: SHVC: On Inter-layer Prediction

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Agenda

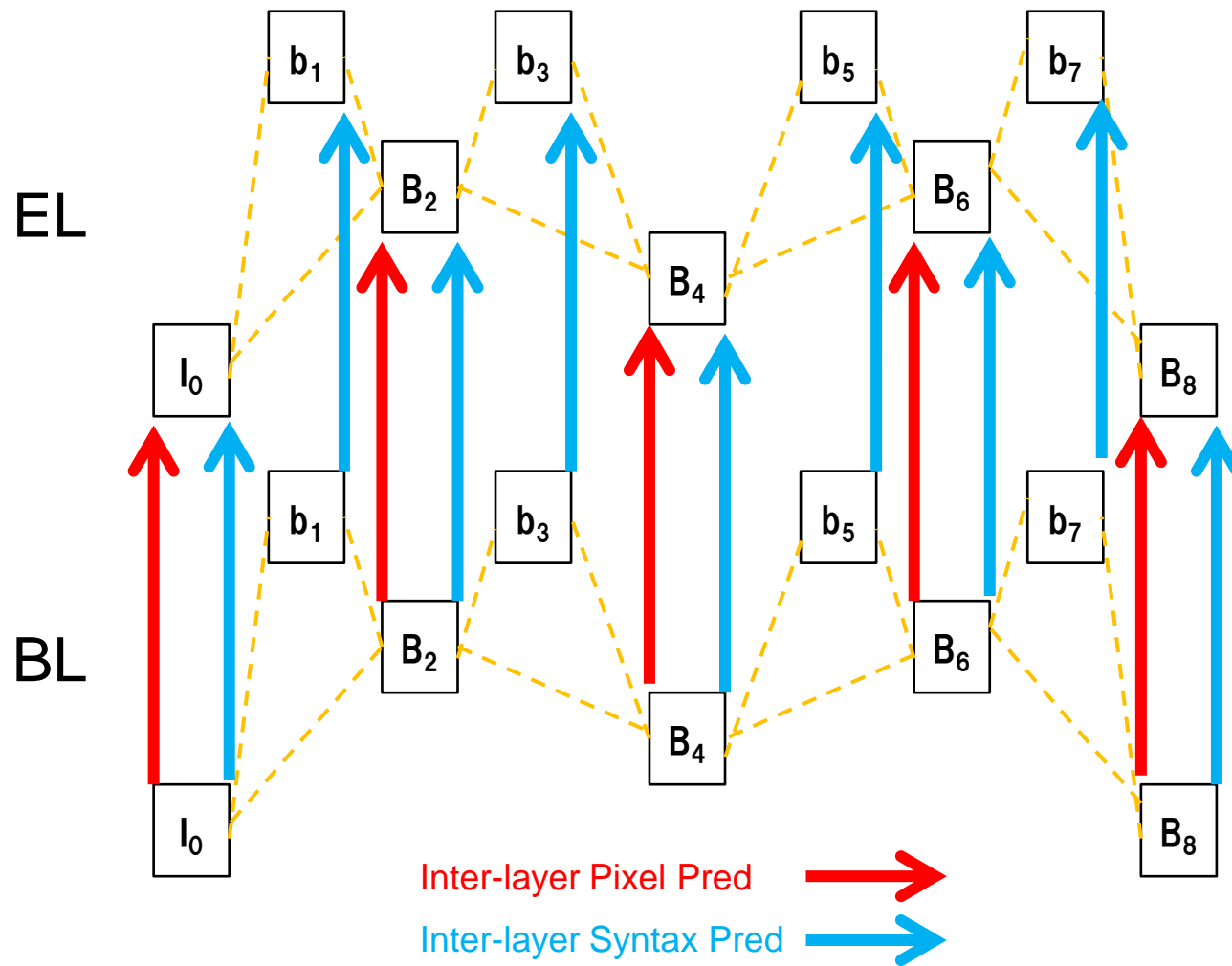
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Introduction

- “Inter-layer Prediction” can be categorized into
 - Inter-layer Pixel Prediction (ex. IntraBL)
 - Inter-layer Syntax Prediction (ex. SVC_MVP)
- The former requires more memory access.
- Impact on coding efficiency and complexity of these inter-layer predictions need to be studied.

Proposed Method

- If time distance between the current and the reference frames is far, more PUs are coded as Intra
 - In this case Inter-layer pixel prediction will be helpful.
- This is not true if time distance between the current and the reference frames is close.
- (Similar discussion in the previous meeting: JCTVC-K0175 and JCTVC-K0264)
 - Even in this case there is co-relation in syntax (like motion information) b/w BL and EL.
- Therefore it is proposed as shown in the next ppt that
 - Inter-layer pixel and syntax predictions be able to be set independently. (Similar proposal is contained in JCTVC-K0071)
 - IL pixel prediction be set in terms of temporal hierarchy.



Simulation Condition

- In this contribution macro “SVC_MVP” is used as an example of inter-layer syntax prediction.
- 4 kinds of tests have been conducted as follow:
 - Test A:
 - **Anchor: Simulcast; Tested: SMuC 0.1.1**
 - Test B:
 - **Anchor: SMuC 0.1.1; Tested: SMuC0.1.1 (IntraBL disabled at highest temp. hierarchy)**
 - Test C:
 - **Anchor: SMuC 0.1.1; Tested: SMuC0.1.1 (IntraBL disabled at highest temp. hierarchy) + SVC_MVP**
 - Test D:
 - **Anchor: SMuC 0.1.1; Tested: SMuC0.1.1 + SVC_MVP**
- Class A and B sequences are tested with RA_{2x,1.5x} conditions.
- The author would like to thank Sharp (JCTVC-L0326) and JVC (JCTVC-L0337) for crosschecking.

Anchor: Simulcast
 Tested: SMuC 0.1.1

	RA HEVC 2x			RA HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-18.5%	-7.8%	-9.3%			
Class B	-15.5%	-9.2%	-7.9%	-26.1%	-20.3%	-18.8%
Overall (EL+BL)	-16.4%	-8.8%	-8.3%	-26.1%	-20.3%	-18.8%
Overall (EL)	-25.2%	-13.6%	-12.9%	-47.2%	-37.9%	-35.2%
Enc Time[%]	107.9%			110.1%		
Dec Time[%]	121.9%			124.4%		
Enc Mem[%]	#DIV/0!			#DIV/0!		
BL Match	Matched			Matched		

Anchor: SMuC 0.1.1

Tested: SMuC0.1.1 (IntraBL disabled at highest temp. hierarchy)

	RA HEVC 2x			RA HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	1.4%	0.6%	1.1%			
Class B	0.8%	0.2%	0.0%	2.1%	1.3%	1.0%
Overall (EL+BL)	1.0%	0.3%	0.3%	2.1%	1.3%	1.0%
Overall (EL)	2.3%	0.8%	0.8%	7.7%	4.6%	3.8%
Enc Time[%]	97.4%			96.7%		
Dec Time[%]	97.8%			98.1%		
Enc Mem[%]	#DIV/0!			#DIV/0!		
BL Match	Matched			Matched		

Anchor: SMuC 0.1.1

Tested: SMuC0.1.1 (IntraBL disabled at highest temp. hierarchy) + SVC_MVP

	RA HEVC 2x			RA HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	0.3%	-1.5%	-1.0%			
Class B	-0.6%	-2.0%	-2.2%	-0.4%	-1.9%	-2.4%
Overall (EL+BL)	-0.4%	-1.9%	-1.8%	-0.4%	-1.9%	-2.4%
Overall (EL)	-0.4%	-3.3%	-3.2%	0.3%	-4.2%	-5.3%
Enc Time[%]	94.2%			92.5%		
Dec Time[%]	96.7%			98.0%		
Enc Mem[%]	#DIV/0!			#DIV/0!		
BL Match	Matched			Matched		

Anchor: SMuC 0.1.1

Tested: SMuC0.1.1 + SVC_MVP

	RA HEVC 2x			RA HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-0.9%	-2.0%	-1.9%			
Class B	-1.3%	-2.3%	-2.3%	-1.8%	-2.9%	-3.2%
Overall (EL+BL)	-1.2%	-2.2%	-2.2%	-1.8%	-2.9%	-3.2%
Overall (EL)	-2.3%	-4.2%	-4.2%	-5.0%	-7.5%	-8.1%
Enc Time[%]	96.1%			94.2%		
Dec Time[%]	97.1%			98.9%		
Enc Mem[%]	#DIV/0!			#DIV/0!		
BL Match	Matched			Matched		

Discussion

- Gains with IntraBL are -16.4% and -26.1% with RA_2x and RA_1.5x respectively.
- Just by disabling it at the highest temporal hierarchy loss by 1.0% and 2.1% are observed with RA_2x and RA_1.5x respectively.
- This loss can be compensated by inter-layer syntax prediction.
 - By enabling SVC_MVP gain by -0.4% and -0.4% can be obtained in comparison with SMuC 0.1.1, even if IntraBL is disabled at the highest temporal hierarchy.
- As reference, gain purely obtained by the option “SVC_MVP” is -1.2% and -1.8% with RA_2x and RA_1.5x respectively.

Conclusion

- This contribution proposes
 - a. Inter-layer pixel and syntax predictions be able to be set independently.
 - b. Inter-layer pixel prediction be set in terms of temporal hierarchy.
- Simulation result shows that the proposal b. provides good trade-off between coding efficiency and complexity, and the loss can be compensated with the proposal a.
- It is recommended that this topic be investigated under CE or AHG, including HLS to support these functionalities.



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