‹JCTVC-H0237›
Non-CE4 Subtest 2: Improvement on quantization matrix signaling

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Summary

❑ **Issues in QM signaling in the current HM**

　❖　unnecessary signaling of QMs for unused TU sizes.

　❖　unnecessary signaling of default QMs when both the default and proprietary matrices are used for a slice or a picture (depending on TU sizes).

❑ **Proposal**

1.　Restrict quantization matrix signaling by min/max TU sizes.

2.　Send a flag that indicates whether to use default matrix or proprietary matrix for each SizeID and MatrixID.

Introduction

❑ **Quantization matrix representation in the current HM**

❖ Using simplified AVC method in JCTVC-G434.

scaling_list_param( ) {	Descriptor
use_default_scaling_list_flag	u(1)
if(!use_default_scaling_list_flag)	
for(SizeID = 0; SizeID < 4; SizeID++)	
for(MatrixID = 0; MatrixID < (SizeID = = 3) ? 2:6; MatrixID++) {	
pred_mode_flag	u(1)
if(!pred_mode_flag)	
pred_matrix_id_delta	ue(v)
else	
scaling_list(QuantMatrix[SizeID][MatrixID], (1 << (4 + (SizeID << 1))))	
}	
}	

scaling_list(ScalingList, coefNum) {	Descriptor
nextcoef = 8	
for(i=0; i<coefNum, i++) {	
delta_coef	se(v)
nextcoef = (nextcoef + delta_coef + 256) % 256	
ScalingList[i] = nextcoef	
}	
}	

❖ Quantization matrix representation at APS level in JCTVC-G1016.

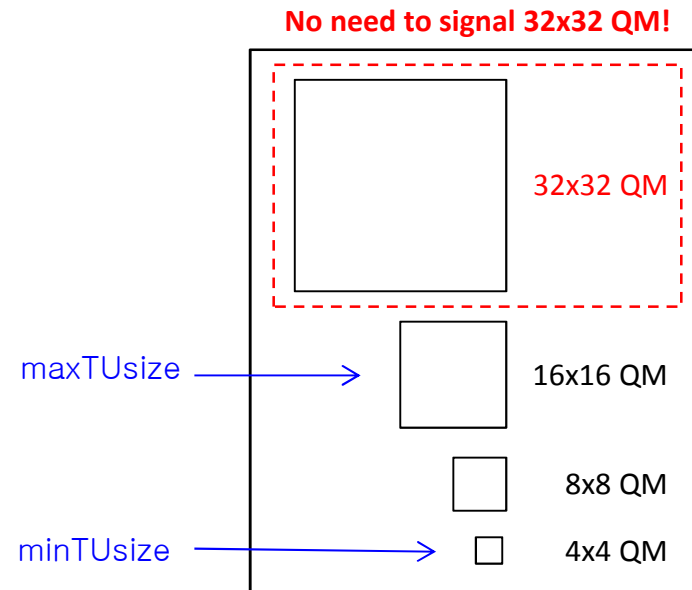| aps_rbsp( ) {	Descriptor
aps_id	ue(v)
aps_scaling_list_data_present_flag	u(1)
…	
if(aps_scaling_list_data_present_flag)	
scaling_list_param( )	
…	
}	

Issue 1

1. **HM5: QM for all TU size are signaled regardless of min/max TU size restriction.**

    ❖ For example, even though Log2MaxTrafoSize is equal to 4 (max. TU size = 16x16), quantization matrices for 32x32 TU have to be signaled.
    → *Unnecessary signaling of large quantization matrix!*

Value of SizeID	Size of quantization matrix
0	4x4
1	8x8
2	16x16
3	32x32

QMs to be signaled for all TU sizes.

No need to signal 32x32 QM!

32x32 QM

maxTUsize → 16x16 QM

8x8 QM

minTUsize → 4x4 QM

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Proposal 1

1. **Restrict quantization matrix signaling by min/max TU sizes.**
   - ❖ For example, when Log2MinTrafoSize is equal to 2 (4x4 TU) and Log2MaxTrafoSize is equal to 3 (8x8 TU), quantization matrices for 16x16 and 32x32 TUs are not signaled.
   - ❖ SizeID from Log2MinTrafoSize-2 to Log2MaxTrafoSize-1.

HM5

scaling_list_param( ) {	Descriptor
use_default_scaling_list_flag	u(1)
if(!use_default_scaling_list_flag)	
for(SizeID = 0; SizeID < 4; SizeID++)	
for(MatrixID = 0; MatrixID < (SizeID = = 3) ? 2:6; MatrixID++) {	
…	
}	
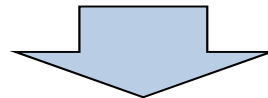
Proposal 1

scaling_list_param( ) {	Descriptor
use_default_scaling_list_flag	u(1)
if(!use_default_scaling_list_flag)	
for(SizeID = Log2MinTrafoSize-2; SizeID < Log2MaxTrafoSize-1; SizeID++)	
for(MatrixID = 0; MatrixID < (SizeID = = 3) ? 2:6; MatrixID++) {	
…	
}	

Issue 2

2. **HM5: Mixed use of default and proprietary QMs depending on TU sizes results in unnecessary signaling of default QM.**

   ❖ **use_default_scaling_list_flag** equal to 1 specifies that the value of quantization matrices is not present and the values of all matrices are set equal to the default matrix.

   ➢ One **use_default_scaling_list_flag** is signaled per APS.

   ❖ Same problem occurred in the cases of intra/inter and Y/U/V

scaling_list_param( ) {
use_default_scaling_list_flag
if(!use_default_scaling_list_flag)
for(SizeID = 0; SizeID < 4; SizeID++)
......
}

Slice	Quantization matrix type		Value of use_default_scaling_list_flag	Analysis
	16x16 TU	32x32 TU		
Slice #1	Default	Default	Set equal to 1	No problem
Slice #2	Proprietary	Proprietary	Set equal to 0	No problem
Slice #3	Default	Proprietary	Set equal to 0	Default matrix for 16x16 TU has to be signaled in APS. → Unnecessary signaling of 16x16 default matrix

Proposal 2

2. Send a flag that indicates whether to use default matrix or proprietary matrix for each SizeID and MatrixID.

❖ For example, when the encoder wants to use default matrix for 16x16 TU and proprietary matrix for 32x32 TU, sid_mid_use_default_scaling_list_flag is set equal to 0 for 16x16 TU and sid_mid_use_default_scaling_list_flag is set equal to 1 for 32x32 TU.

Proposal 2

scaling_list_param( ) {	Descriptor
use_default_scaling_list_flag	u(1)
if(!use_default_scaling_list_flag)	
for(SizeID = 0; SizeID < 4; SizeID++)	
for(MatrixID = 0; MatrixID < (SizeID = = 3) ? 2:6; MatrixID++) {	
sid_mid_use_default_scaling_list_flag	u(1)
if (!sid_mid_use_default_scaling_list_flag) {	
pred_mode_flag	u(1)
if(!pred_mode_flag)	
pred_matrix_id_delta	ue(v)
else	
scaling_list(QuantMatrix[SizeID][MatrixID], (1 << (4 + (SizeID << 1))))	
}	
}	
}	

Proposal 1 + Proposal 2

❑ **Combination of proposal 1 and proposal 2**

scaling_list_param( ) {	Descriptor
use_default_scaling_list_flag	u(1)
if(!use_default_scaling_list_flag)	
for(SizeID = Log2MinTrafoSize-2; SizeID < Log2MaxTrafoSize-1; SizeID++)	
for(MatrixID = 0; MatrixID < (SizeID = = 3) ? 2:6; MatrixID++) {	
sid_mid_use_default_scaling_list_flag	u(1)
if (!sid_mid_use_default_scaling_list_flag) {	
pred_mode_flag	u(1)
if(!pred_mode_flag)	
pred_matrix_id_delta	ue(v)
else	
scaling_list(QuantMatrix[SizeID][MatrixID], (1 << (4 + (SizeID << 1))))	
}	
}	
}	

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Conclusions

❑ **Proposal**

    1. Restrict quantization matrix signaling by min/max TU sizes.

    2. Send a flag that indicates whether to use default matrix or proprietary matrix for each SizeID and MatrixID.

❑ **Benefits**

    ❖ Avoid unnecessary signaling of QMs for unused TU sizes.

    ❖ Avoid unnecessary signaling of default QMs when both the default and proprietary matrices are used for a slice (depending on TU sizes).

❑ **The proposed changes for syntax and semantics are provided in the document.**

❑ **We suggest the proposals to be included in HM.**

Thank You Very Much !

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