



Non-CE11: Block-based Significance Map Context Selection

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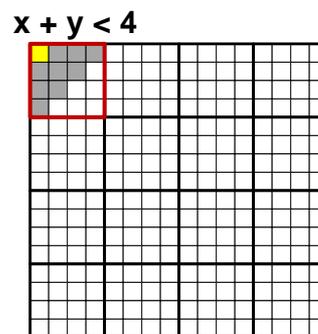
Overall Summary

- In HM-5.0, subblock coding is adopted for large TUs.
 - Each large TU is divided into two regions.
 - Each region uses one context set.
 - The region boundary is a sloped straight line crossing the TU.
 - Some subblocks may need to use two context sets and perform region check for every pixel (quantized transform coefficient).
- We propose a block-based context set selection method
 - Region boundaries must also be subblock boundaries.
 - For each subblock, only one context set is required, and the region check is done at subblock level, not pixel level.
 - Further unify the inferred `significant_coeffgroup_flag` for the region-1 block
- No change in BD-rates and run times

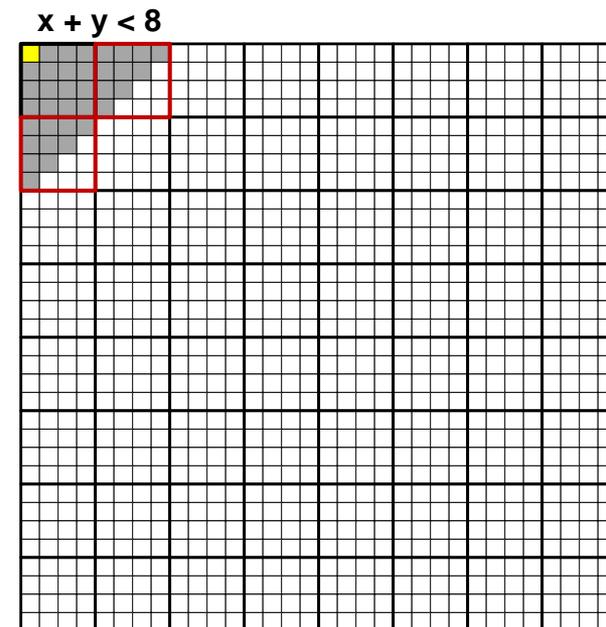
Introduction

- HM-5.0:
 - Use subblock coding for large TUs
 - A large TU is divided into two regions, where each region uses a context set.
 - The region boundary is a straight line that is not along subblock boundaries.

- Problems:
 - Some low frequency subblocks may require two context sets.
 - Need to perform the region check for every pixel



16x16 TU



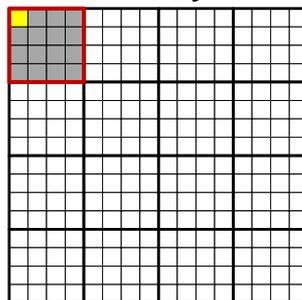
32x32 TU



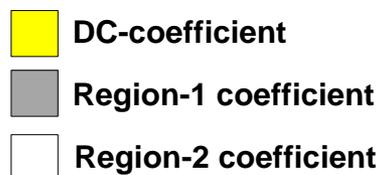
Proposed Block-based Significance Map Context Assignment

- Change the region boundary to a path that is completely along subblock boundaries
 - Reduce switching
- One context set for each subblock
 - Reduce complexity
- One region check for each subblock
 - Reduce complexity
- Region check
 - $\text{blk}_x + \text{blk}_y < \text{thred}$
 - $\text{thred} = \text{TU_size} \ggg 4$

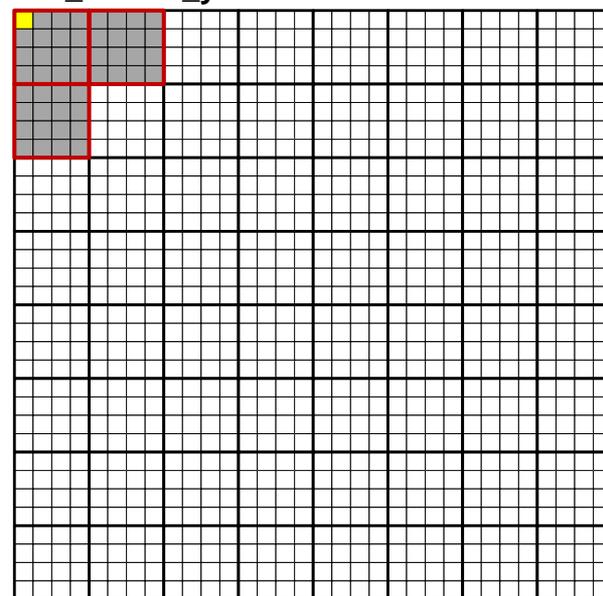
$\text{blk}_x + \text{blk}_y < 1$



16x16 TU



$\text{blk}_x + \text{blk}_y < 2$



32x32 TU



Results

- JCTVC-G1200 anchor
- No change in coding efficiency and run time

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Class B	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class D	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
Class E	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%
Overall	0.0%	0.1%	0.1%	0.0%	0.1%	0.0%
	0.0%	0.1%	0.1%	0.0%	0.1%	0.0%
Class F	0.0%	-0.1%	0.0%	0.0%	0.1%	0.0%
Enc Time[%]	100%			100%		
Dec Time[%]	100%			100%		
	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.0%	-0.1%	0.0%	0.1%	-0.1%
Class B	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%
Class C	0.0%	-0.1%	0.0%	0.0%	0.0%	0.1%
Class D	0.0%	-0.2%	0.0%	0.0%	0.4%	-0.3%
Class E						
Overall	0.0%	-0.1%	0.0%	0.0%	0.2%	0.0%
	0.0%	-0.1%	0.0%	0.0%	0.2%	-0.1%
Class F	-0.1%	-0.1%	-0.1%	0.0%	0.0%	-0.1%
Enc Time[%]	100%			101%		
Dec Time[%]	100%			101%		
	Low Delay B HE			Low Delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.0%	0.2%	-0.1%	0.0%	-0.2%	0.4%
Class C	0.0%	0.1%	0.2%	0.0%	0.3%	0.1%
Class D	0.0%	-0.3%	0.2%	0.0%	0.7%	-0.3%
Class E	0.0%	0.5%	-0.9%	0.0%	-0.9%	0.2%
Overall	0.0%	0.1%	-0.1%	0.0%	0.0%	0.1%
	0.0%	0.1%	-0.1%	0.0%	0.0%	0.2%
Class F	-0.2%	0.0%	-0.3%	0.1%	-0.7%	-0.3%
Enc Time[%]	100%			100%		
Dec Time[%]	100%			100%		

Results – Low QP

- JCTVC-G1200 anchor
 - QP = 12, 17, 22, 27
- No change in coding efficiency and run time

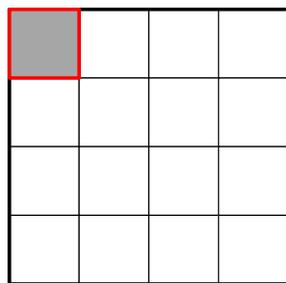
	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class E	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Overall	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class F	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]		100%			100%	
Dec Time[%]		100%			100%	

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class C	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%
Class D	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
Class E						
Overall	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class F	-0.1%	0.0%	-0.1%	0.1%	0.0%	0.0%
Enc Time[%]		100%			101%	
Dec Time[%]		100%			101%	

	Low Delay B HE			Low Delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%
Class D	0.0%	-0.1%	0.0%	0.0%	0.1%	-0.1%
Class E	0.0%	0.2%	0.0%	0.0%	0.0%	-0.2%
Overall	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
Class F	0.0%	-0.1%	-0.1%	0.2%	0.3%	0.0%
Enc Time[%]		100%			100%	
Dec Time[%]		100%			100%	

Inferred significant_coeffgroup_flag

- Two-level significance map in HM-5.0
 - 1st level: significant_coeffgroup_flag to indicate whether a 4x4 subblock has non-zero coefficients
 - 2nd level: significant_coeff_flag
 - The significant_coeffgroup_flag of the 1st subblock is inferred as 1 and not transmitted.
- Propose to infer significant_coeffgroup_flag=1 for all region-1 subblocks



16x16 TU



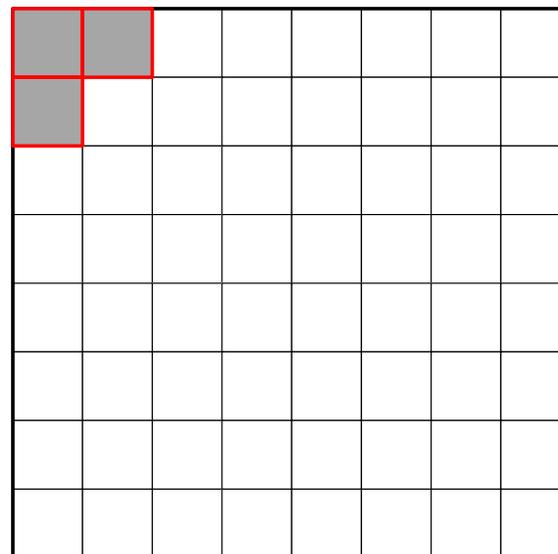
Region-1 subblock



Region-2 subblock



significant_coeffgroup_flag
is inferred as 1



32x32 TU

Combined Results

- JCTVC-G1200 anchor
- No change in coding efficiency and run time

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%
Class B	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class D	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
Class E	0.1%	0.2%	0.2%	0.1%	0.2%	0.3%
Overall	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%
	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%
Class F	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	100%			100%		
Dec Time[%]	100%			98%		

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.1%	-0.1%	0.0%	0.1%	-0.1%
Class B	0.1%	0.1%	0.3%	0.1%	0.2%	0.1%
Class C	0.0%	-0.1%	0.0%	0.0%	0.2%	0.0%
Class D	0.0%	-0.2%	0.2%	0.0%	0.5%	-0.1%
Class E						
Overall	0.0%	0.0%	0.1%	0.0%	0.3%	0.0%
	0.0%	0.0%	0.1%	0.0%	0.3%	-0.1%
Class F	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
Enc Time[%]	100%			100%		
Dec Time[%]	100%			100%		

	Low Delay B HE			Low Delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.1%	0.1%	0.4%	0.1%	-0.1%	0.2%
Class C	0.1%	-0.1%	-0.1%	0.0%	0.1%	0.2%
Class D	0.0%	-0.2%	-0.4%	0.0%	0.8%	0.4%
Class E	0.1%	0.7%	-0.2%	0.0%	-0.6%	-0.8%
Overall	0.1%	0.1%	-0.1%	0.0%	0.1%	0.1%
	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%
Class F	0.0%	0.1%	-0.4%	0.1%	-0.6%	-0.2%
Enc Time[%]	100%			100%		
Dec Time[%]	99%			100%		

Combined Results – Low QP

- JCTVC-G1200 anchor
 - QP = 12, 17, 22, 27
- No change in coding efficiency and run time

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class E	0.0%	0.1%	0.1%	0.0%	0.0%	0.1%
Overall	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class F	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	101%			101%		
Dec Time[%]	100%			99%		

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class B	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
Class D	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
Class E						
Overall	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
Class F	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%
Enc Time[%]	100%			100%		
Dec Time[%]	100%			100%		

	Low Delay B HE			Low Delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Class D	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%
Class E	0.0%	0.1%	0.2%	0.0%	-0.6%	-0.2%
Overall	0.0%	0.0%	0.1%	0.0%	-0.1%	0.0%
	0.0%	0.0%	0.1%	0.0%	-0.1%	0.0%
Class F	0.1%	0.0%	-0.1%	0.3%	0.3%	0.0%
Enc Time[%]	100%			100%		
Dec Time[%]	99%			99%		

Conclusions

- Proposed simplification: block-based context set selection for the 2-level significance map coding
 - Context set region boundaries are along subblock boundaries.
 - Each subblock uses only one context set
 - The region check is done at subblock level instead of pixel level.
- Proposed unification: inferring `significant_coeffgroup_flag=1` for all region-1 subblocks
- No coding efficiency loss
- No run time increase