Description of video coding technology proposal by JVC

JCTVC-A108

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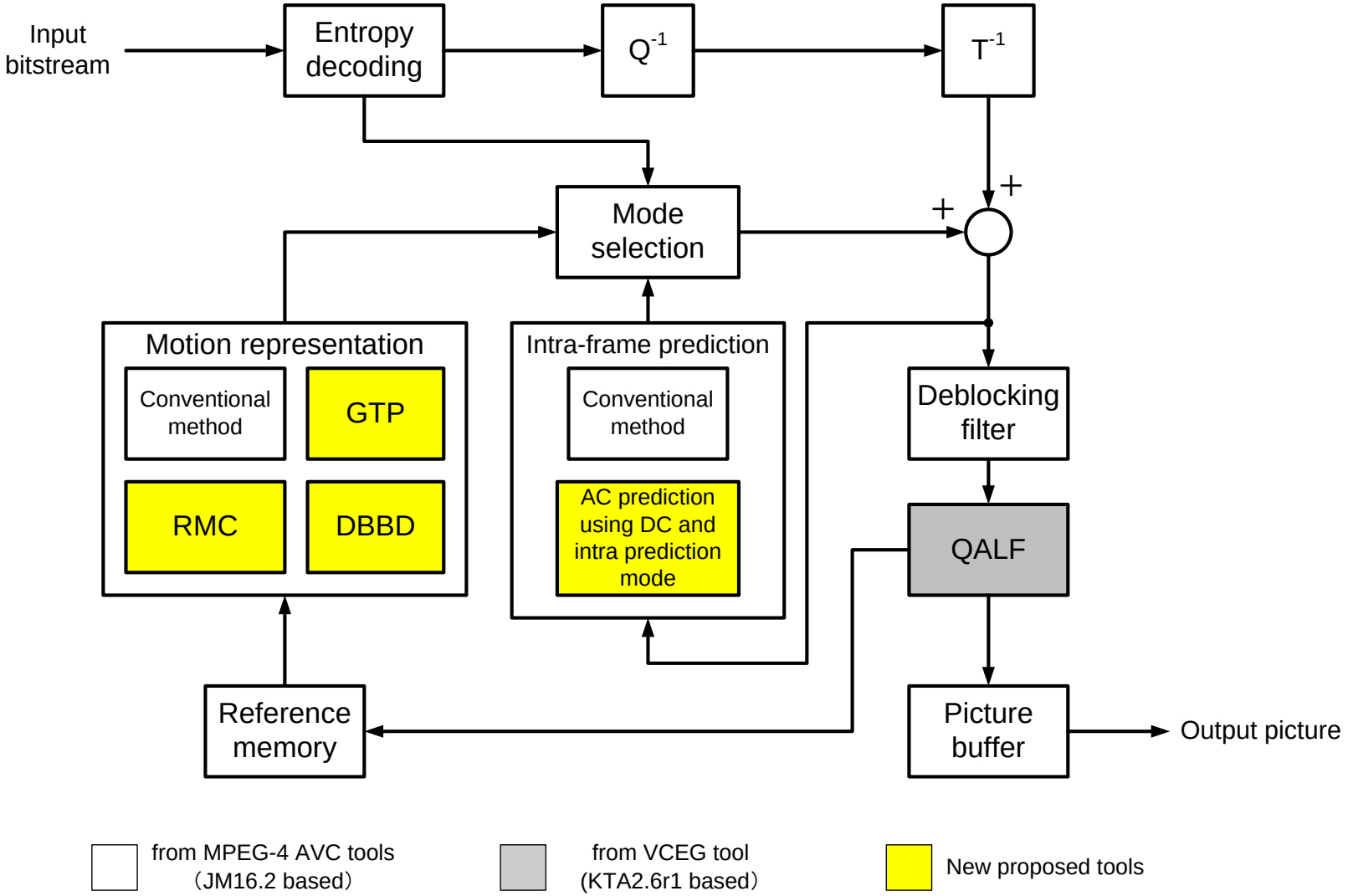
Outline

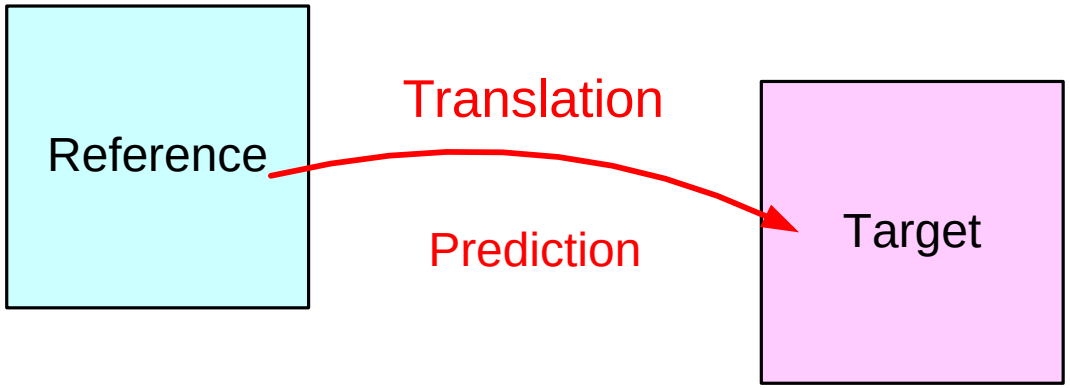
- Overview of Proposed Codec
- Proposed Tools
  - Motion Representation
    - GTP: Geometric Transform Prediction
    - DBBD: Decoder-side Block Boundary Decision Motion Compensation
    - RMC: Refinement Motion Compensation using Decoder-side Motion Estimation
  - Intra-frame Prediction
    - AC Prediction using DC and intra prediction mode
- Experimental Results
- Conclusion

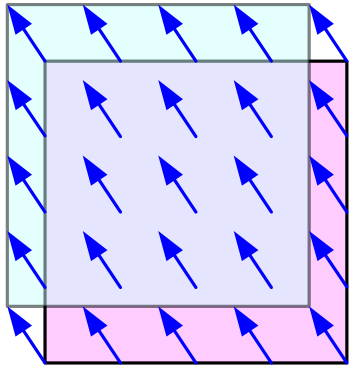
Overview of Proposed Codec



GTP: Geometric Transform Prediction
DBBD: Decoder-side Block Boundary Decision Motion Compensation
RMC: Refinement Motion Compensation using Decoder-side Motion Estimation

Conventional Inter Prediction

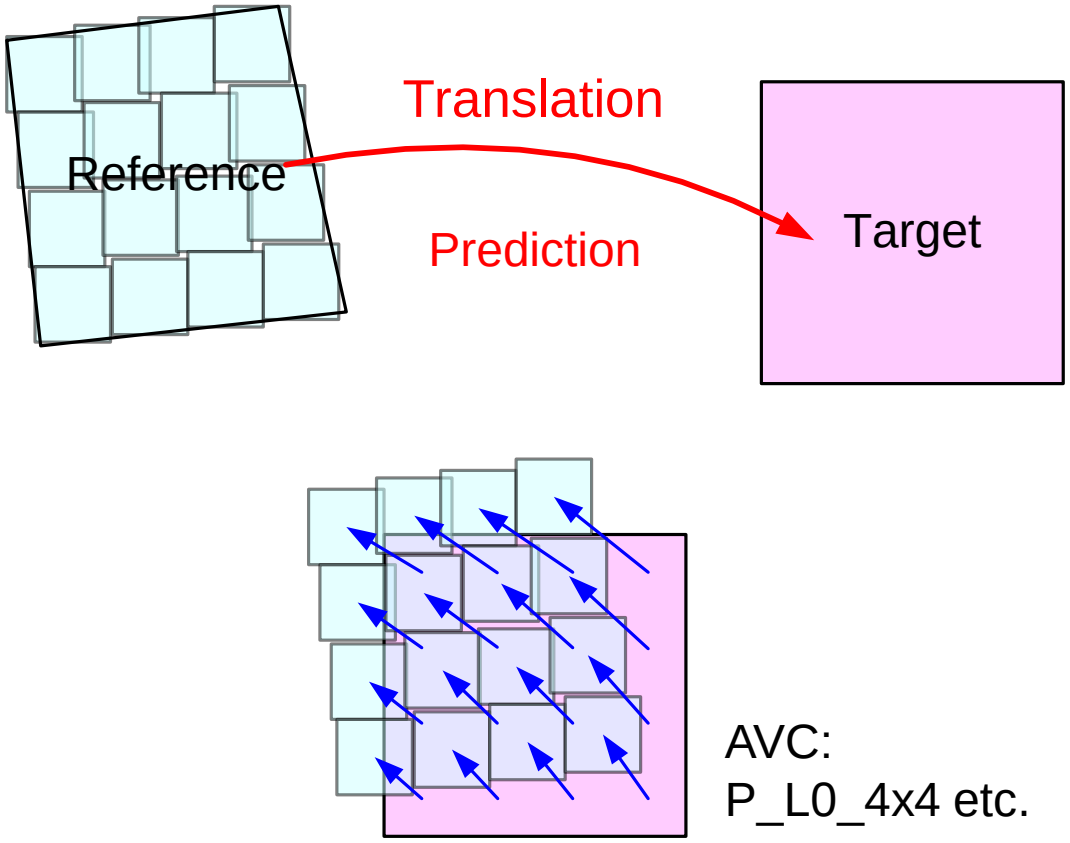




AVC:
P_L0_16x16 etc.

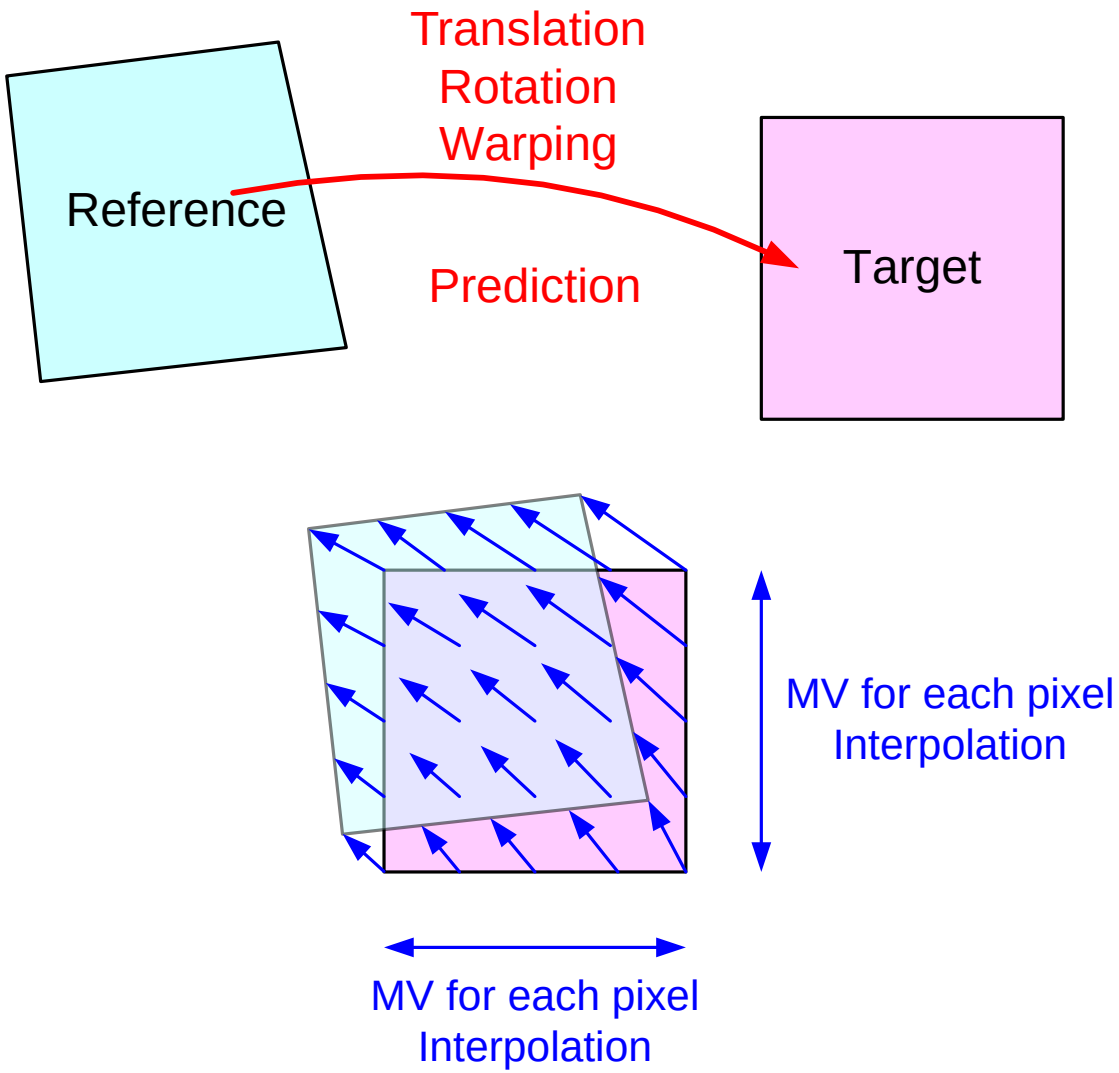
1 MV is coded/decoded.

Conventional Inter Prediction



Each MV for 16 sub-macroblocks partitions is coded/decoded.

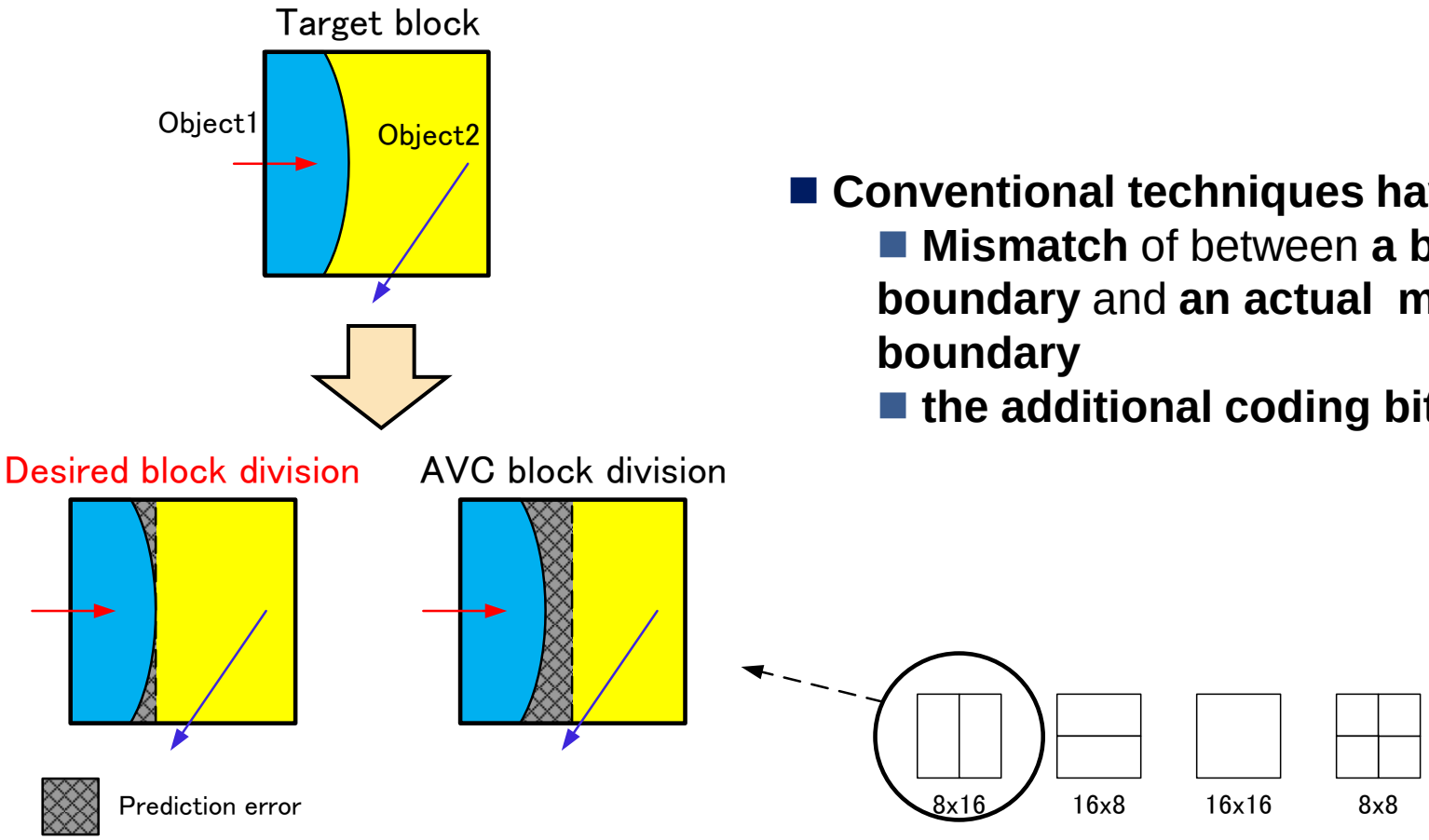
GTP: Geometric Transform Prediction



- Only each MV for 4 representative pixels is coded/decoded.
- The other MVs are interpolated in horizontal and vertical direction.

Motivation of DBBD

(Decoder-side Block Boundary Decision Motion Compensation)



- **Conventional techniques have,**
  - **Mismatch** of between **a block boundary** and **an actual motion boundary**
  - **the additional coding bits**

It is desirable to support **various block patterns without additional coding bits** for MC.

Algorithm of DBBD

(Decoder-side Block Boundary Decision Motion Compensation)

Advantage

MC with **various block patterns without additional coding bits**

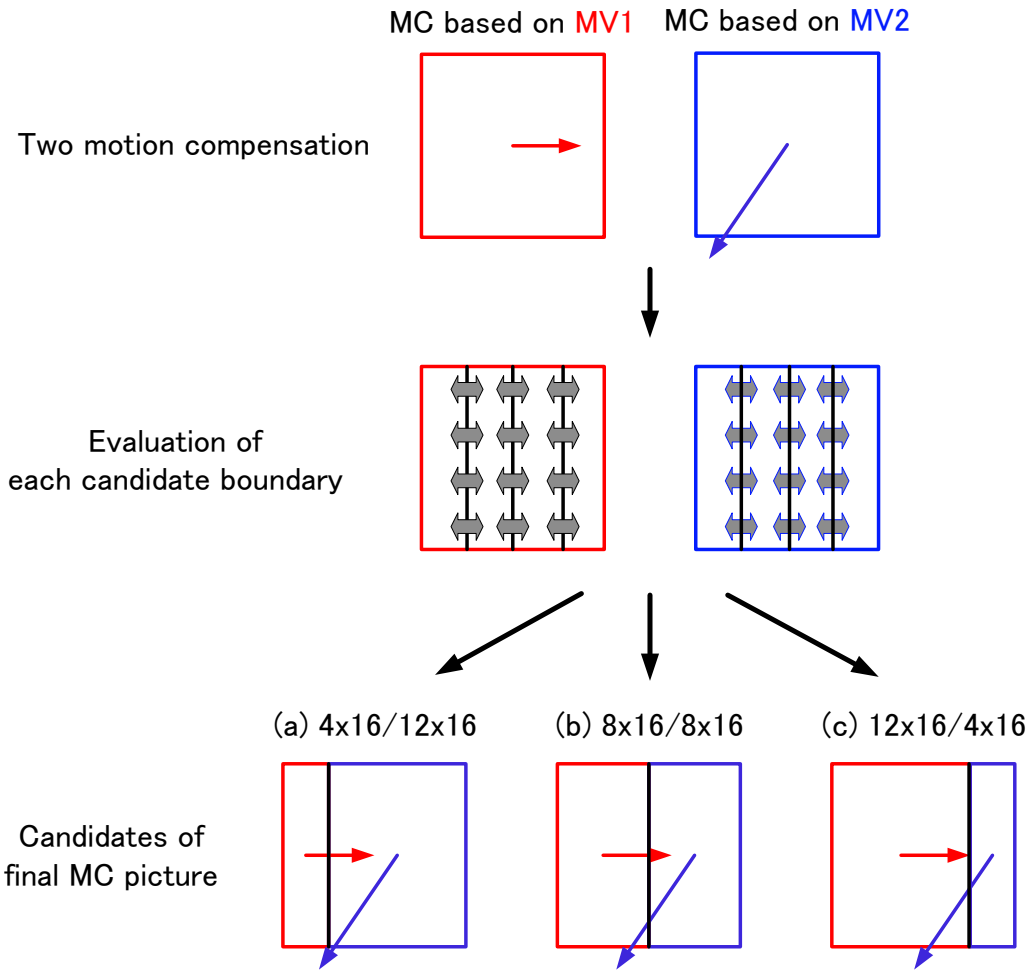
- the block boundary is decided on the decoder side

Decoding process

1. Generate two predicted pictures based on two MVs by the size of macroblock.

2. Decide a real boundary to evaluate each candidate boundary on two predicted pictures.

3. Get a final MC picture using the real boundary.

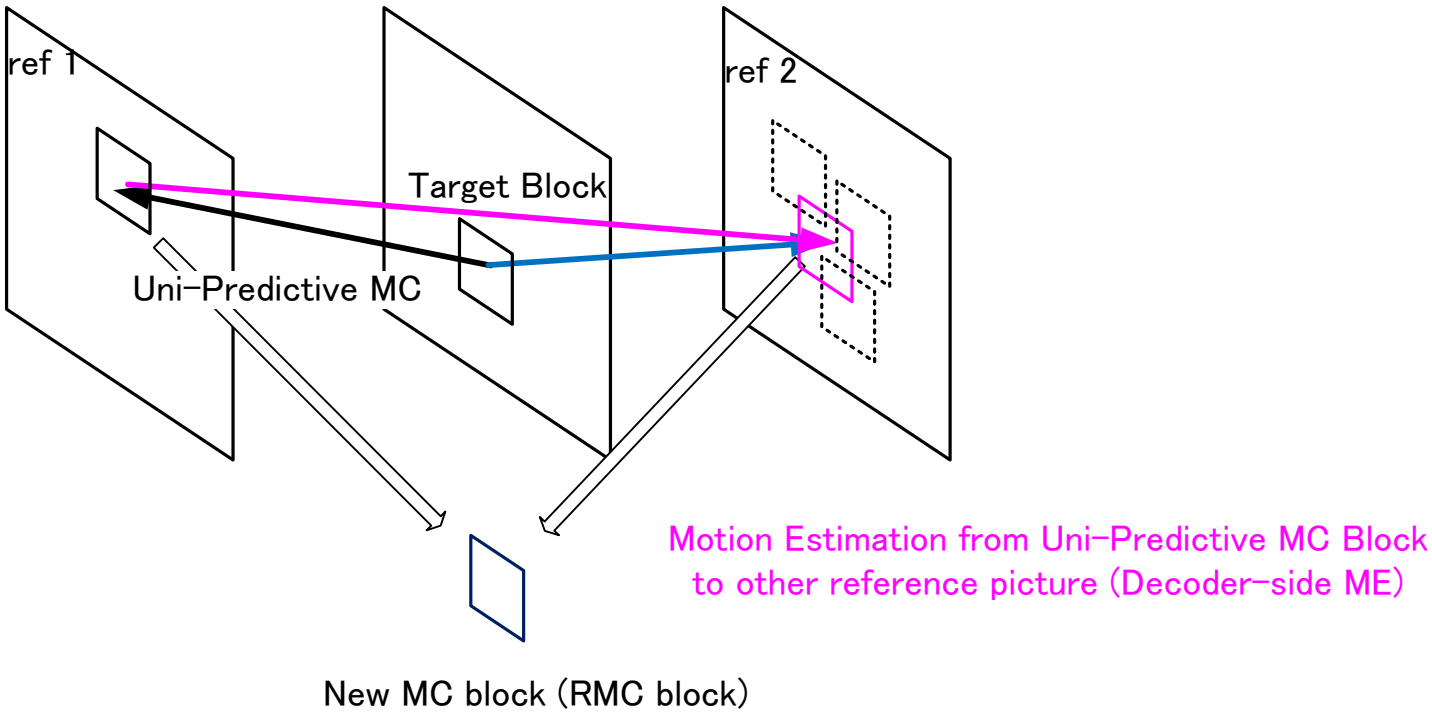


Concept of RMC

(Refinement Motion Compensation using Decoder-side Motion Estimation)

Coding distortion of reference influences the MC efficiency

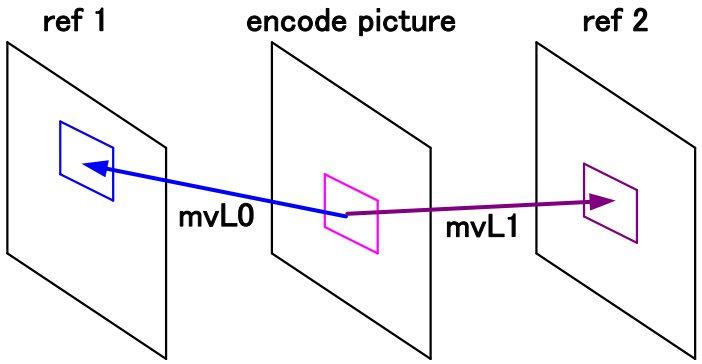
Necessity of smooth distortion and restoration of texture for reference picture



Uni-predictive MC block leads other reference picture with Decoder-side ME approach

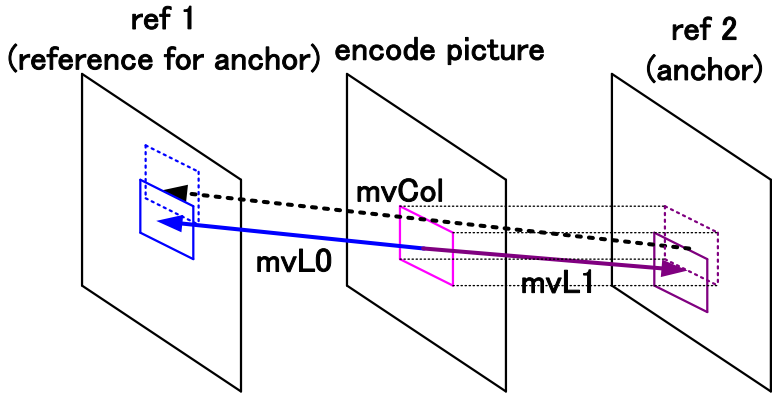
Conventional vs. RMC

Conventional MC



Bi-predictive

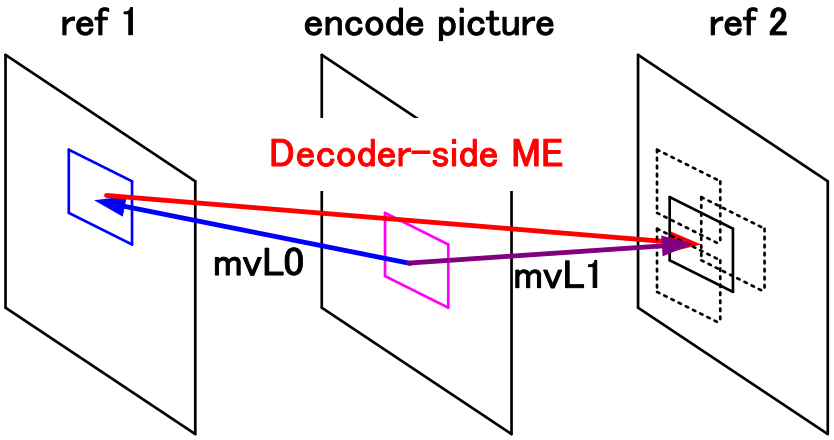
- send mvL0 and mvL1
- no influence for temporal correlation



Temporal Direct

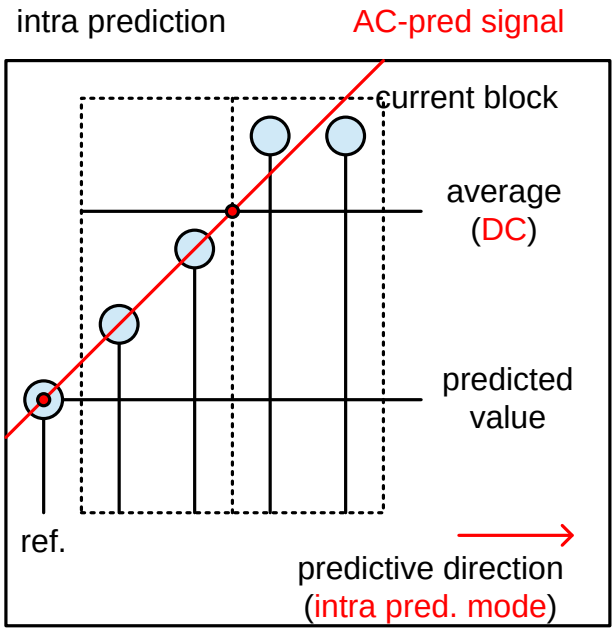
- send no vector
- effective for “high spatial and temporal correlation”

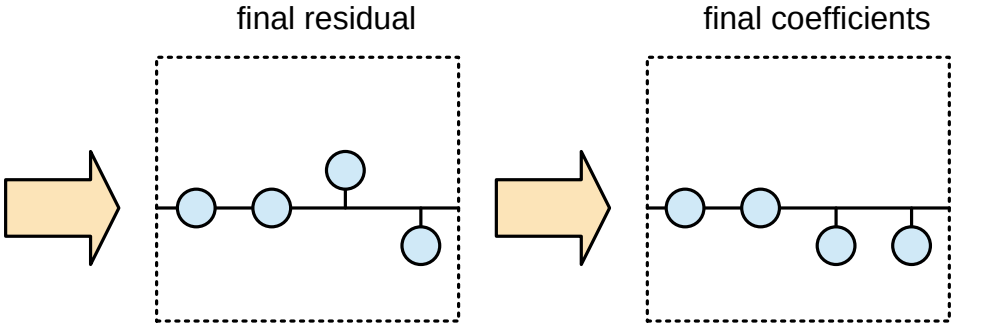
RMC technique



- **send mvL0 only**
- **effective for “small spatial or temporal correlation”**

Concept of
AC prediction using DC and intra prediction mode

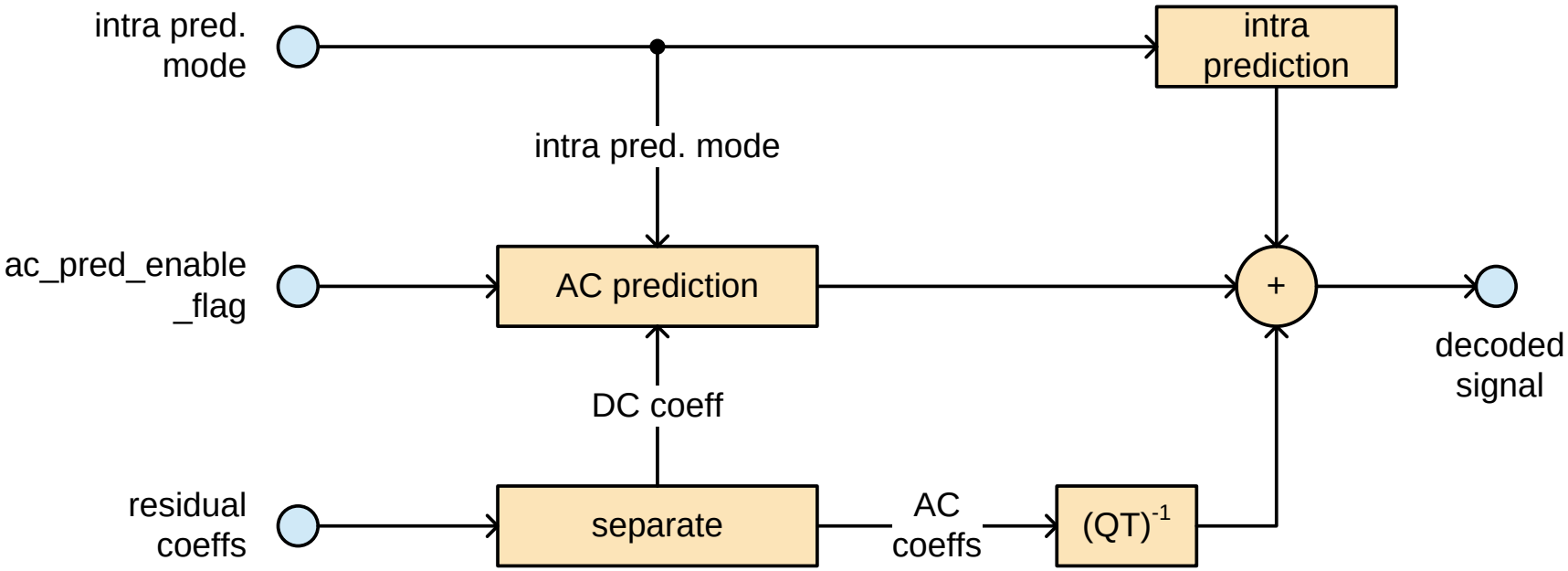




Final residual is the difference between AVC residual and AC-pred. signal.

- AVC-based intra pred. is performed at first.
- AC-pred. signal is obtained from DC and intra pred. mode. It is not coded.
- AC-pred. signal passes through two points:
  - average(DC) of AVC residual at the center in the current block.
  - Zero at an reference position.
- AC-pred. signal slopes along intra pred. mode.
- A flag which indicates whether the AC pred. is applied is sent by each block.

Decoder block diagram of AC prediction using DC and intra prediction mode



- if *ac_pred_enable_flag* is true
  - AC-pred. signal is created from DC coeff. and intra pred. mode.
  - Decoded signal is the sum of intra pred. signal, AC-pred. signal and AC residual.
- otherwise
  - Decoded signal is obtained by the AVC procedure.

Experimental Results

- Bitrate reduction
  - average 9.27% and up to 24.09% for C1 compared with alpha anchor.
  - average 3.18% and up to 22.71% for C2 compared with beta anchor.
  - average 26.49% and up to 53.66% for C2 compared with gamma anchor.

Encoder common settings	
Parameter Name	**Value**
HierarchicalCoding	3
NumberReferenceFrames	4
SymbolMode	1
Transform8x8Mode	1
ScalingMatrixPresentFlag	0
RDOptimization	1
UseRDOQuant	1
RDOQ_Fast	1
RDOQ_QP_Num	1
WeightedPrediction	1
WeightedBiprediction	1
SearchMode	3
SearchRange	128

Individual Settings		
Parameter Name	**C1 Value**	**C2 Value**
EnableOpenGOP	1	0
LowDelay	0	1
IntraPeriod	24-64	0
ReferenceReorder	1	2
MemoryManagement	1	2
PReplaceBSlice	0	1
NumberBFrames	7	3

Conclusion

- Proposed Techniques
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  - Intra-frame Prediction
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- JM16.2-based.
- Bitrate Reduction
  - average 9.27% for C1 compared with alpha anchor.
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JVC KENWOOD
HOLDINGS


ITU
ISO
IEC
ISO/IEC JTC1/SC29 WG11
MPEG
MOVING PICTURE EXPERTS GROUP