



<6th JCT-VC meeting @Torino, IT, July 2011>

<JCTVC-F356> MC Complexity Reduction for Bi-prediction

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16 July 2011

JCTVC-F356 & F712

❑ JCTVC-F356 MC complexity reduction

- ❖ Method 1
- ❖ Method 2
- ❖ Method 3
- ❖ Cross-checked by Nokia (JCTVC-F725)

❑ JCTVC-F712 Additional results on JCTVC-F356

- ❖ Method A
- ❖ Method B
- ❖ Cross-checked by BBC (JCTVC-F7xx)

Introduction

❑ Observation

❖ % Area of PUs satisfying “mvL0==mvL1 && refFrameL0==refFrameL1”

	QP	LD HE (%)	LD LC (%)	RA HE (%)	RA LC (%)
Class A	37			7.8%	8.0%
	32			5.4%	6.0%
	27			3.4%	4.0%
	22			1.9%	2.3%
Class B	37	38.3%	38.6%	10.5%	10.7%
	32	28.8%	28.4%	8.1%	8.4%
	27	21.0%	19.8%	5.3%	5.4%
	22	11.6%	9.2%	1.9%	2.1%
Class C	37	31.3%	33.6%	7.3%	8.2%
	32	21.0%	23.2%	4.6%	5.7%
	27	14.2%	16.2%	2.8%	3.6%
	22	9.3%	10.1%	1.9%	2.1%
Class D	37	32.9%	35.0%	9.9%	11.1%
	32	22.6%	23.7%	6.2%	7.1%
	27	15.4%	16.3%	3.9%	3.9%
	22	10.0%	10.2%	2.0%	2.0%
Class E	37	71.0%	70.2%		
	32	55.1%	57.7%		
	27	41.0%	44.8%		
	22	29.6%	34.4%		
Average		28.3%	29.5%	5.2%	5.7%

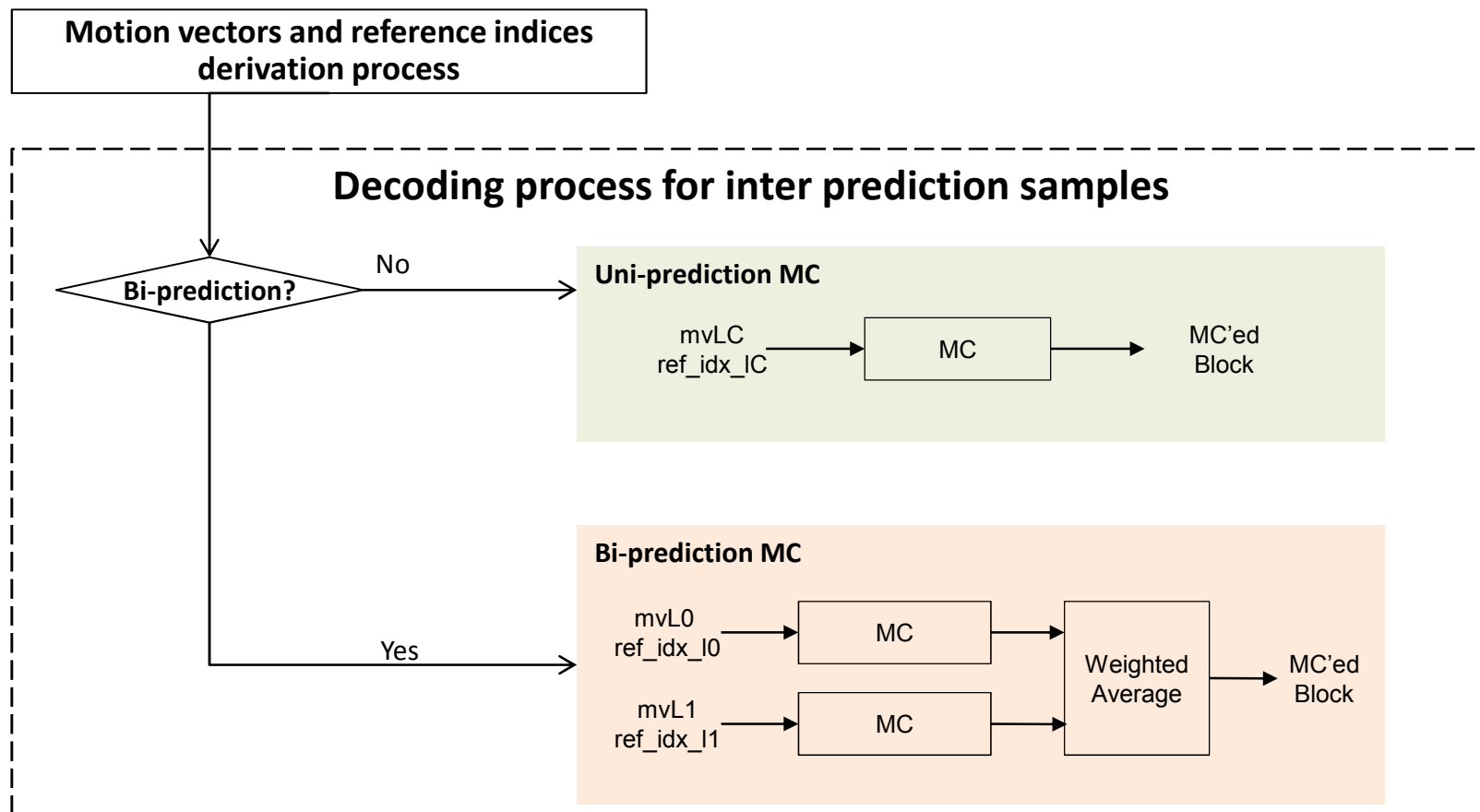
- LD: % Area is computed for all B-Slices
- RA: % Area is computed for the B-Slices of temporal-level 0



❖ Redundant MC and weighted averaging operations for those cases

Introduction

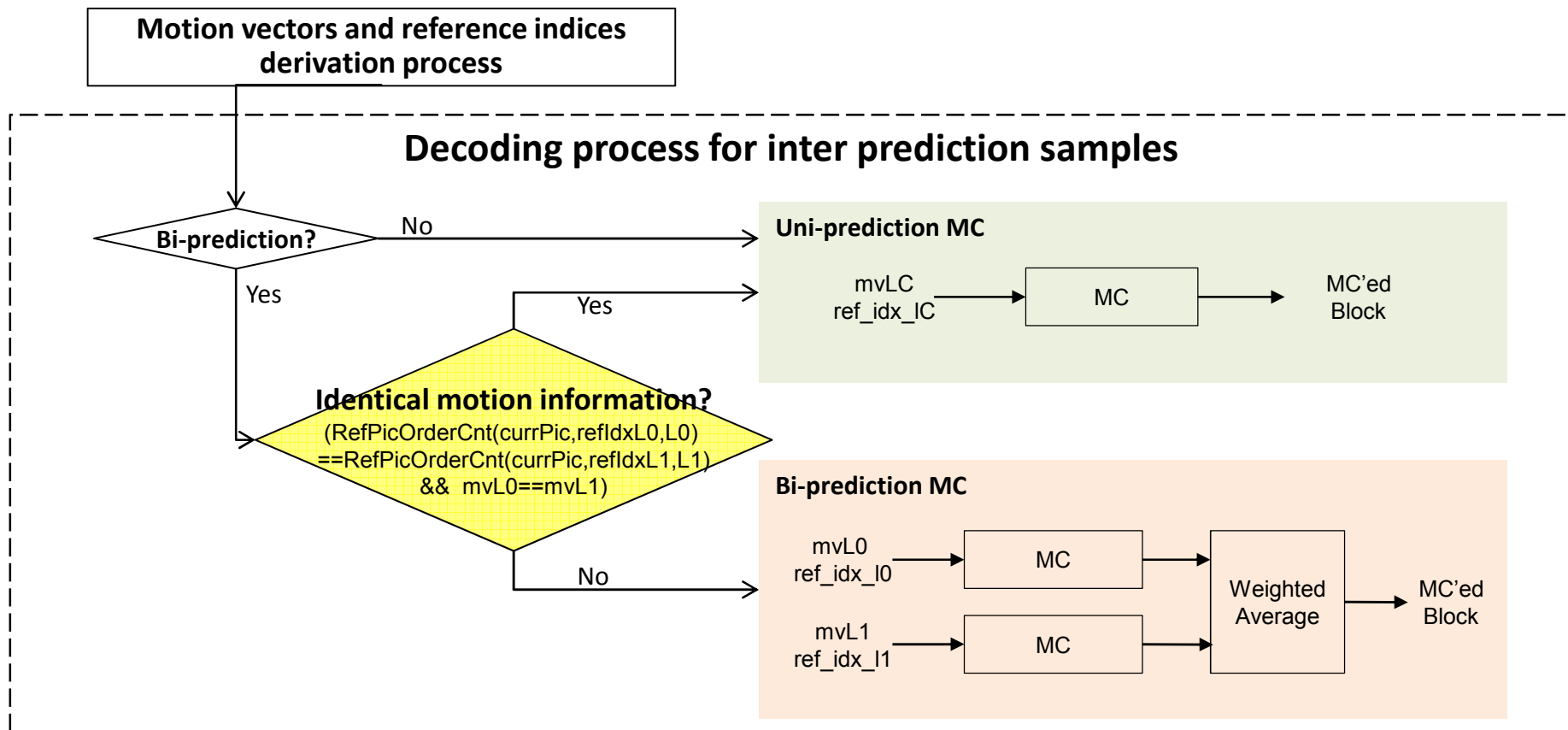
❑ HM 3.0 Motion Compensation



Method 1

❑ Modification of decoding process for inter prediction samples

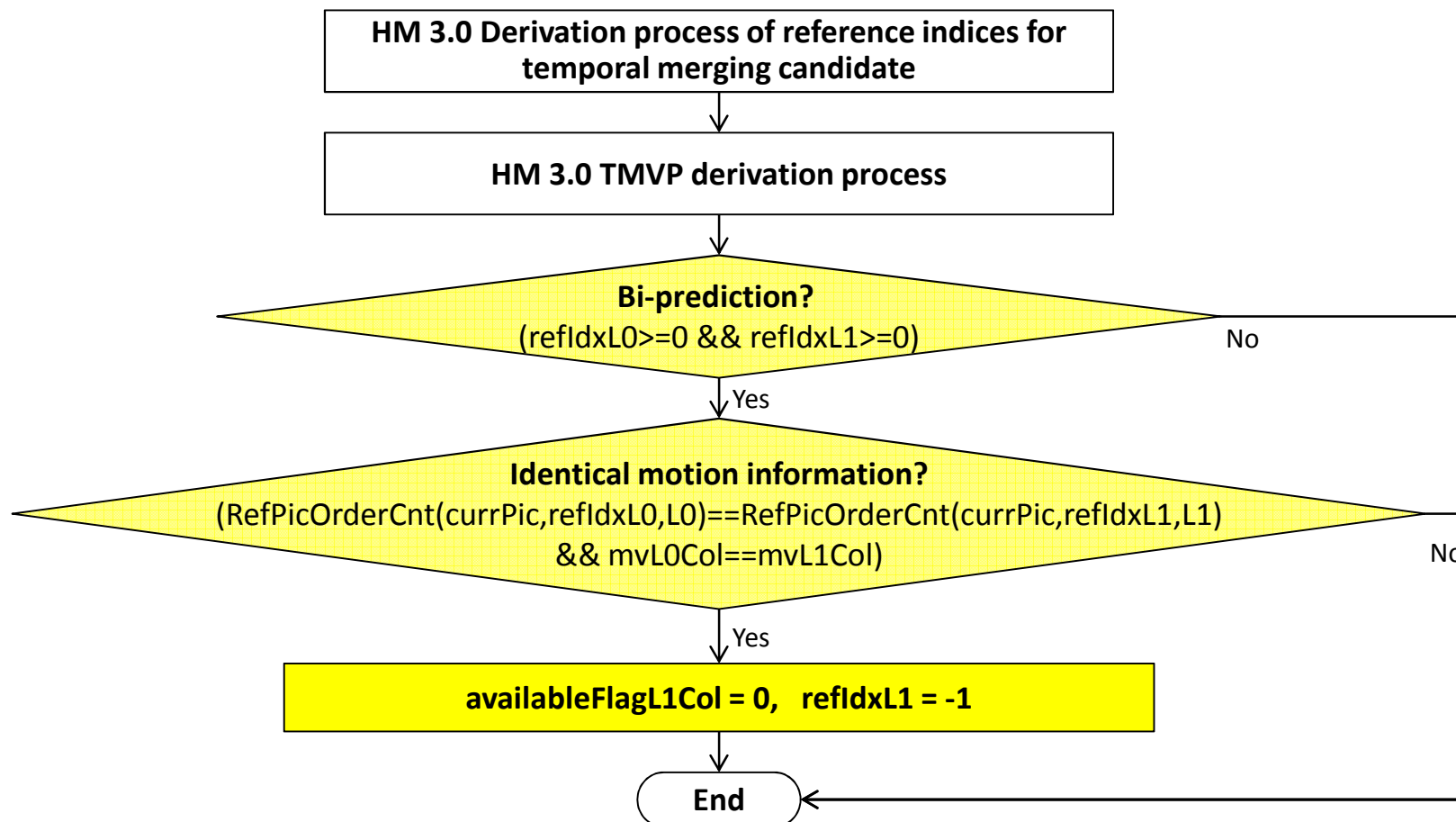
- ❖ If the two motion information is the same,
use uni-MC process instead of bi-MC process.



Method 2

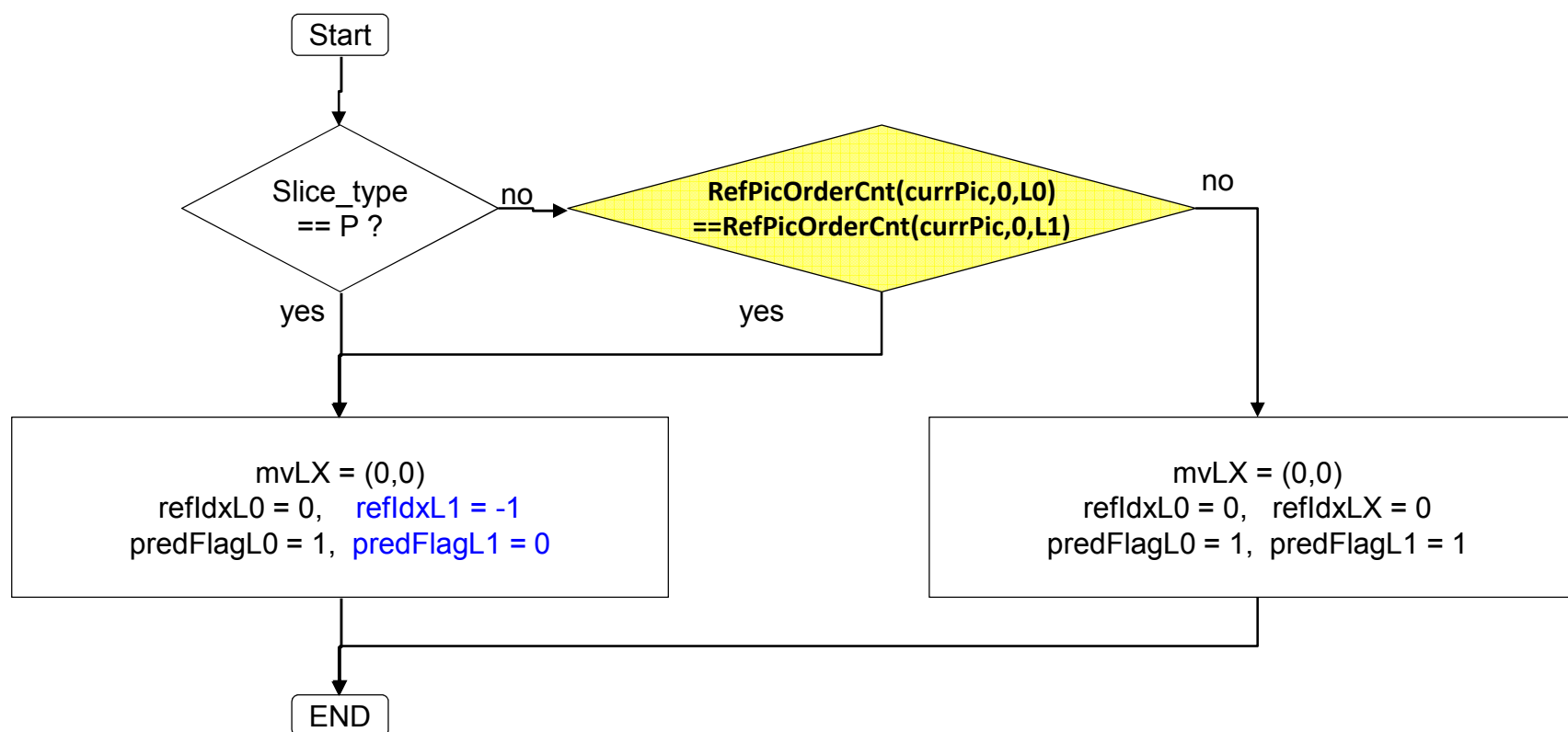
❑ Modification of derivation process for Merge mode MVs

- ❖ If the two motion information is the same,
change the prediction mode to L0 uni-prediction.



Method 2 (cont'd)

❖ Zero merge-candidate (NumMergeCand == 0) case



Method 3

❑ Method 2 + Encoder only modification

- ❖ If a mode satisfies all the following conditions,
 - $\text{PredMode} == \text{MODE_INTER} \ \&\& \ \text{merge_flag} == 0$
 - $\text{inter_pred_flag} == \text{Pred_BI}$
 - $\text{mvL0} == \text{mvL1}$
 - $\text{RefPicOrderCnt}(\text{currPic}, \text{refIdxL0}, \text{L0}) == \text{RefPicOrderCnt}(\text{currPic}, \text{refIdxL1}, \text{L1})$
- ❖ Then perform the following assignments,
 - $\text{inter_pred_flag} = \text{Pred_LC}$
 - $\text{mvLC} = \text{mvL0}$
 - $\text{refIdxLC} \leftarrow \min(\text{refIdxL0}, \text{refIdxL1})$
 - If $\text{refIdxL0} \leq \text{refIdxL1}$, then $\text{refIdxL1} = -1$, $\text{PredFlagL0} = 1$, $\text{PredFlagL1} = 0$
 - Otherwise, $\text{refIdxL0} = -1$, $\text{PredFlagL0} = 0$, $\text{PredFlagL1} = 1$

Experimental Results

❑ Method 1 (Uni-MC instead of Bi-MC)

❖ Left: F356, Right: F725 (from cross-checker)

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	0.0	0.0	-0.1	0.0	0.0	0.1
Class B	0.0	0.0	-0.1	0.0	0.0	0.0
Class C	0.0	0.0	0.0	0.0	0.0	-0.1
Class D	0.0	0.0	0.0	0.0	-0.1	0.0
Class E						
Overall	0.0	0.0	0.0	0.0	0.0	0.0
Enc Time[%]	101%			100%		
Dec Time[%]	98%			99%		

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.0	0.3	0.0	0.0	0.0	-0.1
Class C	0.0	0.0	-0.1	0.0	0.0	-0.2
Class D	0.0	-0.1	0.0	0.0	0.0	-0.2
Class E	0.1	-0.2	-0.7	-0.1	0.2	-0.5
Overall	0.0	0.1	-0.1	0.0	0.0	-0.2
Enc Time[%]	99%			99%		
Dec Time[%]	97%			96%		

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	0.0	0.0	-0.1	0.0	0.0	0.1
Class B	0.0	0.0	-0.1	0.0	0.0	0.0
Class C	0.0	0.0	0.0	0.0	0.0	-0.1
Class D	0.0	0.0	0.0	0.0	-0.1	0.0
Class E						
All	0.0	0.0	0.0	0.0	0.0	0.0
Enc Time[%]	87%			94%		
Dec Time[%]	101%			99%		

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.0	0.3	0.0	0.0	0.0	-0.1
Class C	0.0	0.0	-0.1	0.0	0.0	-0.2
Class D	0.0	-0.1	0.0	0.0	0.0	-0.2
Class E	0.1	-0.2	-0.7	-0.1	0.2	-0.5
All	0.0	0.1	-0.1	0.0	0.0	-0.2
Enc Time[%]	95%			91%		
Dec Time[%]	97%			95%		

Experimental Results

□ Method 2 (L0 uni-prediction TMV)

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	0.0	-0.1	0.1	0.0	0.0	0.1
Class B	0.0	0.0	0.0	0.0	0.0	0.0
Class C	0.0	0.1	0.0	0.0	-0.1	-0.1
Class D	0.0	-0.1	0.0	0.0	0.0	0.1
Class E						
Overall	0.0	0.0	0.0	0.0	0.0	0.0
Enc Time[%]	100%			100%		
Dec Time[%]	100%			99%		

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	-0.1	0.2	0.0	0.0	-0.1	-0.3
Class C	0.0	0.1	0.0	0.0	-0.1	-0.1
Class D	0.0	0.1	0.3	0.0	-0.3	-0.3
Class E	0.0	0.3	-0.2	0.0	0.0	-0.6
Overall	0.0	0.2	0.0	0.0	-0.1	-0.3
Enc Time[%]	100%			100%		
Dec Time[%]	96%			96%		

Experimental Results

❑ Method 3 (Method 2 + Encoder only modification)

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	-0.1	-0.1	0.0	0.0	0.0	0.2
Class B	0.0	-0.1	0.0	0.0	0.0	0.0
Class C	0.0	0.0	0.0	0.0	-0.1	-0.1
Class D	0.0	-0.1	-0.1	0.0	0.0	0.0
Class E						
Overall	0.0	-0.1	0.0	0.0	0.0	0.0
Enc Time[%]	100%			101%		
Dec Time[%]	99%			99%		

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	-0.1	-0.1	-0.1	0.0	-0.1	-0.3
Class C	-0.1	-0.1	-0.1	0.0	0.0	0.0
Class D	-0.1	0.1	-0.1	0.0	0.0	0.0
Class E	0.0	-0.4	-0.5	0.1	-0.1	-0.3
Overall	0.0	-0.1	-0.2	0.0	0.0	-0.2
Enc Time[%]	100%			100%		
Dec Time[%]	96%			96%		

Summary

- ❑ In the current design, the same motion vector could be used for bi-prediction.
- ❑ Several methods for MC complexity reduction for the same-motion case
 - ❖ Method 1: Uni-MC instead of Bi-MC
 - ❖ Method 2: L0 uni-TMVP instead of bi-TMVP (for Merge/Skip)
 - ❖ Method 3: Method 2 + Encoder only modification for AMVP

	RA-HE		RA-LC		LDB-HE		LDB-LC	
	BDR	ET/DT	BDR	ET/DT	BDR	ET/DT	BDR	ET/DT
Method 1	0.0%	101%/98%	0.0%	100%/99%	0.0%	99%/97%	0.0%	99%/96%
Method 2	0.0%	100%/100%	0.0%	100%/99%	0.0%	100%/96%	0.0%	100%/96%
Method 3	0.0%	100%/99%	0.0%	101%/99%	0.0%	100%/96%	0.0%	100%/96%



Thank You Very Much !

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