



Non-CE1: Codeword reordering for last_significant_coeff_x and last_significant_coeff_y

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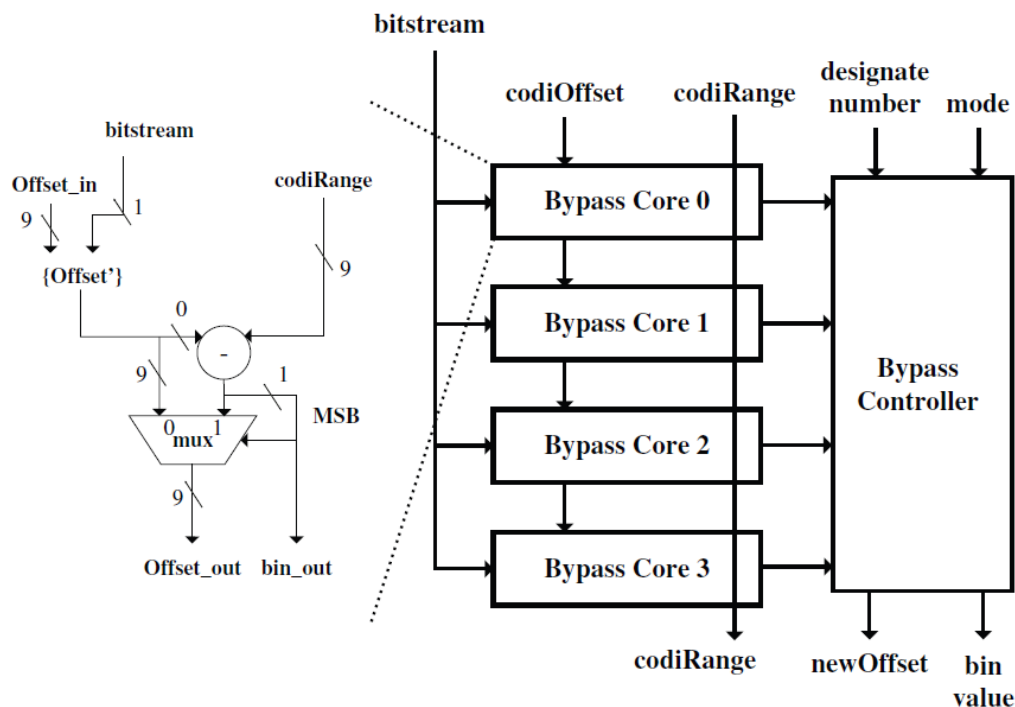
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Overall Summary

- A codeword reordering that groups the bypass bins of `last_significant_coeff_x` and `last_significant_coeff_y` together
 - In CABAC, bypass bins are coded without context and can be processed in parallel easily
 - Grouping the bypass bins of last position X and Y together can improve the coding throughput
- No bit rate increase is observed. The encoding time and decoding time are unchanged.
- More than 5 other companies make the same proposal

CABAC Coding for Bypass Bins

- Since bypass bins are coded without context, the CABAC hardware can be optimized to improve coding throughput for bypass bins
 - 4 bypass bins/cycle [1] (but less than 2 regular bins/cycle)

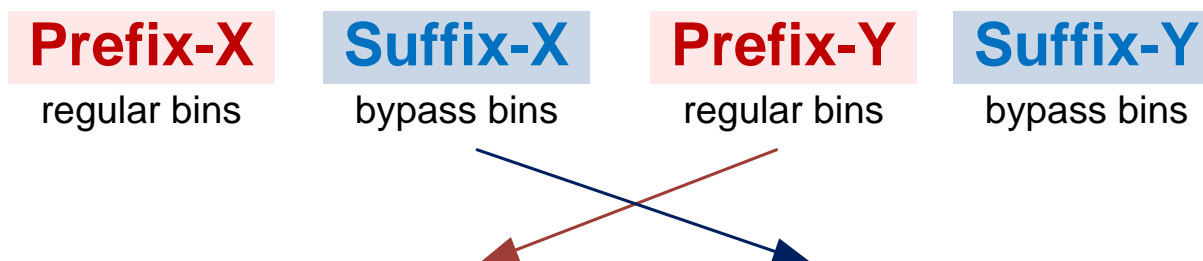


[1] Y.-C. Yang and J.-I. Guo, "High-Throughput H.264/AVC High-Profile CABAC Decoder for HDTV Applications," IEEE Transactions on Circuits and Systems for Video Technology, vol. 19, no. 9, pp. 1395–1399, September 2009.

Proposed

- The last_significant_coeff_x and last_significant_coeff_y can be separated into two parts
 - Prefix part : unary code with **contexts**
 - Suffix part : fixed-length code with **bypass**
- Group the bypass bins together to improve coding throughput

HM4.0 coding order:



Proposed coding order:



Results

- No bit rate increase is observed. The encoding time and decoding time are unchanged.

	All Intra HE			Random Access HE			Low delay B HE		
	Y	U	V	Y	U	V	Y	U	V
Class A	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%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.0%	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%	0.0%	0.0%	0.0%
Class E	0.0%	0.0%	0.0%				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%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]		100%			99%			100%	
Dec Time[%]		100%			100%			100%	

Cross Verification

- We thank Panasonic for crosschecking our proposal
 - JCTVC-G761
- BD-rates and run times are confirmed

Conclusions

- Propose a codeword reordering that groups the bypass bins of last_significant_coeff_x and last_significant_coeff_y together
 - **Enabling the parallel processing**
 - **Improve the coding throughput**
- No bit rate increase is observed. The encoding time and decoding time are unchanged.
 - No impact on software implementation