

# **Reduction of reference picture list checking for temporal motion vector prediction**

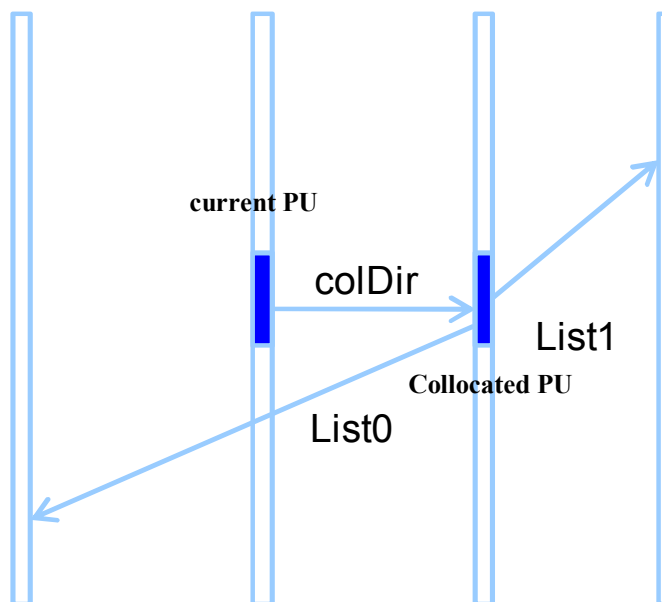
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**Il-Koo Kim, Woo-Jin Han and JeongHoon Park  
(Samsung)**

# Motion information selection used for TMVP

## ❖ Current HM,

- **For every PU**, motion information of the list, which has smaller POC of reference picture than POC of current picture, is used for TMVP after checking **two reference lists** of collocated PU.

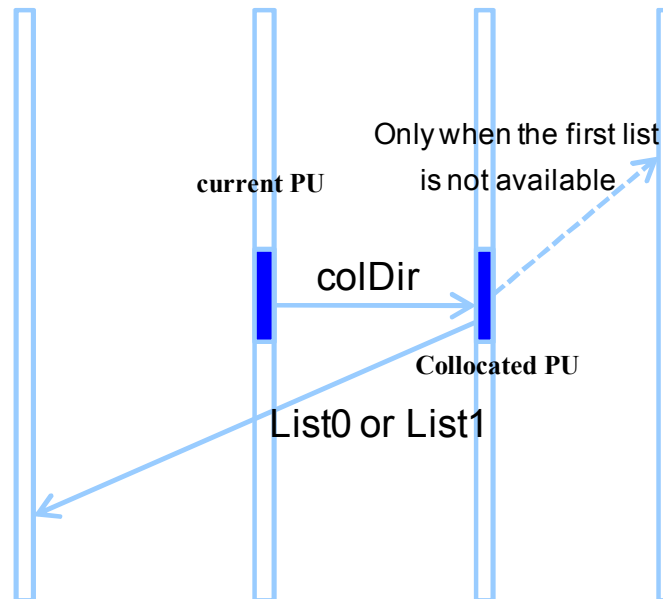


In this example, motion information of **List0** is used because POC of reference picture is smaller than that of current picture

# Reduction of reference picture list checking

## ❖ Proposed method

- Pre-defined reference list is tested first
- Only when the first reference list doesn't exist, the other reference list is checked



# Selection of the first reference list

## ❖ Method (1)

- Set the first list as the same value with **(1-coldir)** for all configurations

## ❖ Method (2)

- Set the first list as the same value with **(1-coldir)** for random access configuration and **current reference list** for low delay configuration
- Using LDC flag in HM reference software

```
eColRefPicList = getSlice()->getSPS()->getUseLDC() ? eRefPicList : RefPicList(1-iColdir);
```

## ❖ Method (3)

- Same with method 2, but low delay condition is found by **checking POCs of reference lists** instead of utilizing LDC flag in HM software.
- If all POCs of reference lists are smaller than POC of current slice, low delay condition is assumed. (**slice level detection**)

# Results (1)

- ❖ Test results with the first picture list as **(1-colDir)**
  - The average loss **0.2%** with slight decoding time decrease (1-2%)
  - Average **0.35%** loss is observed in low delay configuration.

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	0.0	0.0	0.3	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	0.1
Class E						
<b>Overall</b>	<b>0.0</b>	<b>0.0</b>	<b>0.1</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
Enc Time[%]	100%			100%		
Dec Time[%]	98%			99%		

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.2	0.4	0.6	0.6	0.4	0.2
Class C	0.2	0.3	0.2	0.3	0.2	0.0
Class D	0.4	0.4	0.8	0.3	-0.1	0.2
Class E	0.3	0.3	0.2	0.6	0.8	0.2
<b>Overall</b>	<b>0.3</b>	<b>0.3</b>	<b>0.5</b>	<b>0.4</b>	<b>0.3</b>	<b>0.1</b>
Enc Time[%]	100%			100%		
Dec Time[%]	99%			99%		

# Results (2)

## ❖ Test result with **low delay flag (LDC flag) check**

- **No loss** compared to HM-3.0
- The results of low delay cases are **exactly same** with those of HM-3.0.

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	0.0	0.0	0.3	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	0.1
Class E						
<b>Overall</b>	<b>0.0</b>	<b>0.0</b>	<b>0.1</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
Enc Time[%]	100%			100%		
Dec Time[%]	99%			100%		

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
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>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
Enc Time[%]	100%			100%		
Dec Time[%]	100%			101%		

# Results (2)

## ❖ Test result with **low delay condition check**

- **No loss** compared to HM-3.0
- The results of low delay cases are **exactly same** with those of HM-3.0.

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

# Conclusions

- ❖ Three methods are proposed to reduce reference picture list checking for temporal motion vector predictor generation
- ❖ One of them, which utilizes low delay condition checking, provides no loss with reduced number of checking.
- ❖ It is recommended to adopt the proposed reduction of reference picture list checking into the next version of HM.