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JCTVC-B046

Summary of Tool Experiment 2 on IBDI and memory compression

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Document list

- **Summary**
 - JCTVC-B046, TE coordinator
- **Proponent's documents**
 - JCTVC-B044, TOSHIBA
 - JCTVC-B057, NEC
 - JCTVC-B074, Qualcomm
 - JCTVC-B089, TI
- **Related documents**
 - JCTVC-B086, LG
 - JCTVC-B090, TI,
 - JCTVC-B103, Panasonic
 - JCTVC-B114, Sharp Lab.

Summary

- **TE2: IBDI and memory compression**
 - Bit depth compression on IBDI
 - Memory compression on IBDI off
- **4 proposals**
 - TI, TOSHIBA, NEC and Qualcomm
- **Cross-verification**
- **Summary of experimental results**

Proposals

- **Four tools have been proposed.**
- **Three tools (TI, TOSHIBA and NEC) are compression methods and one (Qualcomm) is a tool regarding test condition.**

Tool	Proponent	Method
1	TI	DWT and DC prediction by 8x8-block
2	TOSHIBA	Adaptive scaling by 4x4-block and de-scaling by a pixel
3	NEC	DPCM by 8-pixel
4	Qualcomm	Bi-prediction rounding control

Cross-verification

- **Proponents conducted source code exchange for each other.**
- **Cross-checkers run the software independently and compared their results with proponent's results**

Tool	Proponent	Cross-checker
1	TI	TOSHIBA
2	TOSHIBA	NEC
3	NEC	TI
4	Qualcomm	TOSHIBA

Test condition

- **Configurations are base on JCTVC-A302r1:**
 - Implementation for modified KTA software version 2.6r1
 - HP1 + MVC + MDDT + QALF + RDOQ1
- **Evaluation criteria**
 - Measure impact on bitrate/PSNR using provided data. Use 5-point BD-PSNR and BD-Rate.
 - Memory compression ratio.
 - Complexity (encoding and decoding times)
 - Subjective quality (informal comments)

Coding efficiency (IBDI on)

- Summary of loss BD-bitrate (%) on IBDI

Proponent	TI (A101)		TOSHIBA (A117)		NEC	
Rate	12-bit to 8-bit					
Condition	CS1	CS2	CS1	CS2	CS1	CS2
Class A	0.247	N/A	0.172	N/A	0.584	N/A
Class B	0.065	0.285	0.028	0.198	0.475	1.072
Class C	0.066	0.527	0.010	0.131	0.327	0.491
Class D	0.231	0.268	0.062	0.112	0.934	0.875
Class E	N/A	0.554	N/A	0.462	N/A	2.563
Total	0.134	0.392	0.052	0.209	0.573	1.157

TOSHIBA < TI < NEC

Coding efficiency (IBDI off)

- Summary of loss BD-bitrate (%) on IBDI off

Proponent	TI (A101)		NEC	
Rate	8-bit to 4-bit		8-bit to 5-bit	
Condition	CS1	CS2	CS1	CS2
Class A	0.000	N/A	5.678	N/A
Class B	0.161	0.091	8.640	10.910
Class C	0.760	1.807	4.679	6.741
Class D	5.982	5.662	10.769	9.407
Class E	N/A	0.000	N/A	21.899
Total	1.852	1.896	7.757	11.552

TI < NEC

Coding efficiency (Bi-pred. rounding control)

- Loss BD-bitrate (%) of bi-prediction rounding control off

Proponent	Qualcomm (A121)
Condition	CS1(IBDI off)
Class A	0.189
Class B	0.215
Class C	0.019
Class D	0.195
Total	0.154

Complexity (IBDI on)

- Increase rate (%) of average encoding and decoding times on IBDI

	TI(A101)				TOSHIBA(A117)				NEC			
	CS1		CS2		CS1		CS2		CS1		CS2	
	Enc.	Dec.	Enc.	Dec.	Enc.	Dec.	Enc.	Dec.	Enc.	Dec.	Enc.	Dec.
Class A	0.56	N/A	-1.23	N/A	1.42	N/A	1.30	N/A	1.37	N/A	1.15	N/A
Class B	-0.57	32.40	-1.54	35.73	0.38	6.99	1.78	5.44	-0.05	45.37	2.07	48.74
Class C	-0.67	26.16	-1.41	41.60	0.16	4.63	2.44	5.53	0.06	38.62	3.75	49.39
Class D	-0.93	45.83	-0.18	51.30	0.12	6.09	2.20	7.00	-0.01	47.74	2.91	50.17
Class E	N/A	49.26	N/A	38.25	N/A	6.89	N/A	8.75	N/A	44.43	N/A	58.54
Total	-0.54	38.40	-1.03	41.05	0.39	5.94	1.88	6.67	0.18	43.50	2.68	51.22

Informative results

Complexity (IBDI off)

- Increase rate (%) of average encoding and decoding times on IBDI off

	TI (A101)				NEC			
	CS1		CS2		CS1		CS2	
	Enc.	Dec.	Enc.	Dec.	Enc.	Dec.	Enc.	Dec.
Class A	0.33	N/A	-1.11	N/A	1.31	N/A	-3.98	N/A
Class B	0.31	12.90	-1.63	14.35	0.18	25.80	-3.02	42.49
Class C	-1.07	11.64	-0.30	17.98	0.20	24.72	-0.77	33.88
Class D	-0.07	17.52	0.51	22.48	0.54	29.84	0.92	30.98
Class E	N/A	21.91	N/A	22.14	N/A	26.57	N/A	61.16
Total	-0.16	16.12	-0.63	19.32	0.43	26.72	-1.44	40.42

Informative results

Complexity (Bi-prediction rounding control)

- Increase rate (%) of average of encoding and decoding time on bi-prediction rounding control off

	Qualcomm (A121)	
	CS1	
	Enc.	Dec.
Class A	0.00	N/A
Class B	0.34	-0.21
Class C	-0.34	0.10
Class D	-0.09	-0.17
Class E	N/A	0.01
Total	0.00	-0.04

Increase of complexity is negligible

Subjective quality (informal comments)

- **There were the following comments:**
 - Subjective quality degradation caused by coding loss is invisible for most test cases. (by NEC)
 - Regarding visual quality: for 8b->4b, we observed no visual quality degradation for Classes A, B, and E. We have not yet tested Classes C and D. Also, we have not yet tested visual quality for 12b->8b mode. We plan to do that soon and report it in our contribution. (by TI)
 - As subjective quality checking of decoded sequences, the subjective quality difference caused by adaptive scaling was visually negligible. (by TOSHIBA)

Conclusion

- **In this tool experiment, we have finished to exam four proposals and verified their performance.**
- **Since all tests have been conducted on KTA software at this time, in the next stage, these tools should be tested on TMuC software.**