



# Non-CE11: Modified Method for Two-Level Coding of Significance Maps

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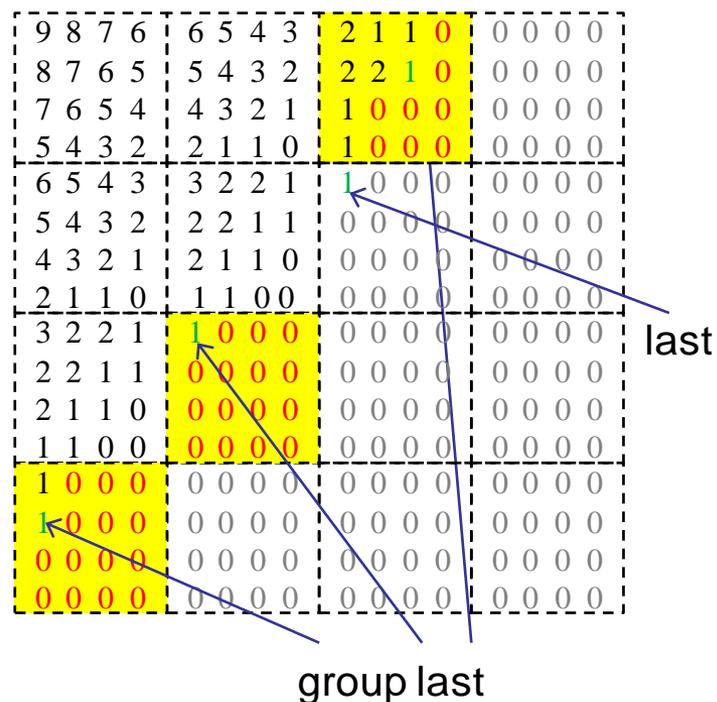
Presented by Tzu-Der (Peter) Chuang  
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# Overall Summary

- Propose to code the position of the last significant coefficient within a sub-block for coding the significance maps in large transform blocks
  
- Benefits
  - Reduced number of coded bins
  - Improved efficiency
  
- No BD-rate loss for HE configurations and Y BD-rate decreases 0.0 – 0.3 % for LC configurations

# Proposed Method

- Code new syntax elements `group_last_significant_coeff_x` and `group_last_significant_coeff_y` to represent the position of the last significant coefficient in scanning order within a sub-block
- New syntax elements are only coded for the sub-block with the group significance flag explicitly coded as '1'
- Coding significance flags is skipped for the coefficients after the last significant coefficient within the sub-block



# CABAC

- Syntax elements **group\_last\_significant\_coeff\_x** and **group\_last\_significant\_coeff\_y** each binarized by a truncated unary code
- Each bin is assigned a single context
- Add 12 new contexts (6 for Luma, 6 for Chroma)

# Results

- JCTVC-G1200 anchor
- No BD-bitrate loss for HE configurations
- Y BD-bitrate decreases 0.0 - 0.3 % for LC configurations
- Thank JVC for verification

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.0%	0.1%	-0.1%	-0.2%	-0.2%
Class B	0.0%	0.0%	0.1%	-0.2%	-0.4%	-0.4%
Class C	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.1%
Class D	0.0%	0.1%	0.1%	-0.1%	-0.1%	-0.1%
Class E	0.1%	0.2%	0.2%	-0.1%	-0.1%	-0.2%
<b>Overall</b>	<b>0.0%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>-0.1%</b>	<b>-0.2%</b>	<b>-0.2%</b>
	0.0%	0.1%	0.1%	-0.1%	-0.2%	-0.2%
Class F	0.0%	0.0%	0.1%	0.0%	0.0%	-0.1%
Enc Time[%]		103.3%			105.5%	
Dec Time[%]		103.5%			104.7%	

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.0%	-0.1%	0.0%	0.0%	-0.3%
Class B	0.0%	-0.1%	0.0%	-0.1%	-0.2%	-0.3%
Class C	0.0%	-0.1%	0.1%	0.0%	-0.1%	-0.1%
Class D	0.0%	-0.2%	0.0%	0.0%	0.3%	-0.2%
Class E						
<b>Overall</b>	<b>0.0%</b>	<b>-0.1%</b>	<b>0.0%</b>	<b>-0.1%</b>	<b>0.0%</b>	<b>-0.2%</b>
	0.0%	-0.1%	0.0%	-0.1%	0.0%	-0.2%
Class F	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
Enc Time[%]		100.9%			104.5%	
Dec Time[%]		100.6%			103.6%	

	Low Delay B HE			Low Delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.1%	-0.1%	0.0%	-0.3%	-0.4%	-0.1%
Class C	0.0%	-0.1%	0.1%	-0.1%	0.0%	-0.2%
Class D	0.0%	-0.4%	-0.2%	-0.1%	0.9%	0.2%
Class E	0.1%	0.3%	-0.4%	-0.2%	0.0%	-0.2%
<b>Overall</b>	<b>0.0%</b>	<b>-0.1%</b>	<b>-0.1%</b>	<b>-0.2%</b>	<b>0.1%</b>	<b>0.0%</b>
	0.0%	-0.1%	-0.1%	-0.2%	0.1%	0.0%
Class F	-0.1%	0.0%	-0.6%	0.0%	-0.5%	-0.3%
Enc Time[%]		101.7%			101.7%	
Dec Time[%]		101.7%			100.7%	

# Coded Bin Statistics

- The coded bin counts versus the HM5.0 anchor
- Total: total number of coded bins (including bypass bins)
- Sig
  - bins for significant flags for HM-5.0
  - bins for significant flags and the sub-block last coefficient positions for the proposal

	All Intra HE		All Intra LC		All Intra HE-10	
	Total	Sig	Total	Sig	Total	Sig
Class A (8bit)	-0.19%	-1.10%	-1.07%	-3.64%		
Class B	-0.44%	-2.05%	-1.68%	-4.79%		
Class C	-0.10%	-0.76%	-0.52%	-1.78%		
Class D	-0.20%	-1.07%	-0.67%	-2.26%		
Class E	-0.44%	-2.40%	-1.31%	-5.16%		
<b>Overall</b>	<b>-0.28%</b>	<b>-1.49%</b>	<b>-1.07%</b>	<b>-3.49%</b>		

	Random Access HE		Random Access LC		Random Access HE-10	
	Total	Sig	Total	Sig	Total	Sig
Class A (8bit)	-0.25%	-1.47%	-0.52%	-2.56%	-0.37%	-1.53%
Class B	-0.39%	-1.98%	-0.93%	-3.76%	-0.38%	-1.95%
Class C	-0.07%	-0.56%	-0.31%	-1.45%		
Class D	-0.06%	-0.57%	-0.29%	-1.50%		
Class E						
<b>Overall</b>	<b>-0.20%</b>	<b>-1.16%</b>	<b>-0.54%</b>	<b>-2.38%</b>	<b>-0.38%</b>	<b>-1.76%</b>

	Low delay B HE		Low delay B LC		Low delay B HE-10	
	Total	Sig	Total	Sig	Total	Sig
Class A						
Class B	-0.24%	-1.32%	-0.89%	-3.58%		
Class C	0.00%	-0.22%	-0.38%	-1.57%		
Class D	0.02%	-0.22%	-0.29%	-1.35%		
Class E	-0.24%	-1.22%	-0.85%	-3.73%		
<b>Overall</b>	<b>-0.12%</b>	<b>-0.75%</b>	<b>-0.61%</b>	<b>-2.55%</b>		

# Conclusion

- Proposed a modified method to further exploit the new two-level diagonal sub-block scan structure for coding significance maps
- Results show the proposal can reduce the number of coded bins while achieving similar or improved efficiency