



<7<sup>th</sup> JCT-VC meeting @Geneva, November 2011>

# 〈JCTVC-G415〉 MC Complexity Reduction for Bi-prediction

**Hui Yong Kim**

[hykim5@etri.re.kr](mailto:hykim5@etri.re.kr)

*Realistic Media Research Team, ETRI  
Media Lab., KyungHee Univ.*



**21 November 2011**

# Introduction

## ❑ In the previous proposal (JCTVC-F356),

- ❖ Roughly 29% and 5% area of forward B-Slices were observed to have identical L0/L1 motion information (i.e.,  $mvL0 == mvL1$  and  $refPOC0 == refPOC1$ ) under HM3.0 LD and RA configuration, respectively.
- ❖ It was proposed that such bi-predictions should be degenerated to uni-predictions for MC complexity reduction.
- ❖ About 4% decoding time reduction was achieved by the proposed method.
- ❖ The meeting note says this could be desirable thing to be included in the reference software.

## ❑ In this proposal,

- ❖ Roughly the same statistics as was in HM3.0 are reported with HM4.0.
- ❖ Roughly the same decoding time reductions as was in the previous proposal are reported with M4.0

# Introduction (cont'd)

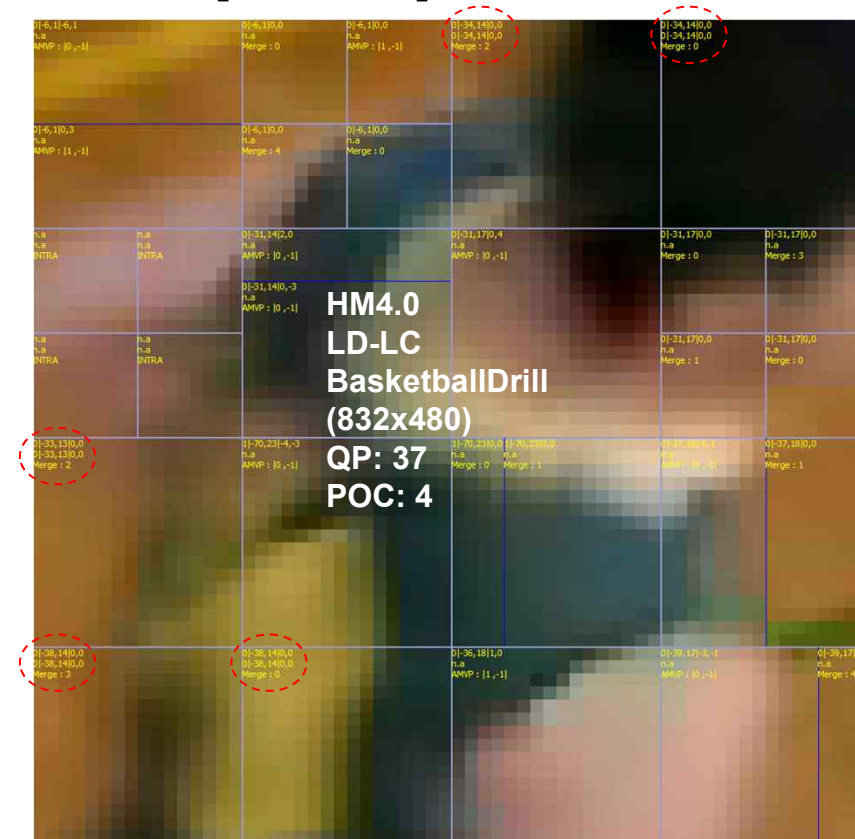
## ❑ Observation

❖ % Area of PUs satisfying “mvL0==mvL1 && pocL0==pocL1”

	QP	LD HE (%)	LD LC (%)	RA HE (%)	RA LC (%)
Class A	22			4.0%	4.3%
	27			5.4%	5.5%
	32			7.2%	6.7%
	37			9.7%	8.9%
Class B	22	11.3%	9.7%	4.8%	4.3%
	27	16.6%	15.0%	7.6%	7.3%
	32	21.2%	19.3%	9.0%	8.8%
	37	26.3%	24.2%	10.4%	9.7%
Class C	22	11.7%	11.7%	2.7%	3.0%
	27	15.7%	15.6%	3.9%	4.3%
	32	20.7%	20.5%	6.1%	6.3%
	37	27.4%	27.4%	8.7%	8.7%
Class D	22	9.6%	9.4%	1.9%	1.9%
	27	13.2%	13.0%	3.1%	3.1%
	32	18.7%	18.4%	4.9%	5.5%
	37	26.0%	25.8%	8.3%	8.4%
Class E	22	47.2%	49.0%		
	27	52.7%	53.4%		
	32	60.0%	59.3%		
	37	68.2%	66.7%		
Average		27.9%	27.4%	6.1%	6.0%

- LD: % Area is computed for all B-Slices
- RA: % Area is computed for the B-Slices of temporal-level 0

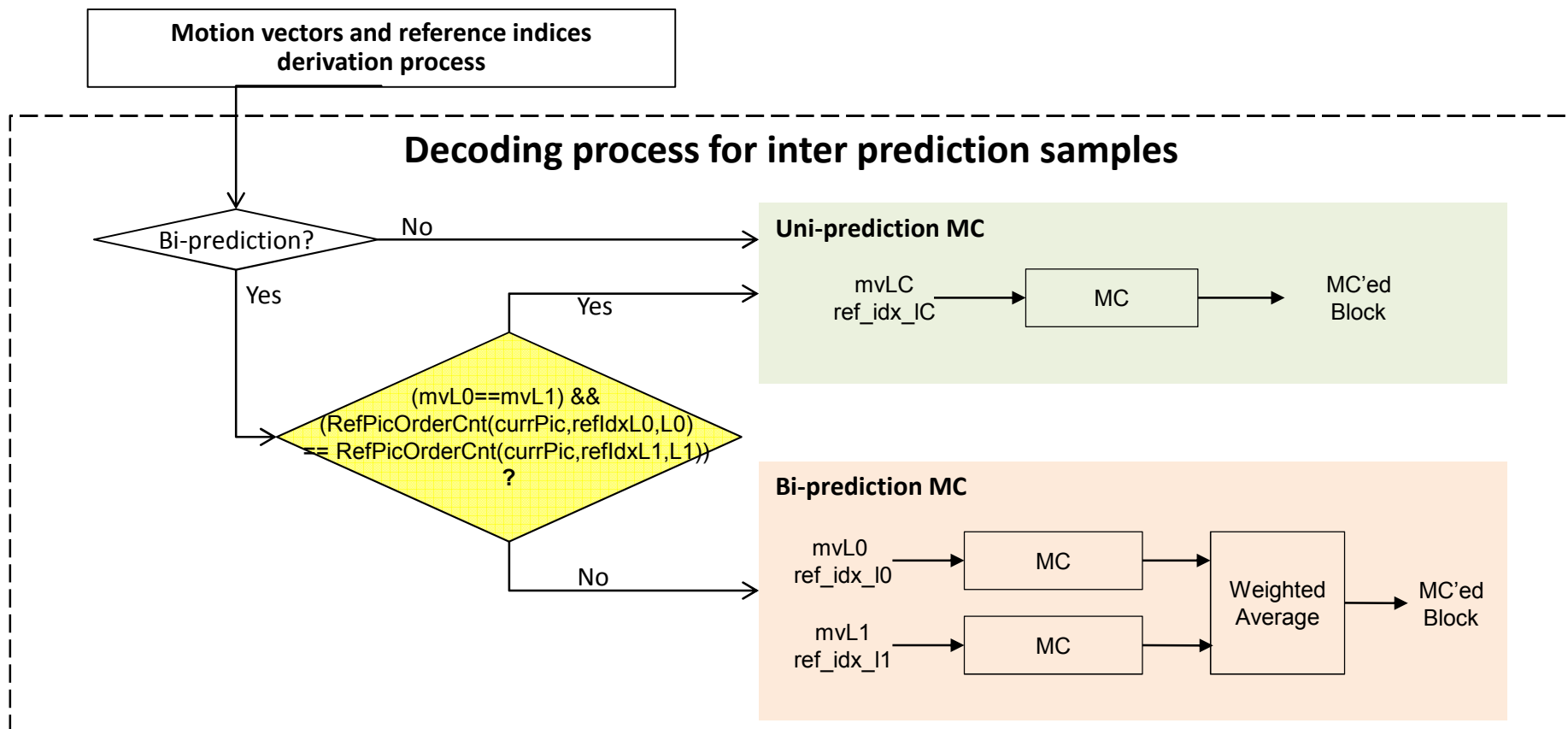
❖ Redundant MC and weighted averaging operations for those cases



# Proposed Method

## ❑ Modification of decoding process for inter prediction samples

- ❖ If the two motion information is the same,  
use L0 uni-MC instead of the bi-MC & weighted averaging operations.



# Experimental Results

## ❑ Complexity reduction in LD-B

- ❖ 4% DT
- ❖ 6~7% operation and 12% memory access for IF (CE3 complexity measurement tool was used.)

## ❑ Cross-checked by Canon (G874)

- ❖ 7~8% DT reduction reported

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class E	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Overall</b>	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[%]	100%			100%		
Dec Time[%]	100%			100%		
Mult[%]	0%			0%		
Adds[%]	0%			0%		
Access[%]	0%			0%		
MemBand(2D) Ave.[%]	0%			0%		
MemBand(2D) Max.[%]	0%			0%		
MemBand(1D) Ave.[%]	0%			0%		
MemBand(1D) Max.[%]	0%			0%		

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class E	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Overall</b>	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[%]	99%			99%		
Dec Time[%]	96%			96%		
Mult[%]	-7%			-6%		
Adds[%]	-7%			-6%		
Access[%]	-12%			-12%		
MemBand(2D) Ave.[%]	-13%			-12%		
MemBand(2D) Max.[%]	-1%			-1%		
MemBand(1D) Ave.[%]	-13%			-12%		
MemBand(1D) Max.[%]	-1%			-1%		

# Conclusion

## ❑ An MC complexity reduction method was proposed.

- ❖ It uses uni-MC instead of the bi-MC & weighted averaging operations when the L0 and L1 motions are identical.
- ❖ In LD-B configurations, it provides
  - 4% reduction in average DT,
  - 6~7% reduction in average # of IF operations,
  - and 12% reduction in average # of memory access for IF

## ❑ Recommendation

- ❖ Integrate the proposed tool in the HEVC reference software and enable it in the common test conditions.



***Thank You Very Much !***

[www.etri.re.kr](http://www.etri.re.kr)