



CREATING THE LIVING NETWORK™

JVET-N0313

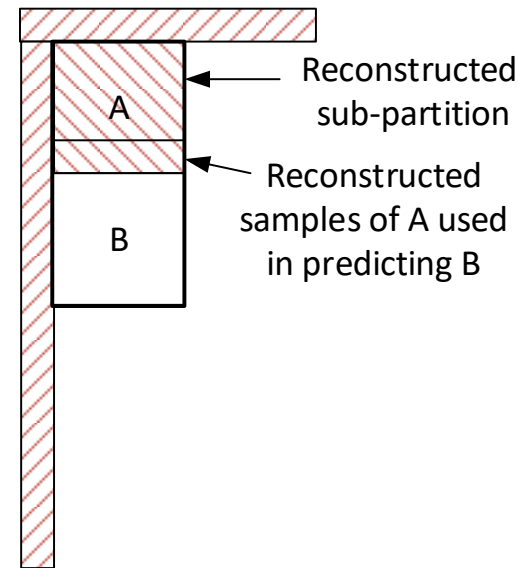
CE3-related: Low latency intra
sub-partitions

Rahul Vanam, Yuwen He (InterDigital)



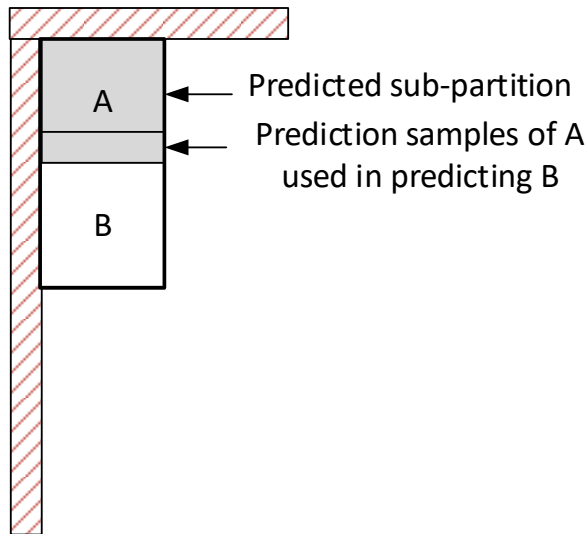
Introduction

- Intra sub-partitions (ISP) was adopted in VTM-4.0
- ISP splits a CU either horizontally or vertically
- Luma blocks of size 4×8 and 8×4 are always split into two sub-partitions
- Larger blocks are always split into four sub-partitions
- Prediction and reconstruction of sub-partitions occur sequentially
 - Reconstructed samples from one sub-partition used for predicting the next sub-partition
 - Introduces latency in sub-partition prediction



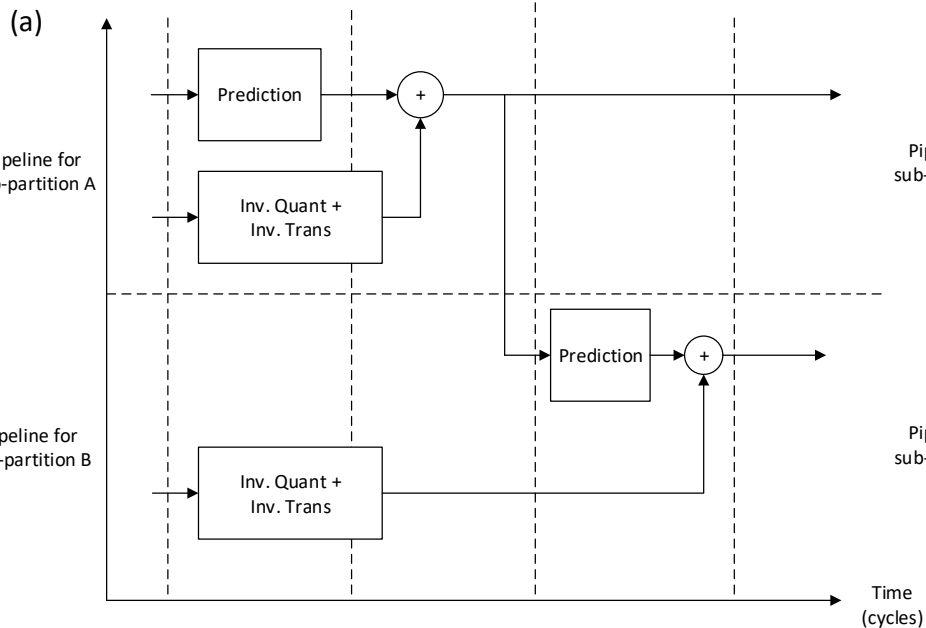
Proposed Low Latency ISP

- Prediction samples from one sub-partition used for predicting next sub-partition
 - Reduces latency for sub-partition prediction

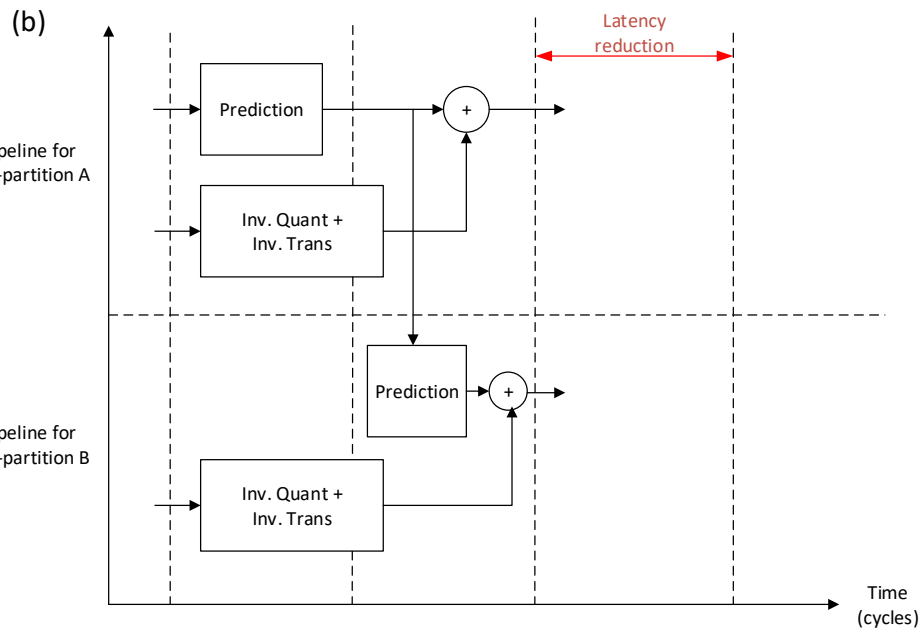


Pipeline comparison

Intra sub-partitions



Low latency ISP



Results (1)

Test 1: Low latency ISP for 4×8 and 8×4 blocks, and regular ISP for larger blocks

	All Intra Main10 (Over VTM-4.0)			Random access Main10 (Over VTM-4.0)		
	Y	U	V	Y	U	V
Class A1	-0.01%	0.01%	0.00%	-0.03%	0.15%	-0.04%
Class A2	0.00%	0.10%	0.00%	-0.03%	0.06%	-0.02%
Class B	0.00%	-0.01%	0.05%	0.01%	-0.06%	-0.08%
Class C	0.04%	-0.15%	-0.05%	0.03%	0.02%	-0.01%
Class E	0.00%	0.00%	0.00%			
Overall	0.01%	-0.02%	0.00%	0.00%	0.03%	-0.04%
Class D	0.02%	0.02%	-0.06%	-0.03%	-0.18%	-0.21%
Class F	0.01%	0.03%	-0.18%	0.02%	-0.16%	-0.20%
Avg. EncT	100%			101%		
Avg. DecT	99%			100%		

Results (2)

Test 2: Low latency ISP for all block sizes permitted by ISP

	All Intra Main10 (Over VTM-4.0)			Random access Main10 (Over VTM-4.0)		
	Y	U	V	Y	U	V
Class A1	0.09%	0.09%	0.08%	0.05%	-0.01%	0.11%
Class A2	0.10%	0.23%	0.11%	0.06%	0.26%	0.11%
Class B	0.13%	0.15%	0.16%	0.09%	0.18%	0.03%
Class C	0.22%	0.21%	0.24%	0.11%	0.15%	0.04%
Class E	0.19%	0.29%	0.13%			
Overall	0.15%	0.19%	0.15%	0.08%	0.15%	0.07%
Class D	0.12%	0.25%	0.08%	0.06%	-0.05%	-0.12%
Class F	0.17%	0.17%	0.12%	0.05%	0.07%	-0.06%
Avg. EncT	99%			100%		
Avg. DecT	98%			100%		

Conclusion

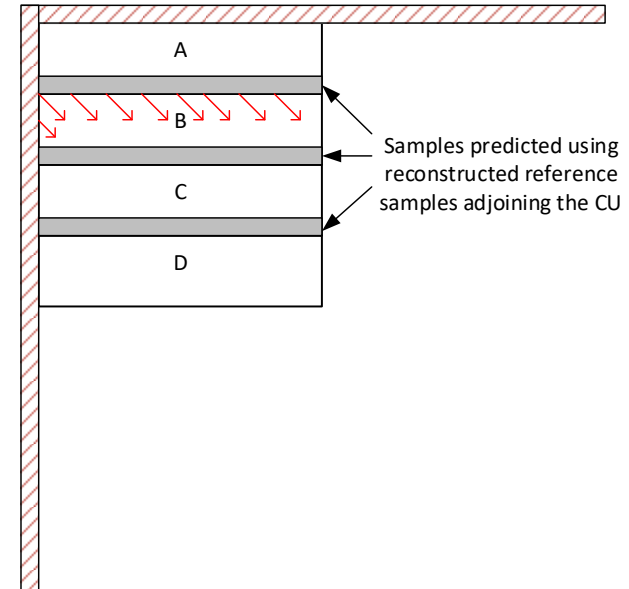
- ISP introduces latency for sub-partition prediction
- Proposed low latency approach uses prediction samples from one sub-partition for predicting the next sub-partition
- Applying this approach to 4×8 and 8×4 blocks yields average luma BD-rate loss of 0.01% for AI, and no loss for RA, with no impact on encoding and decoding time
- Applying this approach to all blocks permitted by ISP yields average luma BD-rate loss of 0.15% for AI, and 0.08% for RA, with no impact on encoding and decoding time

Thank Technicolor for cross-checking the results (JVET-N0719)

Additional results (1)

CU-based low latency ISP

- Reference samples of a CU used to predict samples adjacent to a sub-partition (e.g. bottom row of sub-partition A, B, and C)
- Adjacent predicted samples used for predicting next sub-partition
 - E.g. bottom row prediction samples of A used for predicting B



Additional results (2)

Test 1: CU-based low latency ISP for 4×8 and 8×4 blocks, and regular ISP for larger blocks

	All Intra Main10 (Over VTM-4.0)			Random access Main10 (Over VTM-4.0)		
	Y	U	V	Y	U	V
Class A1	-0.01%	0.05%	-0.01%	-0.02%	0.26%	-0.05%
Class A2	0.00%	0.09%	-0.01%	-0.01%	0.05%	0.00%
Class B	0.00%	0.01%	0.01%	0.00%	0.02%	-0.02%
Class C	0.05%	0.08%	0.15%	0.01%	-0.22%	-0.25%
Class E	0.01%	0.00%	-0.03%			
Overall	0.01%	0.05%	0.03%	0.00%	0.01%	-0.08%
Class D	0.02%	0.07%	0.01%	0.02%	-0.01%	-0.05%
Class F	0.05%	0.04%	-0.01%	0.01%	-0.19%	-0.29%
Avg. EncT	100%			100%		
Avg. DecT	98%			98%		

Additional results (3)

Test 2: CU-based low latency ISP for all block sizes
permitted by ISP

	All Intra Main10 (Over VTM-4.0)			Random access Main10 (Over VTM-4.0)		
	Y	U	V	Y	U	V
Class A1	0.10%	0.05%	0.08%	0.07%	0.24%	0.06%
Class A2	0.12%	0.22%	0.11%	0.07%	0.21%	0.04%
Class B	0.15%	0.16%	0.21%	0.09%	0.11%	0.02%
Class C	0.26%	0.23%	0.30%	0.11%	0.16%	0.15%
Class E	0.26%	0.26%	0.18%			
Overall	0.18%	0.18%	0.19%	0.09%	0.17%	0.07%
Class D	0.15%	0.21%	0.10%	0.04%	0.32%	-0.37%
Class F	0.21%	0.19%	0.03%	0.06%	0.10%	0.02%
Avg. EncT	100%			100%		
Avg. DecT	97%			98%		