



Non-SCE5 : Simplified inter-layer MV scaling and sample position mapping

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Overall Summary

- In SHM, the scaling operations (containing division operations) of inter-layer MV prediction and sample position mapping are needed for each PU even if the spatial resolution ratio is fixed for the entire sequence.
- Propose to reduce the scaling operations as follows.
 - The scaling factors for inter-layer MV scaling and sample position mapping are first derived in the beginning of the slice coding
 - Reuse the scaling factors for all inter-layer MV scaling derivation and sample position mapping derivation
 - **No division is required during the rest of the slice coding**
 - Support spatial scalability with arbitrary ratio
 - **Unification with HEVC MV scaling**
- No BD-rate change, decoding time reduced by 1-2%

Inter-layer MV scaling and position mapping in SHM-1.1

- Inter-layer MV scaling in SHM-1.1:
 - $mvEL_X = (mvBL_X \times picEL_W + (picBL_W/2-1) \times sign(mvBL_X)) / picBL_W$
 - $mvEL_Y = (mvBL_Y \times picEL_H + (picBL_H/2-1) \times sign(mvBL_Y)) / picBL_H$
- Inter-layer sample position mapping in SHM-1.1:
 - $xBL = (xEL \times picBL_W + picEL_W / 2) / picEL_W$
 - $yBL = (yEL \times picBL_H + picEL_H / 2) / picEL_H$
- The division has to be performed for every inter-layer MV scaling and inter-layer sample position mapping, although the picture resolution ratio of the EL to the BL is a fixed value.

Proposed Methods

1. Calculate the scaling factors for inter-layer MV scaling factor and sample position mapping in the beginning of the slice coding
2. Reuse these values for all inter-layer MV scaling derivation and sample position mapping derivation
 - No division is required in the block-level process

- Inter-layer MV scaling:

Slice

$$- \text{ILScalingFactor}_x = \text{Clip}(-4096, 4095, ((\text{picEL}_W \ll 8) + (\text{picBL}_W \gg 1)) / \text{picBL}_W)$$

Block

$$- \text{mvEL}_X = \text{Clip}(-32768, 32767, \text{sign}(\text{ILScalingFactor}_x \times \text{mvBL}_X) \times ((\text{abs}(\text{ILScalingFactor}_x \times \text{mvBL}_X) + 127)) \gg 8)$$

- The dynamic range of the ILScalingFactor_x is the same as that of the MV scaling factors in HEVC
- The HEVC MV scaling module can be reused for inter-layer MV scaling

Proposed Methods

- Inter-layer sample position mapping:

Slice →
$$- \text{ILPosScalingFactor}_x = \frac{((\text{picBL}_W \ll 14) + (\text{picEL}_W \gg 1))}{\text{picEL}_W}$$

Block →
$$- x_{BL} = (x_{EL} \times \text{ILPosScalingFactor}_x + (1 \ll 13)) \gg 14$$

Simulation Results

- Anchor: SHM-1.1
- No coding efficiency loss
- The decoding time is reduced by 1-2%.
- Thank LG for cross-verification (JCTVC-M0284)

	RA-2x	RA-1.5x	RA-SNR	LP-2x	LP-1.5x	LP-SNR	Enc. Time	Dec. Time
IntraBL mode	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%	98%
RefIdx mode	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%	99%

Conclusions

- In this contribution, the modified inter-layer MV scaling factor and sample position mapping are proposed.
 1. The scaling factors for inter-layer MV scaling and sample position mapping are first derived in the beginning of the slice coding
 2. Reuse the scaling factors for all inter-layer MV scaling derivation and sample position mapping derivation
 - **No division is required in the block-level process**
 - Support spatial scalability with arbitrary ratio
 - The HEVC MV scaling module can be reused for inter-layer MV scaling
- No coding efficiency loss
- The decoding time is reduced by 1-2%.