

Fine Granularity QP Change at Slice Level

X. Wang, R. Joshi, G. Van Der Auwera and
M. Karczewicz

Qualcomm, Inc.

Motivation

- CE4, subtest 3
 - RIM (F276) Adaptive reconstruction levels
 - MediaTek (F119) Adaptive quantization offsets
- Adaptive reconstruction levels
 - Send up to 16 offsets per non-intra slice
 - Inter/intra, luma/chroma
 - Offset varies with level
 - Observation: Offset seems to always increase with quantization level

Proposal

- Modification of the ARL idea
 - Sending multiple level offsets may be unnecessary
 - Model the increase in level offsets as QP change

Proposal

- Signal a fine granularity QP change at the slice level.
 - Reconstruction levels on encoder and decoder side are derived using the signaled fine granularity QP value.
 - Up to 4 fine granularity QP changes can be sent
 - Inter/Intra, luma/chroma
- Flags in the slice header to indicate whether fine granularity QP change information is present.

Results (all sequences)

	Random Access HE				Random Access LC			
	Y	U	V	RVM	Y	U	V	RVM
Class A	0.5	-1.3	-1.4		-1.4	-5.2	-5.2	
Class B	-0.8	-1.6	-1.0		-1.3	-3.8	-4.0	
Class C	-1.1	-1.9	-1.8		-1.3	-3.8	-3.8	
Class D	-0.7	-0.7	-0.7		-0.5	-1.9	-1.9	
Class E								
Overall	-0.5	-1.5	-1.2		-1.1	-3.7	-3.7	
Enc Time[%]	102%				108%			
Dec Time[%]	102%				102%			

	Low delay B HE				Low delay B LC			
	Y	U	V	RVM	Y	U	V	RVM
Class A								
Class B	-1.1	-1.5	-2.1	104.8%	-2.2	-4.5	-5.4	104.4%
Class C	-1.4	-2.0	-1.6	104.8%	-2.5	-4.3	-4.3	105.6%
Class D	-0.9	-1.1	-0.8	104.9%	-1.7	-2.8	-2.6	104.4%
Class E	0.0	0.0	0.5	103.6%	-0.5	-1.3	-1.9	102.1%
Overall	-0.9	-1.2	-1.2	104.6%	-1.8	-3.4	-3.8	104.3%
Enc Time[%]	101%				104%			
Dec Time[%]	104%				104%			

Results (excluding Nebuta and BQTerrace)

	Random Access HE				Random Access LC			
	Y	U	V		Y	U	V	
Class A exclud	-0.5	-1.0	-0.5		-0.9	-4.5	-4.7	
Class B exclud	-1.1	-2.2	-1.7		-1.6	-3.8	-3.7	
Class C	-1.1	-1.9	-1.8		-1.3	-3.8	-3.8	
Class D	-0.7	-0.7	-0.7		-0.5	-1.9	-1.9	
Class E								
Overall exclu	-0.9	-1.5	-1.3		-1.1	-3.4	-3.4	
Enc Time[%]	102%				108%			
Dec Time[%]	102%				102%			
	Low delay B HE				Low delay B LC			
	Y	U	V		Y	U	V	
Class A								
Class B exclud	-1.4	-2.1	-2.3	104.6%	-2.7	-4.4	-4.7	104.9%
Class C	-1.4	-2.0	-1.6	104.8%	-2.5	-4.3	-4.3	105.6%
Class D	-0.9	-1.1	-0.8	104.9%	-1.7	-2.8	-2.6	104.4%
Class E	0.0	0.0	0.5	103.6%	-0.5	-1.3	-1.9	102.1%
Overall exclu	-1.0	-1.4	-1.1	104.5%	-1.9	-3.3	-3.5	104.2%
Enc Time[%]	101%				104%			
Dec Time[%]	104%				104%			

BD-rate comparison (All sequences)

configuration	proposal	RIM	MediaTek
RA-HE	-0.5	-0.3	-1.3
RA-LC	-1.1	-1.0	-1.6
LB-HE	-0.9	-0.7	-0.7
LB-LC	-1.8	-1.3	-0.9

BD-rate comparison (excluding Nebuta and BQTerrace)

configuration	proposal	RIM	MediaTek
RA-HE	-0.9	-0.6	-0.9
RA-LC	-1.1	-0.9	-1.1
LB-HE	-1.0	-0.8	-0.6
LB-LC	-1.9	-1.4	-0.9

Conclusions

- The proposed method shows improved performance for all the tested configurations
 - Average BD-rate improvement over 1%
 - Very small added complexity.
 - Increase in RVM measure is observed for LB configurations.
- Fine granularity QP change may be needed in HM 4.0.