

JVET-P0150

CE3-related: Simplification of reference luma intra prediction mode derivation

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Overall Summary

- A simplification of the derivation of reference luma intra prediction mode is proposed
 - The stored luma intra prediction mode for each CU is initialized to DC, and is updated according to the current CU's prediction mode
 - During the reference luma intra mode derivation, if the reference block is available, reference the stored luma intra prediction mode
- The simplest intra prediction mode (DC) is referenced by default
- Only block availability checks are required when deriving the reference luma intra mode

	AI			RA			LB		
	Y	U	V	Y	U	V	Y	U	V
Proposed method	0.00%	-0.08%	-0.07%	0.00%	-0.10%	-0.13%	-0.03%	0.04%	0.14%

VTM6.0 Method Case 1

- In VVC Draft 6, the reference luma intra prediction mode is specially set in the following cases
 1. In the MPM derivation, if one of the following conditions is true, the reference luma intra mode is set to **planar**
 - The neighbouring block is not available.
 - The neighbouring block is **not coded with intra prediction mode**.
 - The neighbouring block is coded with **MIP** mode.
 - The neighbouring block and the current block are not in the same CTU row.

VTM6.0 Method Case 2

- In VVC Draft 6, the reference luma intra prediction mode is specially set in the following cases

2. In the chroma intra prediction mode derivation

- if the reference luma block is **MIP** mode, the reference luma intra prediction mode is set to **planar**
- Otherwise, if the reference luma block is **IBC or palette mode**, the reference luma intra prediction mode is set to **DC**
- Otherwise, the reference luma intra prediction mode is set equal to the luma intra prediction mode of the reference luma block

VTM6.0 Method Case 3

- In VVC Draft 6, the reference luma intra prediction mode is specially set in the following cases

3. In the LFNST set selection

- if the reference luma block is MIP mode, the reference luma intra prediction mode is set to **planar**
- Otherwise, the reference luma intra prediction mode is set equal to the luma intra prediction mode of the reference luma block

→ Many checks are required to derive the reference luma intra prediction mode

Proposed Method in General

- Initialize the luma intra prediction mode of each CU to **DC**
- Update the luma intra prediction mode according to the prediction mode
 - CIIP: planar
 - Non-MIP intra: luma intra prediction mode
 - BDPCM: vertical or horizontal depending on the BDPCM mode index
- When deriving the reference luma intra prediction mode
 - If the reference block is available, reference the stored luma intra prediction mode
 - Otherwise, the reference luma intra prediction mode is set to **DC**

Proposed Method Case 1

- In VVC Draft 6, the reference luma intra prediction mode is specially set in the following cases
 1. In the MPM derivation, if one of the following conditions is true, the reference luma intra mode is set to ~~planar~~**DC**
 - The neighbouring block is not available.
 - ~~– The neighbouring block is not coded with intra prediction mode.~~
 - ~~– The neighbouring block is coded with **MIP** mode.~~
 - The neighbouring block and the current block are not in the same CTU row.

Proposed Method Case 2

- In VVC Draft 6, the reference luma intra prediction mode is specially set in the following cases
 2. In the chroma intra prediction mode derivation
 - ~~— if the reference luma block is **MIP** mode, the reference luma intra prediction mode is set to **planar**~~
 - ~~— Otherwise, if the reference luma block is **IBC or Palette mode**, the reference luma intra prediction mode is set to **DC**~~
 - ~~— Otherwise,~~ the reference luma intra prediction mode is set equal to the luma intra prediction mode of the reference luma block

Proposed Method Case 3

- In VVC Draft 6, the reference luma intra prediction mode is specially set in the following cases

3. In the LFNST set selection

- ~~— if the reference luma block is MIP mode, the reference luma intra prediction mode is set to planar~~
- ~~— Otherwise,~~ the reference luma intra prediction mode is set equal to the luma intra prediction mode of the reference luma block

Results

All Intra Main10					
Over VTM-6.0					
	Y	U	V	EncT	DecT
Class A1	0.01%	-0.10%	-0.14%	102%	101%
Class A2	-0.02%	-0.07%	-0.05%	101%	96%
Class B	0.00%	-0.01%	-0.09%	100%	99%
Class C	0.00%	-0.14%	0.02%	99%	98%
Class E	-0.02%	-0.10%	-0.13%	103%	104%
Overall	0.00%	-0.08%	-0.07%	101%	99%
Class D	-0.01%	-0.03%	-0.04%	98%	100%
Class F	0.01%	-0.06%	-0.08%	100%	101%

Random access Main10					
Over VTM-6.0					
	Y	U	V	EncT	DecT
Class A1	0.03%	-0.24%	-0.21%	101%	103%
Class A2	0.00%	-0.09%	-0.08%	101%	103%
Class B	0.00%	-0.11%	-0.13%	100%	100%
Class C	-0.01%	0.00%	-0.09%	100%	103%
Class E					
Overall	0.00%	-0.10%	-0.13%	100%	102%
Class D	-0.08%	-0.14%	-0.01%	100%	99%
Class F	0.02%	-0.08%	-0.03%	100%	99%

Low delay B Main10					
Over VTM-6.0					
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.02%	0.04%	0.17%	100%	102%
Class C	-0.04%	-0.34%	-0.03%	101%	103%
Class E	-0.10%	0.54%	0.33%	100%	102%
Overall	-0.03%	0.04%	0.14%	100%	102%
Class D	0.02%	0.05%	0.26%	101%	101%
Class F	0.01%	-0.34%	0.31%	100%	101%

Conclusion

- A simplified reference luma intra prediction mode derivation
 - DC mode is used as the mode initialization of the stored luma intra prediction in each CU
 - The stored luma intra prediction mode is updated in each CU
 - The stored luma intra prediction mode is referenced if the reference block is available
- The simplest intra mode (DC) is used as the reference luma intra prediction mode by default
- In the proposed spec, only block availability checks are required
- Results show negligible BD-rate changes
- Thank Kwai for cross-checking!

The background is a solid green color with a repeating pattern of white line-art icons. These icons include various nautical items like anchors, lifebuoys, and seashells, as well as outdoor and travel-related items like a compass, a map, a tent, and a bird in flight. There are also symbols for technology like a smartphone and a Wi-Fi signal.

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Thank you!