JCTVC-T0122
IMPLICIT TRANSFORM QUADTREE PARTITION FOR INTRA BLOCK COPY

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Proposal

- Implicit TU splitting in HEVC SCC working draft 2
    - When max_transform_hierarchy_depth_inter in SPS is equal to 0, inter-coded CUs with non-square partitions are forced to split once without signaling split_transform_flag
    - The implicit TU splitting is only applied to inter-coded CUs
- It is proposed to extend the implicit TU splitting rule to intra block copy mode

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Proposal

- ## The proposed text change

The variable interSplitFlag is derived as follows:

- If max_transform_hierarchy_depth_inter is equal to 0 and CuPredMode[x0][y0] is equal to MODE_INTER or intra_bc_flag[x0][y0] is equal to 1 and PartMode is not equal to PART_2Nx2N and trafoDepth is equal to 0, interSplitFlag is set equal to 1.

- Otherwise, interSplitFlag is set equal to 0.

When split_transform_flag[x0][y0][trafoDepth] is not present, it is inferred as follows:

- If one or more of the following conditions are true, the value of split_transform_flag[x0][y0][trafoDepth] is inferred to be equal to 1:

- log2TrafoSize is greater than MaxTbLog2SizeY.

- IntraSplitFlag is equal to 1 and trafoDepth is equal to 0.

- interSplitFlag is equal to 1.

Otherwise, the value of split_transform_flag[x0][y0][trafoDepth] is inferred to be equal to 0.

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Simulations

- The proposed method is evaluated under the CTC with disabled explicit transform quadtree splitting by setting
  - QuadtreeTUMaxDepthIntra = 1
  - QuadtreeTUMaxDepthInter = 1

Thanks to NCTU for the cross-check!

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Lossy Coding Performance

- Coding performance for *text & graphics with motion*
  - AI: {4.9%, 3.6%, 3.4%}
  - RA: {2.9%, 2.0%, 2.0%}
  - LB: {1.5%, 0.8%, 0.6%}

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-5.4%	-4.1%	-4.2%	-3.3%	-2.4%	-2.5%	-1.7%	-1.1%	-1.1%
RGB, mixed content, 1440p & 1080p	-6.7%	-4.9%	-4.9%	-5.8%	-4.0%	-3.9%	-3.4%	-1.6%	-1.6%
RGB, Animation, 720p	-0.1%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	-0.1%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-4.3%	-3.0%	-2.6%	-2.5%	-1.7%	-1.5%	-1.3%	-0.5%	-0.1%
YUV, mixed content, 1440p & 1080p	-5.4%	-3.2%	-3.0%	-4.3%	-2.7%	-2.6%	-2.1%	-0.7%	0.4%
YUV, Animation, 720p	-0.1%	-0.3%	0.0%	0.0%	-0.1%	-0.1%	0.1%	0.4%	0.0%
YUV, camera captured, 1080p	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	-0.1%	0.0%	0.0%	0.1%
Enc Time[%]	101%			100%			100%		
Dec Time[%]	101%			101%			101%		

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Lossless Coding Performance

- Average bit-rate savings of 0.5%, 0.3%, 0.3% for AI, RA and LB for *text & graphics with motion*

	All Intra				Random Access				Low Delay B			
	Bit-rate change (Total)	Bit-rate change (Average)	Bit-rate change (Min)	Bit-rate change (Max)	Bit-rate change (Total)	Bit-rate change (Average)	Bit-rate change (Min)	Bit-rate change (Max)	Bit-rate change (Total)	Bit-rate change (Average)	Bit-rate change (Min)	Bit-rate change (Max)
RGB, text & graphics with motion, 1080p & 720p	-0.4%	-0.4%	-1.1%	-0.1%	-0.5%	-0.3%	-1.0%	0.0%	-0.5%	-0.3%	-1.0%	0.0%
RGB, mixed content, 1440p & 1080p	-0.3%	-0.3%	-0.3%	-0.2%	-0.1%	-0.1%	-0.2%	0.0%	-0.1%	-0.1%	-0.2%	0.0%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	-0.5%	-0.5%	-1.4%	-0.1%	-0.5%	-0.4%	-1.1%	-0.1%	-0.5%	-0.3%	-1.1%	0.0%
YUV, mixed content, 1440p & 1080p	-0.4%	-0.4%	-0.5%	-0.3%	-0.1%	-0.1%	-0.2%	0.0%	-0.1%	-0.1%	-0.2%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	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[%]	101%				100%				100%			
Dec Time[%]	101%				103%				104%			

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Closing Remarks

- It is proposed to extend the implicit TU splitting to intra block copy mode
- Coding performance
  - Lossy coding: average BD-rate savings of 4.9%, 2.9% and 1.5% for AI, RA and LB
  - Lossless coding: average bit-rate savings of 0.5%, 0.3% and 0.3% for AI, RA and LB
- Suggest to adopt the proposed method to HEVC SCC working draft

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