



**MEDIATEK**

**JVET-M0178**

# **CE10.2.1: Uni-prediction-based CU-boundary-only OBMC**

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# Overall Summary

- Proposed to only apply OBMC to uni-prediction blocks and use uni-prediction for the generation of OBMC region
- BD-rates and runtimes (anchor: VTM-3.0)
  - RA: **-0.27%** (Y) -0.58% (U) -0.62% (V), EncT: 104%, DecT: 103%
  - LB: **-0.36%** (Y) -0.50% (U) -0.51% (V), EncT: 106%, DecT: 105%

# Proposed Methods

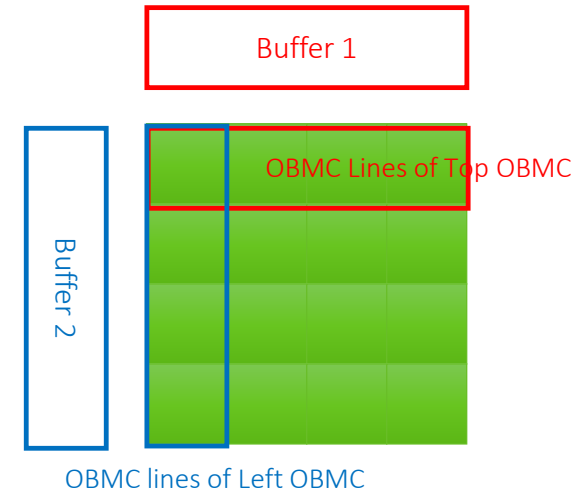
- Uni-prediction-based CU boundary OBMC
  - OBMC is only applied to uni-prediction blocks (triangular mode is treated as bi-prediction)
  - OBMC region is generated using iuni-prediction
    - If neighbouring block is bi-prediction, the MV in the reference picture with the smaller picture order count (POC) distance from the current picture is chosen (choose list 0 if the two POC distances are the same)
  - OBMC is only applied to CU boundary
- Number of blending lines
  - Left (top) boundary:
    - If width (height)  $< 8$ , the number of blending line at boundary is 2 (luma) / 1 (chroma)
    - Otherwise, the number of blending line at boundary is 4 (luma) / 2 (chroma)

# Proposed Methods

- Disable OBMC in small CUs
  - Small CUs:  $\text{width} * \text{height} < 64$
- Remove line buffer for OBMC
  - The top boundary OBMC in CUs locating at the top CTU row is disabled
- Syntax design
  - Merge mode: not signalled, inferred to be 0 if one of the following conditions is true
    - The current block is triangular mode
    - The size of current block  $< 64$
  - AMVP mode: only signalled when current block  $\leq 256$ , inferred to be 0 if one of the following conditions is true
    - The current block is bi-prediction
    - The size of current block  $< 64$

# Proposed Methods

- Lossless data reuse
  - L-buffer OBMC block reuse (encoder only)
  - MC-merging
    - if adjacent OBMC blocks have the same motion information
- Parallel blending
  - The blending process of the top-left 4x4 region can be done in parallel



$$F(x, y) = (L(x, y) * w(x) + T(x, y) * w(y) + C(x, y) * (32 - w(x) - w(y)) + 16) >> 5$$

For luma samples:

If number of luma lines for weighted averaging is 4

$w(i) = \{ 8, 4, 2, 1 \}$ ,

If number of lines for weighted averaging is 2

$w(i) = \{ 8, 4, 0, 0 \}$ ,

where  $i$  is the number of samples at the left/top CU boundary

For chroma samples:

If number of chroma lines for weighted averaging is 2

$w(i) = \{ 8, 4 \}$ ,

If number of lines for weighted averaging is 1

$w(i) = \{ 8, 0 \}$ ,

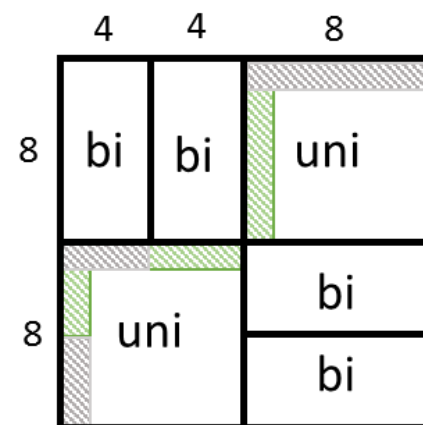
where  $i$  is the number of samples at the left/top CU boundary

# Proposed Methods

- Skip OBMC when neighbouring MV is similar to current MV
  - If both the two conditions are met, OBMC is not performed
    1. The neighbouring block MV and the current block MV point to the same reference picture.
    2. MV difference between the neighbouring block MV and the current block MV is not larger than 1 sample.

# Complexity Comparison

- Use the worst case in a 16x16 region for comparison
  - The worst case of a 8x8 block will not happen in the four 8x8 blocks in a 16x16 region



	On-the-fly method		Pre-generation method	
	Memory bandwidth	Interpolation operations	Memory bandwidth	Interpolation operations
Compared with non-OBMC 8x4 bi-prediction block	0.98	0.87	0.78	0.81

\*on-the-fly implementation: generates prediction blocks from neighbouring blocks when the current CU is decoded

\*pre-generation implementation: generates prediction blocks from neighbouring blocks when the neighbouring block is decoded

# Simulation Results

Random access Main10					
Over VTM-3.0					
	Y	U	V	EncT	DecT
Class A1	-0.12%	-0.42%	-0.44%	104%	101%
Class A2	-0.31%	-0.61%	-0.59%	104%	100%
Class B	-0.20%	-0.53%	-0.65%	104%	103%
Class C	-0.46%	-0.73%	-0.74%	104%	106%
Class E					
<b>Overall</b>	-0.27%	-0.58%	-0.62%	104%	103%
Class D	-0.38%	-0.83%	-0.75%	104%	106%
Class F	-0.04%	-0.31%	-0.18%	104%	105%

Low delay B Main10					
Over VTM-3.0					
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	-0.26%	-0.76%	-0.49%	106%	104%
Class C	-0.50%	-0.49%	-0.65%	106%	107%
Class E	-0.36%	-0.10%	-0.35%	105%	105%
<b>Overall</b>	-0.36%	-0.50%	-0.51%	106%	105%
Class D	-0.52%	-0.80%	-0.31%	106%	109%
Class F	0.03%	-0.36%	-0.34%	105%	105%



# Conclusions

- Uni-prediction-based OBMC and multiple methods are proposed to reduce the complexity of OBMC
- The worst case memory bandwidth and interpolation operations in a 16x16 region with OBMC applied is less than a 8x4 bi-prediction block
- BD-rates and runtimes (anchor: VTM-3.0)
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  - LB: **-0.36%** (Y) -0.50% (U) -0.51% (V), EncT: 106%, DecT: 105%