JCTVC-C185

Recent Improvements of the Low Complexity Entropy Coder (LCEC) in TmuC

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Summary

- Improvements of LCEC since TMuC v0.7
  - Low delay: 6.9%
  - Random access: 5.0%
  - Intra: 0.2%

- PIPE vs. LCEC
  - Low delay: 9.4%
  - Random access: 10.4%
  - Intra: 11.8%

Integration of LCEC in TMuC

- Phase 0 - v0.1   Provided by Samsung & BBC
- Phase 1 - v0.7   Enabled by default, used in TE12
- Phase 2 - v0.7.4   Disabled by default
- Phase 3 - v0.x?   Not adopted yet

LCEC Phase 2 (TMuC v0.7.4)

- Joint coding of block flags (CBFs), Y, U, and V only when residual quadree (RQT) disabled

- Joint coding of:
  - reference frame index,
  - inter direction,
  - adaptive motion resolution flag

- Better bit estimates in RDOQ

LCEC Phase 3 (TMuC v0.?)

- Improved default values for adaptive tables

- Adaptive VLC coding of intra prediction direction

- Minor tuning of RDOQ

- Elimination of CU-level terminating bit

- Joint coding of merge flag and transform skip flag

Minimum number of bits per CU

- LCEC phase1:
  - CU split flag
  - Merge flag
  - Coded block flag, Y
  - Coded block flag, U
  - Coded block flag, V
  - Terminating bit

- LCEC phase2 + LCEC phase3 (+HHI_ROOT_RQT):
  - CU split flag
  - Jointly coded merge flag and transform skip flag

LCEC_PHASE2 & HHI_ROOT_RQT

- LCEC_PHASE2 and HHI_ROOT_RQT are disabled by default.

- RQT enabled:
  - Transform skip flag – one bit to signal no coefficients in CU
  - Enabled by the HHI_ROOT_RQT macro

- RQT disabled:
  - Joint coding of coded block flags using adaptive VLC code
  - Enabled by the LCEC_PHASE2 macro

BD-Rate results

- Anchor:
  - Low complexity configuration of JCTVC-B300
  - RQT = on
  - Transform skip flag = off
  - LCEC phase 2 = off
  - LCEC phase 3 = off

- LCEC phase 2&3 results provided for:
  - RQT on/off
  - Transform skip flag (HHI_ROOT_RQT) on/off

RQT=on, transform skip flag=off

	Low delay		Random access		Intra	
Phase 2	on	on	on	on	on	on
Phase 3	off	on	off	on	off	on
Class A			-0,4	-1,2	-0,2	-0,5
Class B	-1,5	-2,4	-0,2	-0,9	-0,3	0.0
Class C	-1,9	-2,5	-0,4	-1,2	-0,3	-0,1
Class D	-1,9	-2,4	-0,5	-1,0	-0,4	-0,3
Class E	-1,9	-4,7			-0,1	-0,7
All	-1,8	-2,9	-0,4	-1,0	-0,3	-0,3

RQT=off, transform skip flag=off

	Low delay		
Phase2	off	on	on
Phase3	off	off	on
Class B	0,5	-4,3	-5,6
Class C	1,5	-3,4	-4,7
Class D	1,3	-3,9	-5,3
Class E	-1,8	-10,1	-13,1
All	0,5	-5,1	-6,7

RQT=on, transform skip flag=on

	Low delay		
Phase2	off	on	on
Phase3	off	off	on
Class B	-2,5	-3,9	-5,3
Class C	-1,7	-3,6	-4,7
Class D	-2,4	-4,4	-5,9
Class E	-7,7	-9,5	-13,9
All	-3,2	-5,0	-6,9

RQT=on, phase2=on, phase3=on, transform skip flag=on

	Low delay	Random access	Intra
Class A		-5,6	-0,5
Class B	-5,3	-5,4	0,0
Class C	-4,7	-4,2	-0,1
Class D	-5,9	-5,1	-0,2
Class E	-13,9		-0,7
All	-6,9	-5,0	-0,2

PIPE vs. LCEC

	Low delay	Random access	Intra
Class A		-9,9	-11,9
Class B	-11,4	-13,2	-13,4
Class C	-7,5	-9,4	-10,7
Class D	-6,3	-8,4	-10,0
Class E	-10,9		-13,3
All	-9,1	-10,4	-11,8

Conclusion

- Significant improvement of LCEC since TMuC v0.7 by enabling:
  - LCEC phase 2
  - LCEC phase 3
  - Transform skip flag

- We propose to enable all flags by default in TMuC