

DC mode as a default intra mode (JCTVC-H0242)

**Il-Koo Kim, Tammy Lee, JaeHyun Kim and
JeongHoon Park
(Samsung)**

Introduction

❖ HM5.0

- Planar mode as a default intra mode when the condition of neighboring PU is as follows.
 - Not available
 - Inter coded PU
 - Located in above LCU

❖ Proposal

- DC mode as a default intra mode when the condition of neighboring PU is as follows.
 - Not available
 - Inter coded PU
 - Located in above LCU

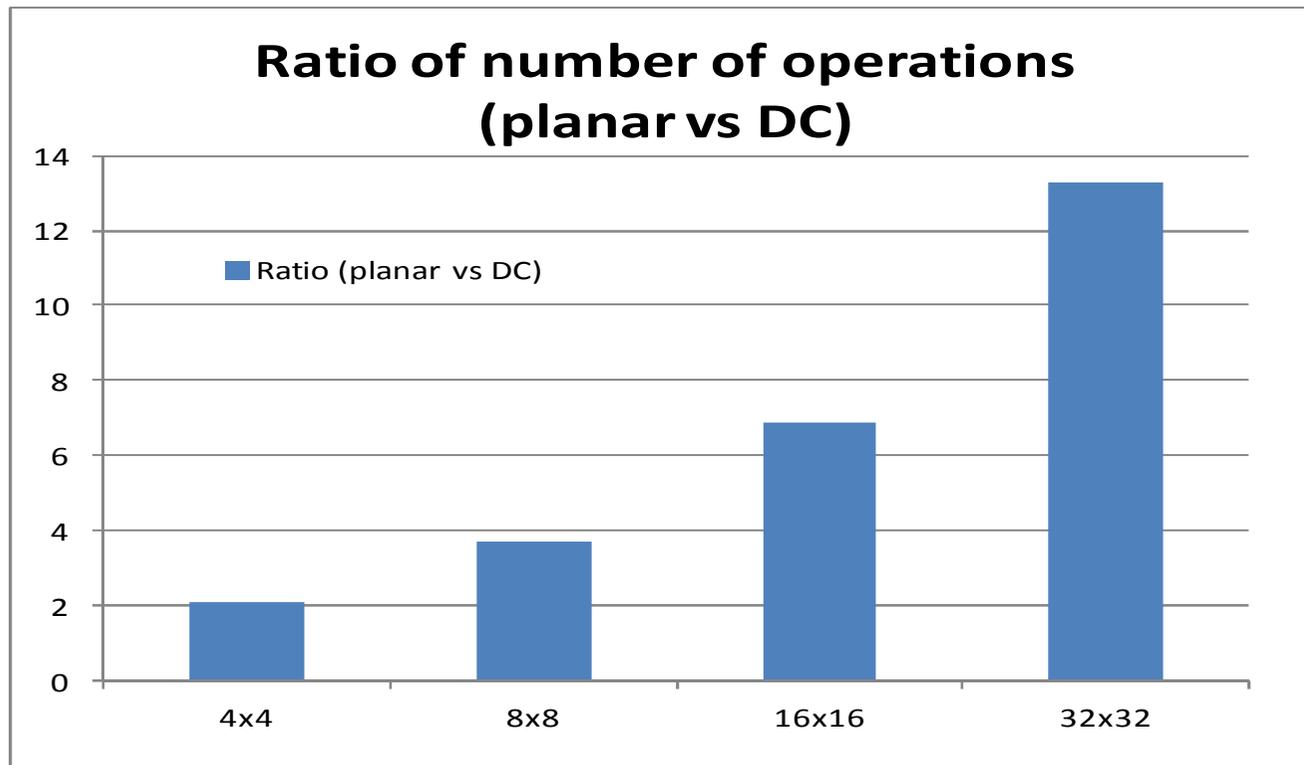
Analysis (1)

- ❖ Number of operations needed for DC mode and planar mode: 32x32 PU case
- ❖ Ratio between number of operations for (DC prediction + DC prediction filtering) and that of planar prediction is approximately 13.3.

32x32 PU	multiplication	division	add or subtract	shift	sum
DC prediction	0	1	66	0	67
DC pred. filtering	63	0	127	63	253
Planar prediction	0	0	3168	1088	4256

Analysis (2)

- ❖ Ratios between the number of operations needed to perform DC and planar prediction for each PU size.
- ❖ The ratio increases as size of PU increases. The range is between 2.1 and 13.3.



Analysis (3)

- ❖ Number of hit of DC and planar mode when the default intra mode is DC or planar mode
- ❖ To get these statistics, HM5.0 was modified and tested under common test conditions. The results contain counts from Class F sequences.

	Default intra mode : planar			Default intra mode : DC		
	DC	planar	Ratio (DC/planar)	DC	planar	Ratio (DC/planar)
AI-HE	106319002	108974895	0.98	125161867	96244063	1.30
AI-LC	146598332	120048850	1.22	165758944	106774352	1.55
RA-HE	7144617	7692199	0.93	8642367	6233130	1.39
RA-LC	8543907	8080440	1.06	10001637	6609510	1.51
LD-HE	2181866	2964875	0.74	2930284	2175855	1.35
LD-LC	3056830	3598524	0.85	3905565	2671018	1.46
RA-HE-10	5764466	6472374	0.89	7129560	5160053	1.38

Test Results (1)

- ❖ Test results under common test condition (JCTVC-G1200)
 - Anchor software: HM-5.0
 - No loss without runtime changes

	All Intra HE			All Intra LC		
	Y	U	V	Y	U	V
Class A (8bit)	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
Class B	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
Class C	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
Class D	0.0%	0.0%	-0.1%	0.0%	0.0%	-0.1%
Class E	0.1%	-0.4%	-0.3%	0.1%	-0.3%	-0.3%
Overall	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
Class F	0.0%	-0.1%	0.0%	0.0%	-0.1%	-0.1%
Enc Time[%]	101%			100%		
Dec Time[%]	99%			99%		

	Random Access HE			Random Access LC			Random Access HE-10		
	Y	U	V	Y	U	V	Y	U	V
Class A (8bit)	0.0%	-0.1%	-0.2%	0.1%	0.0%	-0.4%	0.1%	0.0%	0.4%
Class B	0.0%	-0.2%	-0.1%	0.1%	0.0%	-0.2%	0.1%	-0.1%	-0.1%
Class C	0.0%	-0.2%	0.0%	0.1%	0.0%	0.0%			
Class D	0.1%	-0.2%	0.1%	0.0%	0.4%	-0.1%			
Class E									
Overall	0.0%	-0.2%	-0.1%	0.0%	0.1%	-0.1%	0.1%	-0.1%	0.1%
	0.0%	-0.2%	0.0%	0.0%	0.1%	-0.2%	0.1%	-0.1%	0.2%
Class F	-0.1%	-0.1%	-0.2%	0.0%	-0.2%	-0.1%			
Enc Time[%]	100%			100%			100%		
Dec Time[%]	100%			99%			100%		

Test Results (2)

- ❖ Test results under common test condition (JCTVC-G1200)
 - Anchor software: HM-5.0
 - No loss without runtime changes
 - 0.2% and 0.1% BD-rate gain for class F sequences under LDHE and LDLC conditions

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.0%	0.0%	0.2%	0.0%	-0.3%	0.0%
Class C	0.0%	-0.2%	0.2%	0.0%	0.0%	0.2%
Class D	0.0%	-0.2%	0.0%	0.0%	1.2%	-0.2%
Class E	-0.1%	0.2%	-1.3%	0.0%	-1.1%	0.5%
Overall	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.1%
	0.0%	0.0%	-0.2%	0.0%	0.0%	0.1%
Class F	-0.2%	-0.1%	-0.4%	-0.1%	-1.4%	-0.3%
Enc Time[%]		100%			100%	
Dec Time[%]		99%			99%	

Conclusions

- ❖ DC mode as a default intra mode when the condition of neighboring PU is as follows.
 - Not available
 - Inter coded PU
 - Located in above LCU

- ❖ Lower complexity than planar, high hit number when default DC mode

- ❖ No loss without runtime changes for class A-E
- ❖ 0.2% and 0.1% BD-rate gain for class F sequences under LDHE and LDLC conditions

- ❖ It is recommended to adopt this modification in HEVC.