

JCTVC-D049

Mode-Dependent Coefficient Scanning for Intra Prediction

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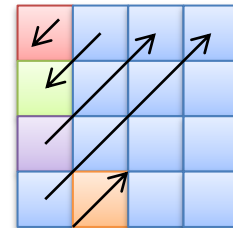
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Transforms Coefficient Coding in HM1

- 4x4 TU Example

- Significance map

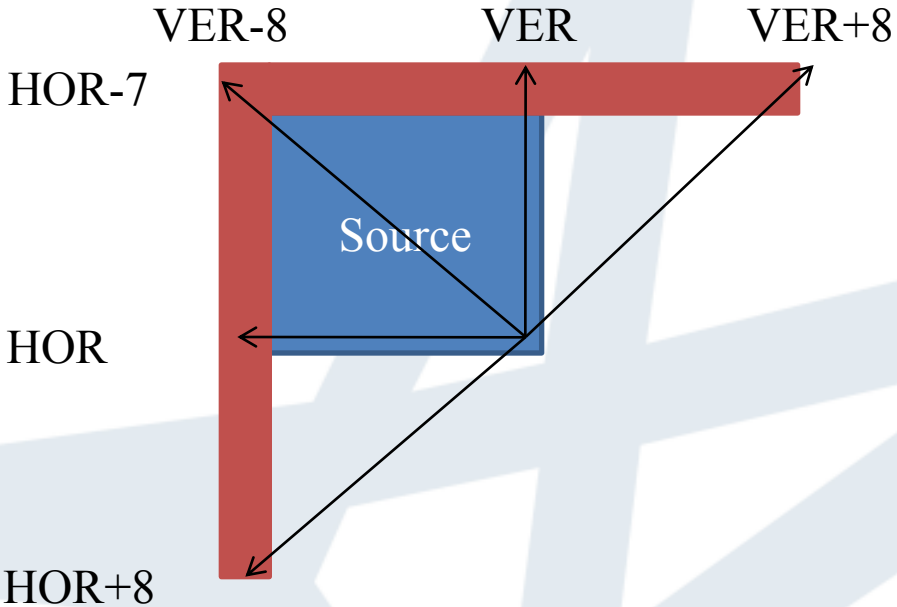
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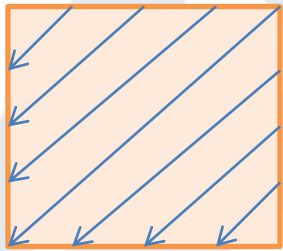
- Issues

- Counters needed for adaptive scan
 - Difficulties in parallelizing coefficient coding [C227]

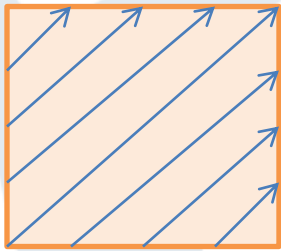
Proposed Approach – Mode-Dependent Simplified Scans



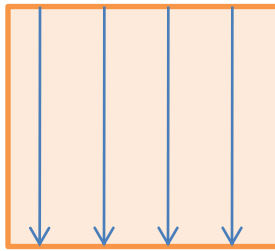
Mode	N = 4, 8	N = 16, 32
DC	DL	DL
VER-8	UR	UR
VER-7 to VER-5	DL	DL
VER-4 to VER+4	H	DL
VER+5 to VER+8	DL	DL
HOR-7 to HOR-5	UR	UR
HOR-4 to HOR+4	V	UR
HOR+5 to HOR+8	UR	UR



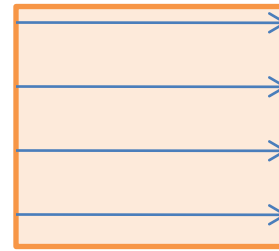
Down-Left



Up-Right



Vertical



Horizontal

Comparisons with D360, D393

- Zig-Zag mode still seems to use adaptive selection of diagonal direction

Advantages

- No updating of scan orders for each prediction mode necessary
- No collection of statistics necessary
- Set of scans are simple to implement (low overhead)
- Possible to do wave-front scans for parallelization

Experimental conditions

- Consider the following cases
 - MDSS on its own
 - MDSS with DCT/DST
- Following JCTVC-C500 and JCTVC-C507
 - Test Intra (high-efficiency and low-complexity) and Random Access (high-efficiency and low-complexity)

Results (Proposed)

	Intra			Intra LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.4	-0.2	-0.1	0.9	0.7	0.6
Class B	-0.5	-0.4	-0.4	0.2	0.1	-0.1
Class C	-1.1	-0.6	-0.7	-0.3	-0.4	-0.5
Class D	-1.0	-0.7	-0.7	-0.1	-0.3	-0.4
Class E	-1.4	-0.8	-0.7	0.1	-0.2	-0.1
All	-0.9	-0.6	-0.5	0.1	-0.1	-0.2
Enc Time[%]	106%			101%		
Dec Time[%]	100%			99%		

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.2	0.1	0.4	0.4	0.4	0.3
Class B	-0.3	0.0	0.1	0.1	0.2	0.0
Class C	-0.4	-0.2	-0.2	-0.1	-0.1	-0.1
Class D	-0.3	-0.4	-0.1	-0.1	-0.3	0.1
Class E						
All	-0.3	-0.1	0.0	0.0	0.0	0.1
Enc Time[%]	101%			100%		
Dec Time[%]	101%			100%		

Results (Adaptive Scan Order in TMuC 0.9)

	Intra			Intra LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.4	-0.3	-0.3	0.2	-0.3	-0.4
Class B	-0.5	-0.5	-0.4	-0.9	-1.4	-1.6
Class C	-1.0	-0.8	-0.8	-0.8	-1.1	-1.1
Class D	-0.9	-0.7	-0.7	-0.7	-1.0	-1.1
Class E	-1.2	-0.8	-0.7	-1.0	-1.2	-1.0
All	-0.8	-0.6	-0.6	-0.7	-1.1	-1.2
Enc Time[%]	106%			106%		
Dec Time[%]	220%			368%		

	Random access			Random access LoCo		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-0.2	0.1	0.3	0.0	0.0	-0.2
Class B	-0.3	-0.1	-0.3	-0.5	-0.5	-0.7
Class C	-0.3	-0.3	-0.3	-0.4	-0.4	-0.4
Class D	-0.3	-0.2	-0.1	-0.2	-0.2	-0.4
Class E						
All	-0.3	-0.1	-0.2	-0.3	-0.3	-0.5
Enc Time[%]	101%			101%		
Dec Time[%]	320%			557%		

Results (Mode-Dependent Scans+Transforms)

	I2R DCT/ODST-3 (D046) + MDSS			QC MDDT (in TMuC 0.9)		
	Intra			Intra		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-2.5	-3.0	-2.9	-2.8	-3.0	-2.9
Class B	-1.3	-1.7	-1.7	-1.5	-1.8	-1.8
Class C	-2.0	-1.8	-1.8	-2.1	-2.0	-2.0
Class D	-2.1	-1.8	-1.8	-2.1	-2.0	-1.9
Class E	-2.7	-2.9	-2.6	-2.7	-2.7	-2.5
All	-2.0	-2.1	-2.0	-2.1	-2.2	-2.1
Enc Time[%]	106%			106%		
Dec Time[%]	102%			223%		

	Random access			Random access		
	Y BD-rate	U BD-rate	V BD-rate	Y BD-rate	U BD-rate	V BD-rate
Class A	-1.1	-0.5	-0.3	-1.2	-0.6	-0.2
Class B	-0.7	-0.4	-0.3	-0.8	-0.5	-0.4
Class C	-1.0	-0.7	-0.5	-1.0	-0.6	-0.7
Class D	-0.9	-0.6	-0.3	-0.9	-0.5	-0.5
Class E						
All	-0.9	-0.6	-0.4	-0.9	-0.5	-0.5
Enc Time[%]	101%			101%		
Dec Time[%]	101%			322%		

Conclusions

- Proposed mode-dependent scans for intra coding
 - No significant difference in coding performance from adaptive scan order
 - Simplified set of fixed scans with no adaptivity required
- Recommend further study for adoption into HM