



MEDIATEK

JVET-00793

CE3-related: MIP with simplified mode index coding

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Overall Summary

- Simplify the Matrix-based Intra Prediction mode (MIP)
 1. Remove the mapping table between MIP mode index and non-MIP mode index and reduce the number of modes to be power-of-2 modes (32/16/8) in each MIP group
 2. Simplify the matrix index derivation
 3. Reduce the number of MIP modes from 32/16/8 to 8/8/8

BD-rate (%)	AI			RA			LB		
	Y	Cb	Cr	Y	Cb	Cr	Y	Cb	Cr
Item 1 + Item 2	0.03	-0.03	0.00	0.02	-0.08	0.09	-0.01	0.32	0.15
Item 1 + Item 2 + Item 3	0.05	-0.01	0.02	0.04	0.02	0.05	0.06	0.28	0.10

Introduction to MIP

- Two tables are used to map mode indices between MIP mode and non-MIP mode
 - Map MIP-to-non-MIP: non-MIP MPMs or chroma DM derivation
 - Map non-MIP-to-MIP: MIP MPMs derivation
- The number of MIP modes in three groups are (35, 19, 11)
- The MIP mode index signaling comprises
 - MPM is selected: { MPM_flag (1, context coded), MPM index (TU, cMax=2)
 - Non-MPM is selected: { MPM_flag (0, context coded), Remaining mode (fixed length, 31, 15, 7) for group (0, 1, 2)
- The composition of the MIP mode index, mipModelIdx, is
 - $\text{isTranspose} = (\text{mipModelIdx} > \text{numOfMode}/2) ? \text{TRUE} : \text{FALSE}$
 - $\text{matrixIndex} = \text{mipModelIdx} - \text{isTranspose} * (\text{numOfMode}/2)$

Proposed Method 1

- ~~Two tables are used to map mode indices between MIP mode and non MIP mode~~
 - MIP modes are mapped to Planar mode
 - No need to map non-MIP modes to MIP modes since MIP MPMs are removed
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- The number of MIP modes in three groups are ~~(35, 19, 11)~~
- The MIP mode index signaling comprises → (32, 16, 8)
 - MPM is selected: { MPM_flag (1, context coded), MPM index (TU, cMax=2)
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 - ~~MPM is selected: { MPM_flag (1, context coded), MPM index (TU, cMax=2)~~
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- The composition of the MIP mode index, mipModelIdx, is
 - isTranspose = (mipModelIdx > numOfMode/2)? TRUE : FALSE
 - matrixIndex = mipModelIdx – isTranspose * (numOfMode/2)

Proposed Method 2

- ~~Two tables are used to map mode indices between MIP mode and non MIP mode~~
 - MIP modes are mapped to Planar mode
 - No need to map non-MIP modes to MIP modes since MIP MPMs are removed
- The number of MIP modes in three groups are ~~(35, 19, 11)~~
- The MIP mode index signaling comprises → (32, 16, 8)
 - ~~MPM is selected: { MPM_flag (1, context coded), MPM index (TU, cMax=2)~~
 - ~~Non MPM is selected: { MPM_flag (0, context coded),~~ MIP mode index (fixed length, 31, 15, 7) for group (0, 1, 2)
- The composition of the MIP mode index, mipModeldx, is
 - isTranspose = (mipModeldx &1)
 - matrixIndex = (mipModeldx >>1)

Proposed Method 3

- ~~Two tables are used to map mode indices between MIP mode and non MIP mode~~
 - MIP modes are mapped to Planar mode
 - No need to map non-MIP modes to MIP modes since MIP MPMs are removed
- The number of MIP modes in three groups are ~~(35, 19, 11)~~
- The MIP mode index signaling comprises ~~→ (32, 16, 8)~~ → (8, 8, 8)
 - ~~MPM is selected: { MPM_flag (1, context coded), MPM index (TU, cMax=2)~~
 - ~~Non MPM is selected: { MPM_flag (0, context coded),~~ MIP mode index (fixed length, ~~31, 15, 7~~) for group (0, 1, 2)
→ (7, 7, 7)
- The composition of the MIP mode index, mipModeldx, is
 - isTranspose = (mipModeldx &1)
 - matrixIndex = (mipModeldx >>1)

Results – Method 2

All Intra Main10					
Over VTM-5.0					
	Y	U	V	EncT	DecT
Class A1	0.04%	0.06%	0.08%	98%	99%
Class A2	0.05%	-0.04%	-0.02%	97%	100%
Class B	0.02%	-0.07%	0.01%	97%	99%
Class C	0.02%	-0.03%	0.00%	98%	100%
Class E	0.03%	-0.02%	-0.08%	97%	106%
Overall	0.03%	-0.03%	0.00%	98%	100%
Class D	0.05%	0.12%	0.03%	98%	99%
Class F	0.00%	0.02%	-0.02%	99%	100%

Random access Main10					
Over VTM-5.0					
	Y	U	V	EncT	DecT
Class A1	0.05%	-0.09%	0.26%	99%	99%
Class A2	0.05%	0.08%	0.11%	99%	99%
Class B	0.03%	0.01%	0.16%	99%	100%
Class C	-0.04%	-0.29%	-0.15%	98%	97%
Class E					
Overall	0.02%	-0.08%	0.09%	99%	99%
Class D	0.05%	0.16%	-0.03%	99%	99%
Class F	0.04%	-0.04%	0.10%	99%	97%

Low delay B Main10					
Over VTM-5.0					
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.01%	0.41%	-0.29%	99%	98%
Class C	0.01%	0.22%	-0.02%	99%	100%
Class E	-0.04%	0.31%	1.11%	100%	99%
Overall	-0.01%	0.32%	0.15%	99%	99%
Class D	0.04%	0.28%	1.20%	97%	101%
Class F	-0.01%	-0.11%	0.41%	98%	98%

Results – Method 3

All Intra Main10					
Over VTM-5.0					
	Y	U	V	EncT	DecT
Class A1	0.01%	0.06%	0.09%	96%	100%
Class A2	0.06%	0.04%	0.00%	96%	100%
Class B	0.03%	-0.05%	0.04%	97%	100%
Class C	0.06%	-0.01%	0.04%	97%	99%
Class E	0.07%	-0.06%	-0.06%	97%	100%
Overall	0.05%	-0.01%	0.02%	97%	100%
Class D	0.12%	0.23%	0.05%	99%	101%
Class F	0.06%	0.00%	-0.03%	98%	100%

Random access Main10					
Over VTM-5.0					
	Y	U	V	EncT	DecT
Class A1	0.02%	0.04%	0.30%	99%	96%
Class A2	0.04%	0.14%	0.06%	99%	99%
Class B	0.05%	0.12%	0.05%	99%	96%
Class C	0.03%	-0.20%	-0.14%	99%	97%
Class E					
Overall	0.04%	0.02%	0.05%	99%	97%
Class D	0.08%	0.00%	0.21%	99%	100%
Class F	0.05%	0.00%	0.04%	100%	97%

Low delay B Main10					
Over VTM-5.0					
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.03%	0.65%	0.35%	99%	99%
Class C	0.08%	0.26%	-0.20%	99%	99%
Class E	0.08%	-0.30%	0.10%	100%	97%
Overall	0.06%	0.28%	0.10%	99%	99%
Class D	0.01%	0.31%	0.49%	98%	99%
Class F	0.04%	0.29%	0.22%	97%	98%

Conclusion

1. Remove the mapping table between MIP mode index and non-MIP mode index and reduce the number of modes to be power-of-2 modes (32/16/8) in each MIP group
 2. Simplify the matrix index derivation
 3. Reduce the number of MIP modes from 32/16/8 to 8/8/8
- Thank Huawei for cross-checking!

BD-rate (%)	AI			RA			LB		
	Y	Cb	Cr	Y	Cb	Cr	Y	Cb	Cr
Item 1 + Item 2	0.03	-0.03	0.00	0.02	-0.08	0.09	-0.01	0.32	0.15
Item 1 + Item 2 + Item 3	0.05	-0.01	0.02	0.04	0.02	0.05	0.06	0.28	0.10

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, seashells, and fish, as well as outdoor and travel items like a compass, a map, a tent, a backpack, and a bird in flight. There are also symbols for weather like a sun and a lightning bolt, and other items like a camera and a bottle.

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Thank you!