

JCTVC-L0279: SHVC: On Motion Data Compression

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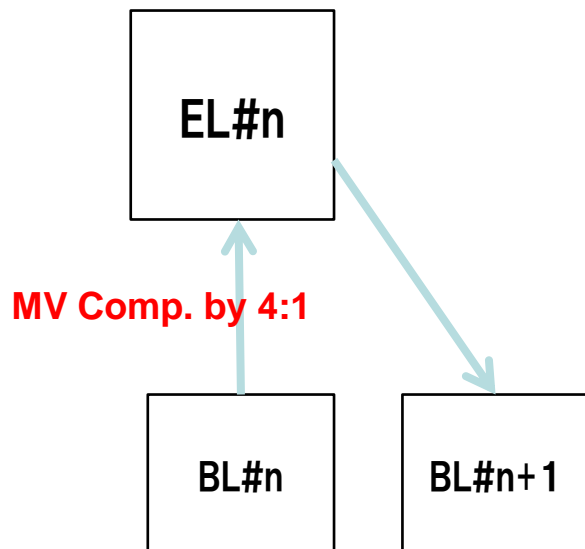
Agenda

- Introduction
- Proposed Method
- Simulation Condition
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- Discussion
- Conclusion

Introduction

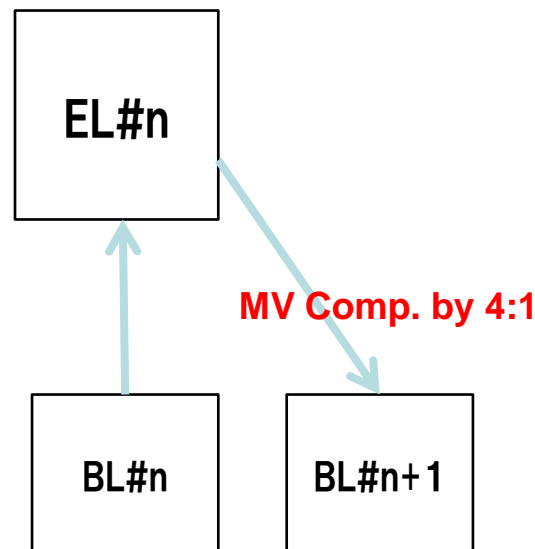
- If uncompressed, motion information of reference pictures need to be stored in the unit of 4x4 block.
- HEVC ver 1. employs motion data compression scheme, and motion information is stored in the unit of 16x16 block.
- In SMuC 0.1.1 this motion data compression is executed right after the encoding/decoding of the base-layer.
- However most proposals in TE 5.2.x postpone this compression after the encoding/decoding of the enhancement layer.
- The former method may cause loss in coding efficiency especially in the case of 2x scalability.
- On the contrary more buffer for motion storage will be needed for the latter method.

SMuC Implementation:



ETRI's Implementation

(#define MOTION_COMP_MODIFICATION 1)



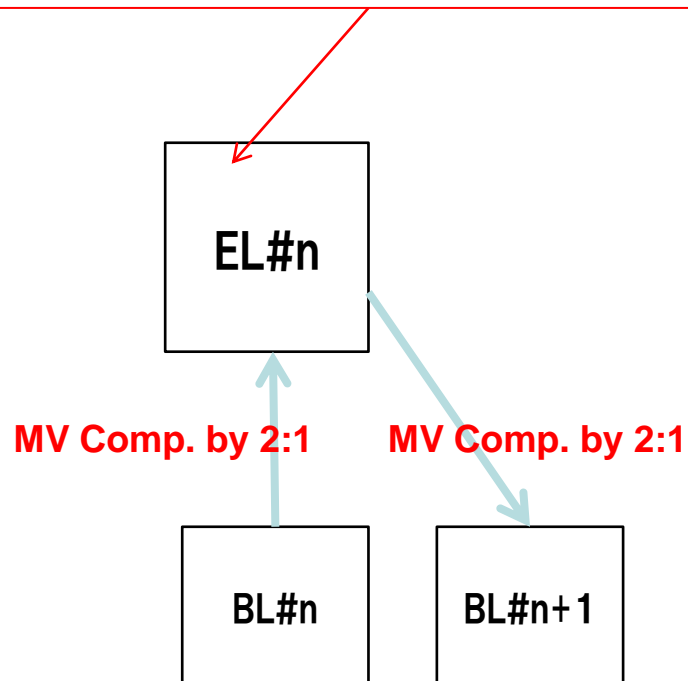
Similar Method is implemented with most of TE5.2.x proposals.

MV Comp. by 4:1 means that motion data be stored at every 16x16 block for single layer coding or SNR scalability, but it means that it be stored at every 32x32 block for enh layer of 2x scalability. In this case loss would be larger.

Proposed Method

- To see how intermediate solution between SMuC implementation and postpone-mv-compression scheme works, the method as shown in the next ppt is tested.

In case of 2x scalability
CoBLMV is available in the unit of 16x16 blocks at enhlayer resolution.
(Same resolution for TMVP in HEVC version 1)



Simulation Condition

- 3 tests have been conducted:
 - Test A:
 - **ETRI_Merge (MOTION_COMP_MODIFICATION=1)**
 - Test B:
 - **Tested: ETRI_Merge (MOTION_COMP_MODIFICATION=0)**
 - Test C:
 - **Tested: ETRI_Merge (With the proposed method)**
- SMuC 0.1.1 is used as anchor.
- Class A and B sequences are tested with {RA, LP}_{2x,1.5x} conditions.
- The proponent would like to thank ETRI for crosschecking. (JCTVC-L0368)

Anchor: SMuC0.1.1

Tested: ETRI_Merge (MOTION_COMP_MODIFICATION=1)

	RA HEVC 2x			RA HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-2.6%	-5.4%	-5.2%			
Class B	-2.0%	-3.6%	-3.8%	-2.3%	-3.7%	-4.1%
Overall (EL+BL)	-2.2%	-4.1%	-4.2%	-2.3%	-3.7%	-4.1%
Overall (EL)	-4.2%	-7.6%	-7.7%	-6.1%	-9.3%	-10.1%
Enc Time[%]	95.2%			94.0%		
Dec Time[%]	96.7%			99.1%		
Enc Mem[%]	#DIV/0!			#DIV/0!		
BL Match	Matched			Matched		
	LD-P HEVC 2x			LD-P HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-1.5%	-3.3%	-3.2%			
Class B	-1.1%	-2.2%	-2.3%	-1.2%	-2.0%	-2.2%
Overall (EL+BL)	-1.2%	-2.5%	-2.5%	-1.2%	-2.0%	-2.2%
Overall (EL)	-2.2%	-4.3%	-4.4%	-2.7%	-4.3%	-4.7%
Enc Time[%]	96.6%			94.9%		
Dec Time[%]	97.2%			98.9%		
Enc Mem[%]	#DIV/0!			#DIV/0!		
BL Match	Matched			Matched		

Anchor: SMuC0.1.1

Tested: ETRI_Merge (MOTION_COMP_MODIFICATION=0)

	RA HEVC 2x			RA HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-0.8%	-1.9%	-1.8%			
Class B	-1.2%	-2.2%	-2.3%	-1.8%	-2.9%	-3.1%
Overall (EL+BL)	-1.1%	-2.2%	-2.1%	-1.8%	-2.9%	-3.1%
Overall (EL)	-2.1%	-4.1%	-4.1%	-4.9%	-7.5%	-8.0%
Enc Time[%]	96.0%			94.2%		
Dec Time[%]	97.7%			99.6%		
Enc Mem[%]	#DIV/0!			#DIV/0!		
BL Match	Matched			Matched		
	LD-P HEVC 2x			LD-P HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	0.0%	-1.5%	-1.3%			
Class B	-0.4%	-1.4%	-1.5%	-0.8%	-1.4%	-1.6%
Overall (EL+BL)	-0.3%	-1.4%	-1.4%	-0.8%	-1.4%	-1.6%
Overall (EL)	-0.5%	-2.6%	-2.6%	-1.8%	-3.1%	-3.5%
Enc Time[%]	97.3%			100.0%		
Dec Time[%]	98.4%			100.0%		
Enc Mem[%]	#DIV/0!			#DIV/0!		
BL Match	Matched			Matched		

Anchor: SMuC0.1.1

Tested: ETRI_Merge (w/ proposal in ppt #4)

	RA HEVC 2x			RA HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-2.0%	-4.3%	-4.1%			
Class B	-1.8%	-3.3%	-3.4%	-2.2%	-3.6%	-3.9%
Overall (EL+BL)	-1.9%	-3.6%	-3.6%	-2.2%	-3.6%	-3.9%
Overall (EL)	-3.6%	-6.6%	-6.7%	-5.9%	-9.1%	-9.7%
Enc Time[%]	95.4%			94.0%		
Dec Time[%]	97.3%			99.8%		
Enc Mem[%]	#DIV/0!			#DIV/0!		
BL Match	Matched			Matched		
	LD-P HEVC 2x			LD-P HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	-0.9%	-2.2%	-2.0%			
Class B	-0.9%	-1.8%	-1.9%	-1.1%	-1.9%	-2.1%
Overall (EL+BL)	-0.9%	-1.9%	-1.9%	-1.1%	-1.9%	-2.1%
Overall (EL)	-1.6%	-3.4%	-3.4%	-2.6%	-4.1%	-4.5%
Enc Time[%]	96.7%			94.9%		
Dec Time[%]	98.7%			100.9%		
Enc Mem[%]	#DIV/0!			#DIV/0!		
BL Match	Matched			Matched		

Discussions

- Gain with Test A is -2.2%, -2.3%, -1.2% and -1.2% for RA_2x, RA_1.5x, LD-P_2x and LD-P_1.5x, respectively.
- Gain with Test B is -1.1%, -1.8%, -0.3% and -0.8% for RA_2x, RA_1.5x, LD-P_2x and LD-P_1.5x, respectively.
- Loss of Test B over A is larger with the 2x-case than with the 1.5x-case, as the resolution of motion vector storage with enhancement-layer resolution is coarser with the 2x-case.
- Gain with Test C is -1.9%, -2.2%, -0.9% and -1.1% for RA_2x, RA_1.5x, LD-P_2x and LD-P_1.5x, respectively.
- The proposed method is a good trade-off between coding efficiency and complexity.

Conclusion

- There are 2 motion-data compression schemes for SHVC
 - SMuC: motion data compression is executed right after the encoding/decoding of the base-layer
 - Most TE 5.2.x proposals: postpone this compression after the encoding/decoding of the enhancement layer
- This contribution proposes an intermediate solution between the 2 methods.
- Simulation result shows that the proposed method provides a good trade-off between coding efficiency and complexity.
- It is recommended that the proposed method be investigated under CE or AHG.



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