AHG5: Bin reduction for delta QP coding
(JCTVC-J0089)

V. Sze, M. Budagavi (TI), V. Seregin, J. Sole, M. Karczewicz (Qualcomm)

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TEXAS INSTRUMENTS

Context Coded bins in HM-7.0

- In HM-7.0, cu_qp_delta uses TU binarization and all the bins are context coded.

- When cMax is a large value, the worst case number of context coded bins is large.
  - cu_qp_delta (cMax=26); 0.40625 ctx coded bins/pixel

- For the worst case, this syntax element accounts for 18% of the context coded bins.

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Proposal

- Use truncated unary for the prefix, with smaller cMax, and using kth order Exp-Golomb coding as the suffix.

- Only the bins of the prefix are context coded, while the bins of the suffix are bypass coded.

- Similar to coeff_abs_level_minus1 in H.264/AVC and motion vector difference in HM-7.0.

- For TU with cMax=5 and EG0,
  - Reduction of **total context coded bins** in worst case (26 bins → 5 bins)
  - Reduction of **total bins** in worst case (27 bins → 15 bins)
  - Group bypass bins and fewer switches between context coded bins and bypass
  - Removes dependency of cMax on sign value
  - Reduction of number of contexts from 3 to 2.

TEXAS INSTRUMENTS

Coding Efficiency Results

	MAIN			HE10		
	AI	RA	LB	AI	RA	LB
TU4EG0	0.03	0.04	0.01	0.03	0.03	0.04
TU5EG0	**0.02**	**0.02**	**-0.01**	**0.02**	**0.02**	**0.03**

AHG5 Summary

	MAIN						HE10					
	max bins per syntax element		max context bins per syntax element		max bypass bins per syntax element		max bins per syntax element		max context bins per syntax element		max bypass bins per syntax element	
	HM-7.0	This Work	HM-7.0	This Work	HM-7.0	This Work	HM-7.0	This Work	HM-7.0	This Work	HM-7.0	This Work
ref_idx_lx	15		15		0		15		15		0	
cu_qp_delta	27	15	26	5	1	10	33	15	32	5	1	10
sao_offset	9		8		1		33		32		1	