<10th JCT-VC meeting @Stockholm, July 2012>

⟨JCTVC-J0201⟩
QM Bypass for Transform Skip Mode

Hui Yong Kim

hykim5@etri.re.kr

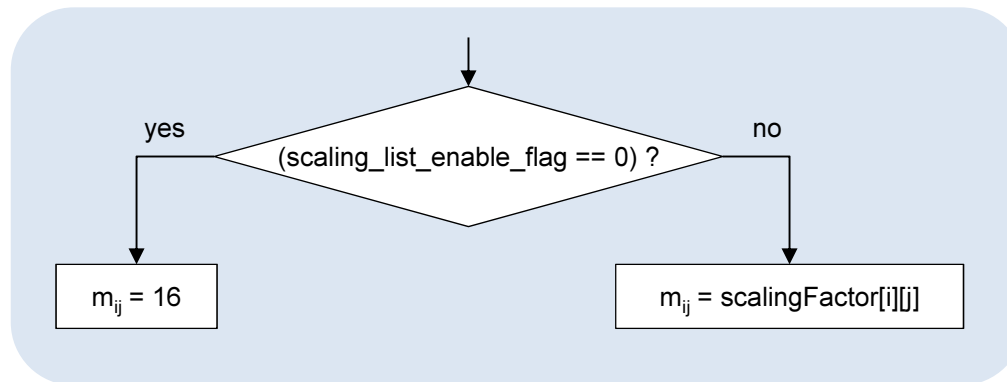*Realistic Media Research Team, ETRI*
Media Lab., Kyung Hee Univ.

2012-07-09

Issue

❑ HM 7 Transform Skipping

❖ When non-flat scaling matrix is used for a slice, transform skipped residual blocks may undergo some position-dependent scaling, which is undesirable for spatial residue signal.

```
                              ↓
        yes          (scaling_list_enable_flag == 0) ?          no
    ┌─────────────┐                                        ┌──────────────────────────┐
    │  m_ij = 16  │                                        │  m_ij = scalingFactor[i][j]  │
    └─────────────┘                                        └──────────────────────────┘
```

< 8.6.3 Scaling process for transform coefficients >

* scalingFactor[i][j] = ScalingFactor[SizeID][RefMatrixID][trafoType][i*nW+j]
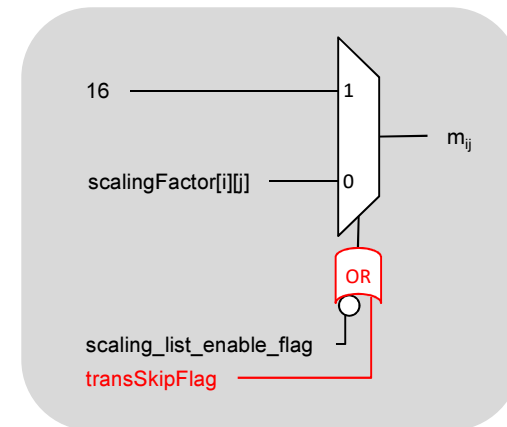
Proposal

❑ **QM bypass for Transform Skipped Blocks**

❖ Always use constant (i.e., non-position-dependent) scaling factor for transform skipped residue regardless of the value of scaling_list_enable_flag

❖ Benefit:

➢ Prevents undesirable position-dependent scaling of spatial residue

➢ Enables QM optimization only for frequency-domain residue, without being hampered by spatial-domain residue

❖ Required change:

➢ Adds just one condition in scaling factor (m_{ij}) derivation process (8.6.3)

➢ Introduce negligible increase of implementation cost
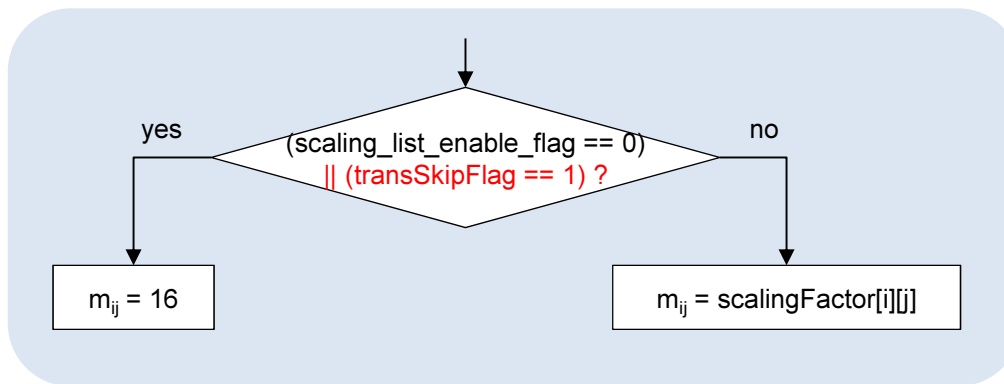
< constant scaling factor for transform skipped residue>

< equivalent logic diagram >

ETRI IT R&D Global Leader

Results

❑ **Experimental Results**

   ❖ Anchor: TSkip-enabled HM7 + Default QM

   ❖ Proposed: QM bypass for TSkip

      ➢ AI: -2.6/-2.8% for Main/HE10 (class F)

      ➢ RA: -3.6/-3.6% for Main/HE10 (class F)

      ➢ LD: -2.1/-1.9% for Main/HE10 (class F)

	All Intra Main			All Intra HE10		
	Y	U	V	Y	U	V
Class A	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%
Class B	-0.1%	0.6%	0.6%	-0.1%	0.6%	0.6%
Class C	-0.5%	3.0%	3.2%	-0.3%	3.2%	3.2%
Class D	-0.5%	4.0%	3.8%	-0.3%	3.9%	3.8%
Class E	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
Overall	-0.2%	1.5%	1.5%	-0.1%	1.6%	1.6%
	-0.2%	1.5%	1.5%	-0.1%	1.5%	1.5%
Class F	-2.8%	1.0%	-0.7%	-2.6%	2.2%	0.6%
Enc Time[%]		108%			107%	
Dec Time[%]		100%			100%	

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	0.1%	-0.4%	-0.3%	0.0%	-0.1%	-0.4%
Class B	0.2%	0.6%	0.4%	0.1%	0.4%	0.3%
Class C	-0.7%	0.5%	0.6%	-0.7%	0.7%	0.9%
Class D	-0.4%	1.6%	1.1%	-0.5%	1.5%	1.2%
Class E						
Overall	-0.2%	0.6%	0.4%	-0.2%	0.6%	0.5%
	-0.2%	0.5%	0.4%	-0.2%	0.6%	0.4%
Class F	-3.6%	-2.6%	-3.9%	-3.6%	-1.3%	-2.6%
Enc Time[%]		97%			99%	
Dec Time[%]		100%			100%	

	Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	0.0%	0.3%	0.3%	0.0%	0.1%	0.0%
Class C	0.0%	0.2%	0.2%	-0.1%	0.1%	0.1%
Class D	0.0%	0.6%	0.0%	0.0%	0.5%	0.4%
Class E	0.0%	0.8%	0.2%	0.0%	-0.4%	0.5%
Overall	0.0%	0.4%	0.2%	0.0%	0.1%	0.2%
	0.0%	0.4%	0.2%	0.0%	0.1%	0.1%
Class F	-2.1%	-1.2%	-2.2%	-1.9%	0.1%	-1.9%
Enc Time[%]		97%			99%	
Dec Time[%]		100%			100%	

Conclusion

❑ **Conclusion**

❖ Propose to always use constant scaling factor for transform skipped residue

➢ Corrects the position-dependent scaling issues for spatial residue

➢ Shows 1.9~3.6% luma BDR gain for class F sequences (with default QM)

❖ Recommend adopting the proposed change into the DIS version of HM.

Thank You Very Much !

www.etri.re.kr