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Non-CE6: Intra Mode Coding with Fix Length Binarization

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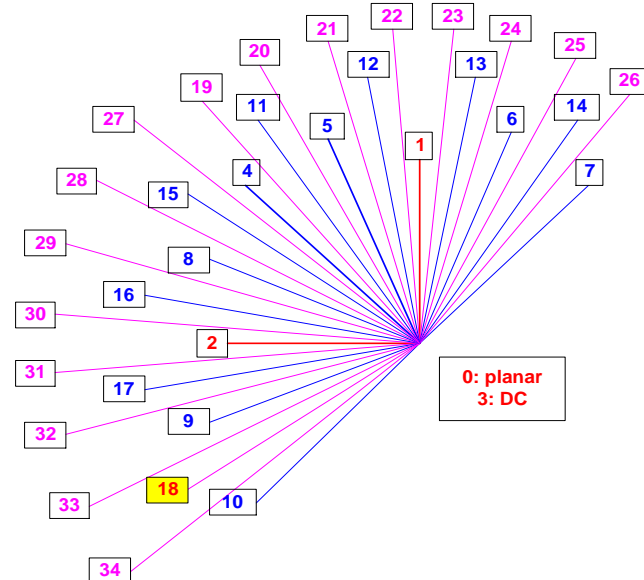
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Outline

- Introduction
  - Intra mode coding in current HM (5.0)

- Proposed Intra mode coding

- Results

- Conclusions

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Introduction

- Intra mode coding in current HM (5.0)
  - 2MPM + Remaining modes
  - Intra 4x4 block
    - Total 18 modes, 16 remaining modes need 4 bins to code
    - Direction HOR+6 (mode 18) is skipped in order to satisfy the 4 bin coding structure
  - Intra block with size 8x8, 16x16, 32x32, 64x64
    - Total 35 modes, 33 remaining modes
    - 31 remaining modes are coded by 5 bins, and the left 2 remaining modes are coded by 6 bins by using escape code.

Proposed Method 1

- Intra mode coding with 3MPM and fix length binarization for remaining modes
  - Add mode 18 (HOR+6) to intra 4x4 block coding
  - Use 3MPMs
    - 4x4 intra block will have 16 remaining modes
    - Other size blocks will have 32 remaining modes
    - Fixed length binarization is achieved

- 3MPM selection

Neighboring modes input	MPMs output
LeftIntraDir!=AboveIntraDir	LeftIntraDir, AboveIntraDir, Planar/DC/Vertical
LeftIntraDir==AboveIntraDir	A: HM 2MPM, DC/Vertical
	B: LeftIntraDir, left and right neighbors of "LeftIntraDir"

- 3MPM entropy coding: Bypass coding

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Proposed Method 2

- Remove mode 34 (HOR+7) from intra mode coding
  - Intra block with size 8x8, 16x16, 32x32, 64x64 will have 32 remaining modes.
    - Fixed length binarization is obtained
  - Other parts keep the same as HM5.0

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Results: Method 1A

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A (8bit)	-0.3%	0.1%	0.2%	-0.4%	-0.1%	-0.1%
Class B	-0.2%	-0.1%	0.0%	-0.3%	-0.2%	-0.1%
Class C	-0.1%	-0.1%	0.0%	-0.2%	-0.1%	-0.1%
Class D	-0.2%	0.0%	0.0%	-0.2%	-0.1%	-0.1%
Class E	-0.1%	0.1%	0.3%	-0.2%	-0.2%	0.0%
Overall	-0.2%	0.0%	0.0%	-0.2%	-0.1%	-0.1%
	-0.2%	0.0%	0.0%	-0.2%	-0.1%	-0.1%
Class F	0.0%	0.0%	0.0%	-0.1%	0.1%	0.0%
Enc Time[%]	100.6%			100.8%		
Dec Time[%]	99.6%			100.0%		

Results: Method 1B

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A (8bit)	-0.3%	0.0%	0.1%	-0.4%	-0.2%	-0.1%
Class B	-0.2%	-0.1%	0.0%	-0.3%	-0.1%	-0.1%
Class C	-0.2%	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%
Class D	-0.2%	0.0%	-0.1%	-0.2%	-0.1%	-0.2%
Class E	-0.3%	0.0%	0.2%	-0.4%	-0.3%	-0.1%
Overall	-0.2%	0.0%	0.0%	-0.3%	-0.2%	-0.1%
	-0.2%	0.0%	0.0%	-0.3%	-0.2%	-0.1%
Class F	-0.1%	0.0%	0.0%	-0.1%	0.0%	-0.1%
Enc Time[%]	100.5%			100.8%		
Dec Time[%]	99.9%			100.2%		

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Results: Method 2

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
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%	0.1%	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%
Class F	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	99.5%			99.4%		
Dec Time[%]	99.9%			99.9%		

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Conclusion

- Fix length binarization based methods are proposed for Intra prediction mode coding
  - 0.2%~0.3% BD rate reduction.
  - Simplify software and coding procedure.
  - Negligible impact on encoding and decoding runtime.

- Recommend to adopt one of the proposed methods.

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