

Non-CE3: Simplified context derivation for significance map

JCTVC-I0296

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1. Overview

Overview

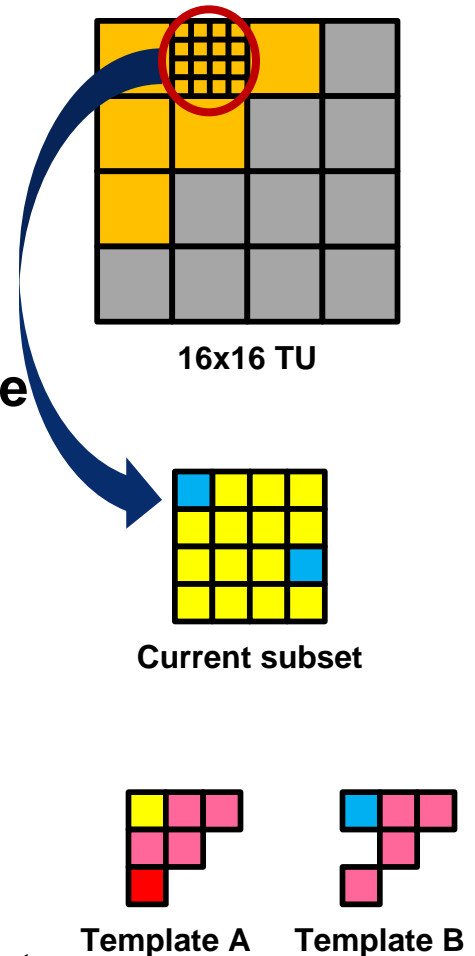
- Proposed technique
 - Simplified context derivation for significance map
- Algorithm
 - Position based context derivation by `significant_coeff_group_flag`
- Benefit
 - Context dependency entirely removed for large TUs
- Crosscheck
 - JCTVC-I0367 by Sharp
- Simulation results
 - Average 0.1% coding loss



2. Algorithm

HM6.0 - Context index derivation process for significance map for large TU

- Fixed context for high frequency area
- Template based for **low frequency area**
- **Step1. count up non-zero coeffs in the template**
 - Template A for **yellow** coeffs
 - Template B for **blue** coeffs
- **Step2. derive the context index**
 - Context index = (**min(count,4)** + 1) >> 1
- Need template hole calculation (2 bin parallel)
- Depends on previous coeffs in the same subset



Proposed algorithm - Context index derivation process for significance map for large TU

■ Step1. determine the pattern

- $\text{pattern} = \text{significant_coeff_group_flag}(\text{right}) + (\text{significant_coeff_group_flag}(\text{bottom}) \ll 1)$

1 time for 1 subset

Similar derivation process for context index of 'significant_coeff_group_flag'

■ Step2. derive the context index

- based on the pattern and the position

(a) $X + Y \leq 2 ? 1 : 0$

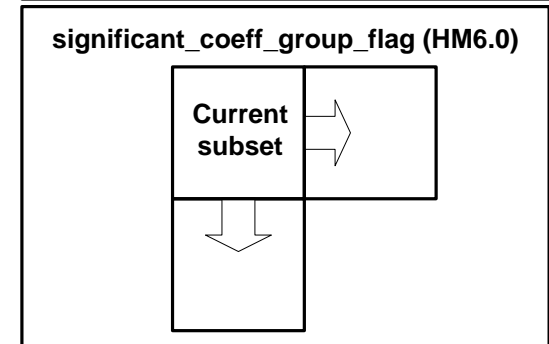
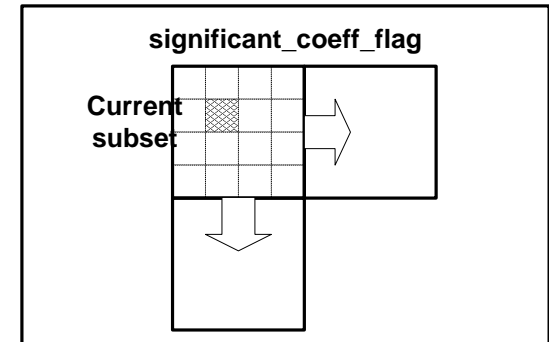
(b) $Y \leq 1 ? 1 : 0$

(c) $X \leq 1 ? 1 : 0$

(d) $X + Y \leq 4 ? 2 : 1$

No need to refer previous coefficients in the subset

No need of template hole calculation



1	1	1	0
1	1	0	0
1	0	0	0
0	0	0	0

(a) No coeff

1	1	1	1
1	1	1	1
0	0	0	0
0	0	0	0

(b) Coeff in only right

1	1	0	0
1	1	0	0
1	1	0	0
1	1	0	0

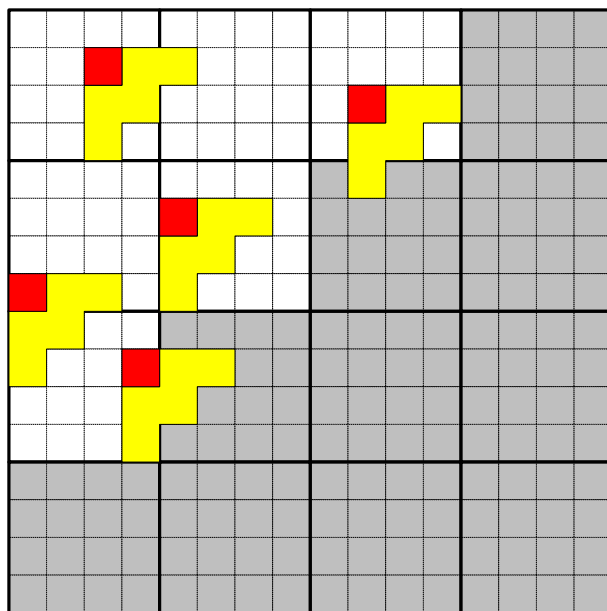
(c) Coeff in only bottom

2	2	2	2
2	2	2	2
2	2	2	1
2	2	1	1

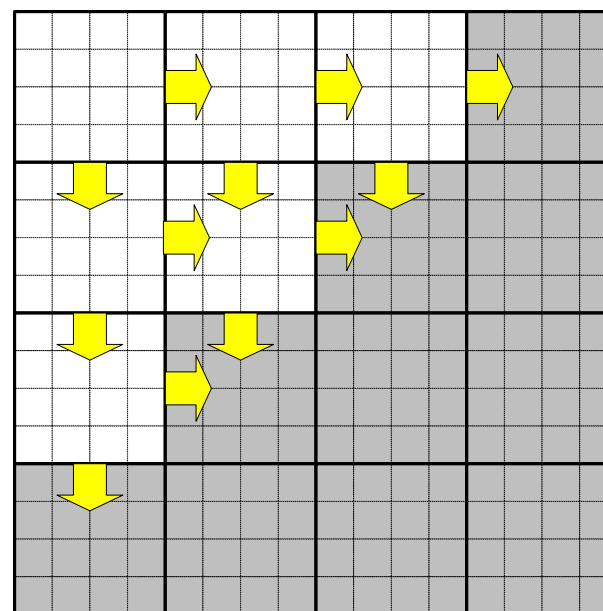
(d) Coeff in right and bottom

Benefits

- **Context dependency entirely removed**
- **No need of template hole calculation**
- **Share logic with significant_coeff_group_flag context derivation**
- **Throughput improvement for various implementation**



HM6.0



Proposal



3. Experiments

Experimental results

	All Intra Main			Random Access Main			Low delay B Main		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.2%	0.2%	0.2%	0.2%	0.1%	0.4%			
Class B	0.2%	0.2%	0.3%	0.2%	0.2%	0.2%	0.1%	0.5%	0.2%
Class C	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	0.1%	0.4%	0.2%
Class D	0.1%	0.2%	0.1%	0.1%	-0.2%	0.3%	0.1%	0.3%	0.4%
Class E	0.2%	0.2%	0.3%				0.2%	-0.7%	-0.9%
Overall	0.1%	0.2%	0.2%	0.1%	0.0%	0.3%	0.1%	0.2%	0.1%
	0.1%	0.2%	0.2%	0.2%	0.0%	0.3%	0.1%	0.3%	0.1%
Class F	0.0%	0.2%	0.1%	0.1%	0.1%	0.0%	0.0%	-0.3%	0.4%
Enc Time[%]	99%			99%			100%		
Dec Time[%]	100%			101%			101%		

	All Intra HE10			Random Access HE10			Low delay B HE10		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.1%	0.1%	0.2%	0.1%	0.3%	0.0%			
Class B	0.1%	0.1%	0.1%	0.2%	0.2%	0.1%	0.1%	0.0%	0.5%
Class C	0.1%	0.1%	0.2%	0.1%	0.2%	0.1%	0.1%	0.4%	0.5%
Class D	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	-0.1%	0.0%
Class E	0.2%	0.1%	0.2%				0.1%	0.1%	-0.9%
Overall	0.1%	0.1%	0.2%	0.1%	0.2%	0.1%	0.1%	0.1%	0.1%
	0.1%	0.1%	0.2%	0.1%	0.2%	0.1%	0.1%	0.1%	0.1%
Class F	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.2%	0.0%	1.0%
Enc Time[%]	98%			99%			99%		
Dec Time[%]	100%			101%			98%		

Experimental results (lowQP)

	All Intra Main			Random Access Main			Low delay B Main		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%			
Class B	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	-0.2%
Class D	0.0%	0.1%	0.0%	0.0%	-0.1%	0.1%	0.1%	0.1%	0.2%
Class E	0.1%	0.2%	0.1%				0.0%	-0.9%	-0.6%
Overall	0.1%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	-0.1%	-0.1%
	0.1%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	-0.1%	-0.1%
Class F	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	99%			99%			99%		
Dec Time[%]	100%			100%			100%		

	All Intra HE10			Random Access HE10			Low delay B HE10		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%			
Class B	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%	0.0%	0.0%	0.2%
Class C	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%
Class D	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%
Class E	0.1%	0.1%	0.1%				0.0%	-0.5%	0.8%
Overall	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%	0.0%	0.3%
	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%	0.0%	0.4%
Class F	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.1%	0.4%
Enc Time[%]	99%			101%			103%		
Dec Time[%]	100%			102%			103%		

Experimental results (RDOQ off)

	All Intra Main			Random Access Main			Low delay B Main		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.2%	0.5%	0.6%	0.0%	0.3%	0.2%			
Class B	0.1%	0.4%	0.4%	0.1%	0.3%	0.3%	0.1%	0.1%	0.3%
Class C	0.1%	0.2%	0.2%	0.1%	0.0%	0.2%	0.1%	0.0%	0.3%
Class D	0.0%	0.1%	0.1%	0.0%	0.3%	0.4%	0.0%	0.2%	0.2%
Class E	0.3%	0.6%	0.7%				-0.1%	0.4%	0.7%
Overall	0.1%	0.3%	0.4%	0.1%	0.2%	0.3%	0.0%	0.2%	0.4%
	0.1%	0.3%	0.4%	0.1%	0.2%	0.2%	0.0%	0.2%	0.4%
Class F	0.0%	0.2%	0.0%	0.1%	0.1%	0.3%	0.2%	1.5%	0.3%
Enc Time[%]									
Dec Time[%]									

	All Intra HE10			Random Access HE10			Low delay B HE10		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.2%	0.5%	0.4%	0.0%	0.4%	0.4%			
Class B	0.1%	0.4%	0.4%	0.2%	0.3%	0.2%	0.1%	0.1%	0.9%
Class C	0.1%	0.2%	0.2%	0.1%	0.1%	0.2%	0.1%	0.1%	-0.1%
Class D	0.0%	0.1%	0.1%	0.1%	-0.2%	0.0%	0.1%	0.4%	0.0%
Class E	0.3%	0.6%	0.7%				0.1%	0.1%	0.7%
Overall	0.1%	0.3%	0.4%	0.1%	0.2%	0.2%	0.1%	0.2%	0.4%
	0.1%	0.3%	0.4%	0.1%	0.2%	0.2%	0.1%	0.1%	0.5%
Class F	0.0%	-0.1%	0.1%	0.1%	0.2%	-0.2%	0.2%	2.0%	-2.7%
Enc Time[%]									
Dec Time[%]									

Experimental results

(SIGMAP_CONST AT HIGH FREQUENCY off)

	All Intra Main			Random Access Main			Low delay B Main		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.2%	0.1%	0.1%	0.1%	0.1%	0.3%			
Class B	0.2%	0.0%	0.1%	0.1%	0.1%	0.3%	0.1%	0.4%	0.3%
Class C	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%	0.2%
Class D	0.0%	0.1%	0.0%	0.0%	-0.2%	0.2%	0.1%	-0.3%	0.3%
Class E	0.2%	0.2%	0.2%				0.0%	-0.8%	-0.7%
Overall	0.1%	0.1%	0.1%	0.1%	0.0%	0.2%	0.1%	-0.1%	0.1%
	0.1%	0.1%	0.1%	0.1%	0.0%	0.2%	0.1%	0.0%	0.1%
Class F	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	-0.1%	0.2%
Enc Time[%]	98%			100%			100%		
Dec Time[%]	100%			98%			98%		

	All Intra HE10			Random Access HE10			Low delay B HE10		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.1%	0.0%	0.1%	0.1%	0.5%	0.0%			
Class B	0.1%	-0.1%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.4%
Class C	0.0%	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%	0.4%	0.2%
Class D	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	-0.3%	-0.1%
Class E	0.2%	0.0%	0.1%				0.2%	-0.1%	1.4%
Overall	0.1%	0.0%	0.0%	0.1%	0.2%	0.1%	0.1%	0.0%	0.4%
	0.1%	0.0%	0.0%	0.1%	0.2%	0.1%	0.1%	0.1%	0.4%
Class F	0.0%	0.0%	-0.1%	0.1%	0.1%	0.2%	0.2%	-1.0%	1.3%
Enc Time[%]	98%			100%			100%		
Dec Time[%]	99%			100%			100%		

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4. Conclusion

Conclusion

■ Benefits

- **Context dependency entirely removed**
- No need of template hole calculation
- Share logic with significant_coeff_group_flag context derivation
- Throughput improvement for various implementation

■ Recommendation

- Adopted to DIS and HM

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