

JCTVC-O0085

# **AHG5/AHG8: Improvement of MV-HEVC-based RGB coding for screen contents**

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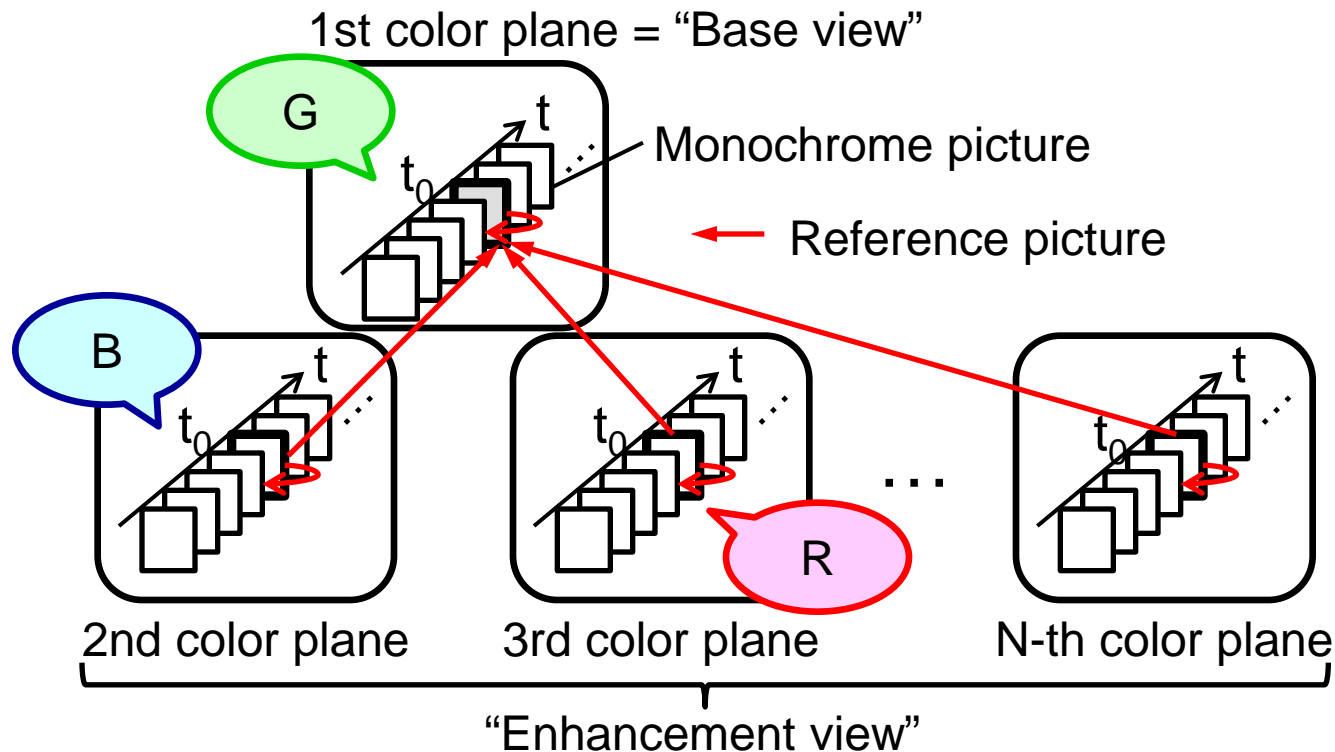
Mitsubishi Electric Corporation

# Overall summary

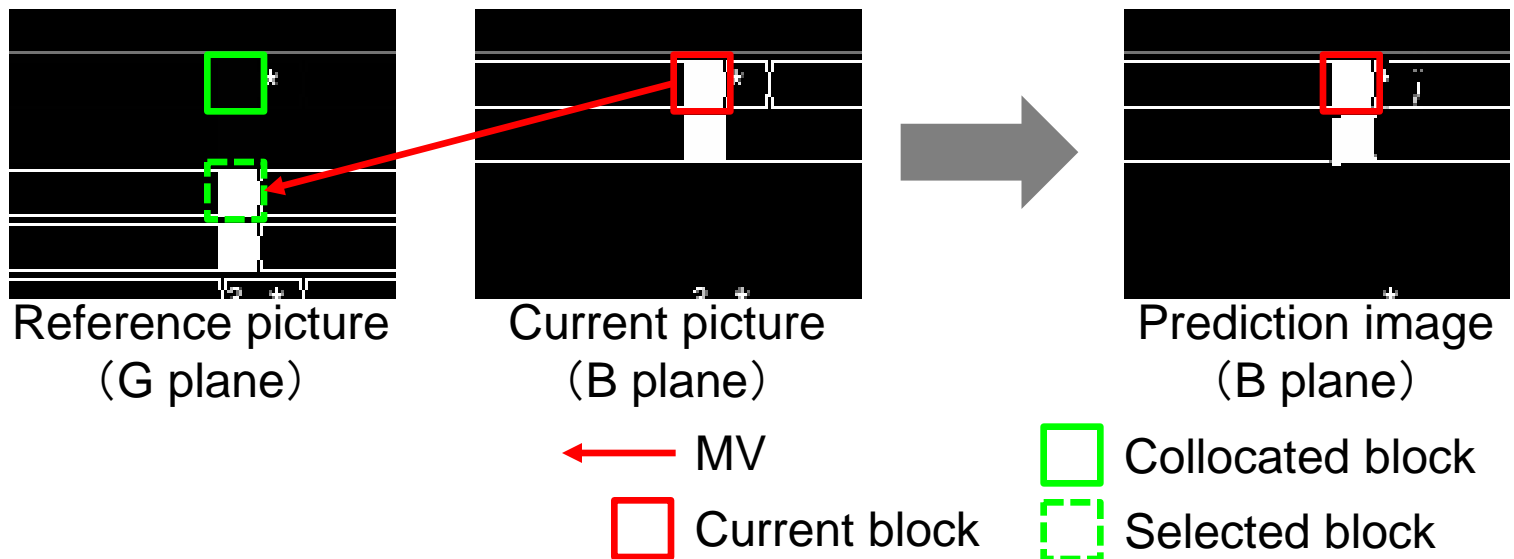
- Propose a modified scheme of MV-HEVC-based RGB coding
  - MV-HEVC-based RGB coding
    - Luma 4:0:0 coding for each color plane
    - G plane is used as one of reference pictures of inter prediction for corresponding R and B plane coding
  - Proposed modification
    - Introduce intra block copying adopted in RExt at last meeting
    - According to analysis, the restriction of motion vector to zero for inter-color prediction is applied
- The proposed scheme achieves 20%, 16% and 14% average BD-rate gain relative to MV-HEVC for AI, RA and LDB configurations
- Recommend studying the proposed scheme in AHG

# Coding architecture

- We proposed a new architecture for color video coding by using MV-HEVC in Vienna meeting
  - Apply each color plane into a monochrome view source
  - 1st color plane is used as one of reference pictures of inter prediction for the other planes
    - In the case of RGB coding, G plane is applied as 1st color plane

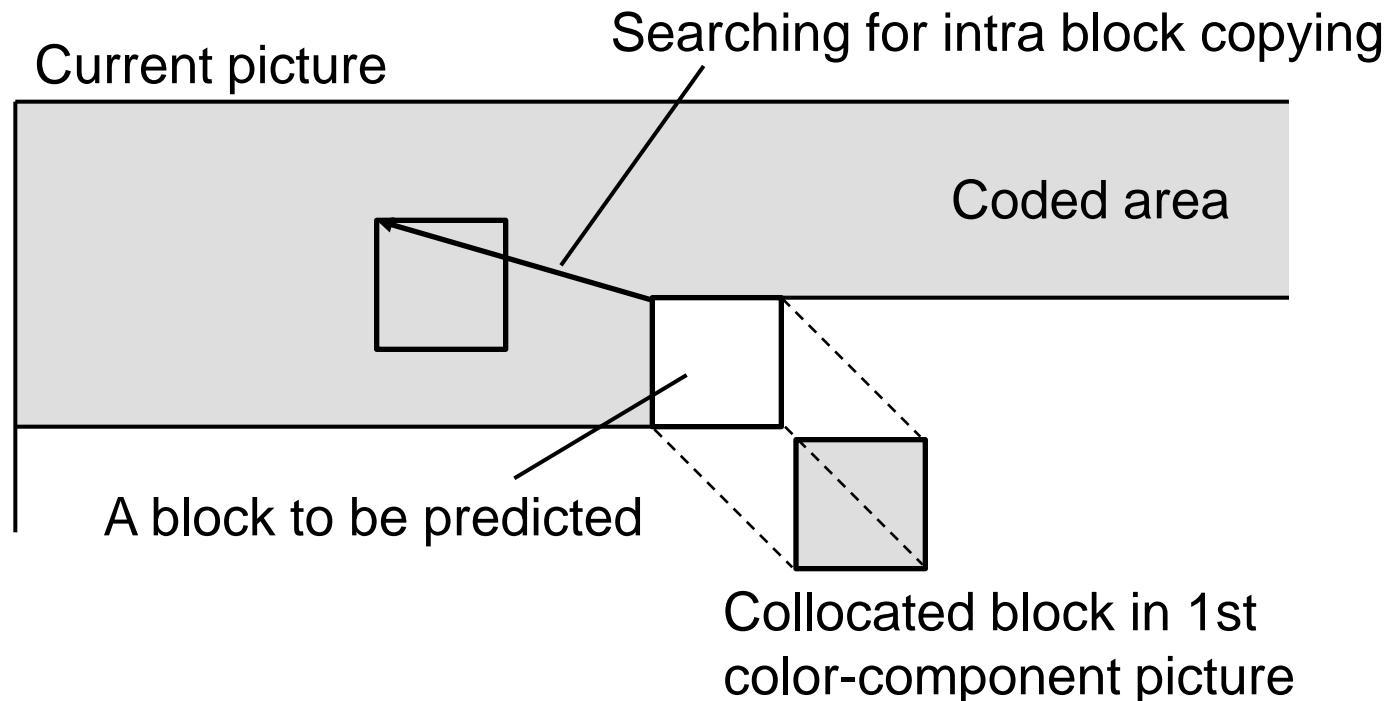


- According to analysis of simulation results at low QP for screen contents
  - Zero-MVs are selected at over 85% of prediction blocks selecting inter-color prediction
- In case of the blocks selecting non-zero vectors
  - Some blocks look for a block similar to the current block in surrounding area of the reference picture
  - Such searching can be also realized by intra block copying



# Proposed modifications

- Introduce intra block copying adopted in RExt4 instead of motion searching for inter-color prediction
  - Apply intra block copying for each color component
  - Restrict inter-color prediction vectors to zero



- Test under AHG8 recommendation configurations
  - Test sequences: RGB4:4:4 screen contents
  - Anchor: HTM8.0 (The previous proposed scheme)
  - PSNR: 
$$PSNR_{GBR^m} = \frac{PSNR_G + PSNR_B + PSNR_R}{3}$$
  - QP: 37, 32, 27, 22, 17, 12, 7, 2
- Achieve 18.0%-20.4%, 14.9%-17.2% and 11.4%-14.7% average BD-rate gains for AI, RA and LDB configurations

Configurations	QP37to22 (Main-tier)	QP32to17 (High-tier)	QP27to12 (Super- High-tier)	QP22to07	QP17to02
All Intra	-18.0%	-19.3%	-19.9%	-20.4%	-20.4%
Random Access	-14.9%	-16.2%	-16.7%	-17.0%	-17.2%
Low Delay B	-11.4%	-13.2%	-14.2%	-14.6%	-14.7%

- Test under AHG8 recommendation configurations
  - Anchor: RExt4.1 disabling RExt-specific tools
  - Case 1: HTM8.0 (The previous proposed scheme)
  - Case 2: The proposed modified scheme
- The proposed modification achieves up to 43.3%, 33.2% and 28.5% average BD-rate gains for AI, RA and LDB configurations

Case	Configurations	QP37to22 (Main-tier)	QP32to17 (High-tier)	QP27to12 (Super-High-tier)	QP22to07	QP17to02
Case 1	All Intra	-31.4%	-29.1%	-26.6%	-23.0%	-18.6%
	Random Access	-22.8%	-21.7%	-20.6%	-18.6%	-16.0%
	Low Delay B	-18.5%	-18.6%	-18.3%	-17.1%	-14.6%
Case 2	<b>All Intra</b>	<b>-43.3%</b>	<b>-42.4%</b>	<b>-41.0%</b>	<b>-38.4%</b>	<b>-35.0%</b>
	<b>Random Access</b>	<b>-32.9%</b>	<b>-33.2%</b>	<b>-32.8%</b>	<b>-31.6%</b>	<b>-29.7%</b>
	<b>Low Delay B</b>	<b>-26.5%</b>	<b>-28.0%</b>	<b>-28.5%</b>	<b>-27.9%</b>	<b>-25.9%</b>

- Propose a modification of RGB coding scheme based on MV-HEVC
  - Introduce intra block copying instead of motion searching for inter-color prediction
- The proposed scheme achieves:
  - 20%, 16% and 14% average BD-rate gain relative to HTM8.0 for AI, RA and LDB configurations
  - 40%, 32% and 27% average BD-rate gain relative to RExt4.1 w/o RExt-specific tools for AI, RA and LDB configurations
- Recommend studying the proposed scheme in AHG



# Supplemental slide(s)

# vs HEVC RExt (optional)

- Test under AHG8 recommendation configurations
  - Test sequences: RGB4:4:4 screen contents
  - Anchor: RExt4.1 **with intra block copying**
  - PSNR: 
$$PSNR_{GBR^m} = \frac{PSNR_G + PSNR_B + PSNR_R}{3}$$
  - QP: 37, 32, 27, 22, 17, 12, 7, 2
- Achieve 16.7%-24.3%, 15.0%-17.8% and 13.9%-17.1% average BD-rate gains for AI, RA and LDB configurations

Configurations	QP37to22 (Main-tier)	QP32to17 (High-tier)	QP27to12 (Super- High-tier)	QP22to07	QP17to02
All Intra	-24.3%	-23.7%	-22.6%	-20.2%	-16.7%
Random Access	-16.8%	-17.6%	-17.8%	-16.9%	-15.0%
Low Delay B	-13.9%	-15.8%	-17.1%	-16.7%	-14.3%