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Source: E. Alshina, J. Boyce, Y.-W. Huang, S.-H. Kim, L. Zhang

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Abstract

Seven experiments on coding tools were agreed to carry out between JVET-B and JVET-C meetings in order to get better understanding of technologies considered for inclusion to the next version of JEM, analyse and verify their performance, complexity and interaction with existing JEM tools. This report summarises the status of each experiment.

Introduction

JVET group coordinated experiments were conducted following principles were agreed in [1].

Due to the JEM2.0 reference SW release delay development braches for each EE were created later than expected and so first release of EE s/w happened at April, 19. It was announced via JVET reflector.

Table 1. Summary of Exploration Experiments.

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Exploration Experiments on Coding Tools Report

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ABSTRACT

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Authors: V. Sengul

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external meeting notes

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Joint Video Experts Team (JVET)
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1 Summary

MEETING NOTES

[JVET-C0010](#) Exploration Experiments on Coding Tools Report [E. Alshina, J. Boyce, Y.-W. Huang, S.-H. Kim, L. Zhang]

Summary of Exploration Experiments.

#	Main test and sub-tests	Document	Y-BD-rate (Enc/DecTime)	Cross-check
2.1	Quad-tree plus binary-tree (QTBT) (*) SW released at April, 19, modified during EE.	JVET-C0024	AI: -3.3% (ET 5.4, DT 1.0) RA: -3.8% (ET 2.?, DT 1.?) LD: -4.5% (ET 2.4, DT 1.1) LDP: -4.5% (ET 2.2, DT 1.2)	JVET-C0056 Samsung
	Low-complexity Intra configuration		AI: -2% (ET 2.5, DT 1.0)	
2.2	Non Square TU Partitioning(**) SW released and unchanged since April, 19	JVET-C0077 JVET-B0047	AI: -1.5% (ET 1.9, DT 1.0) RA: -1.0% (ET 1.1, DT 1.0) LD: -0.7% (ET 1.1, DT 1.0) LDP: -0.8% (ET 1.1, DT 1.0)	JVET-B0068 Sony
2.3	NSST and PDPC index coding (all modifications enabled)	JVET-C0042	AI: -0.6% (ET 1.5, DT 1.0) RA: -0.2% (ET 1.1, DT 1.0) LD: -0.1% (ET 1.1, DT 1.0)	JVET-C0059 Samsung JVET-C0087 Qualcomm

			LDP: -0.1% (ET 1.2, DT 1.0)	
	w/o removing PDPC restriction		AI: -0.2% (ET 0.9, DT 1.0) RA: -0.1% (ET 1.0, DT 1.0) LD: -0.0% (ET 1.1, DT 1.1) LDP: -0.0% (ET 1.0, DT 1.0)	
2.4	De-quantization and scaling for next generation containers SW released and unchanged since April 19	JVET-C0095 (registered May 25)		
2.5	Improvements on adaptive loop filter SW released and unchanged since April, 19	JVET-C0038	AI: -1.0% (ET 1.0, DT 1.1) RA: -1.2% (ET 1.0, DT 1.0) LD: -1.1% (ET 1.0, DT 1.0) LDP: -1.5% (ET 1.0, DT 1.0)	JVET-C0036 Huawei JVET-C0057 Samsung JVET-C0074 Sharp JVET-C0091
	W/o chroma filter vs whole package		AI: 0.1% (ET 1.0, DT 1.0) RA: 0.0% (ET 1.0, DT 1.0) LD: 0.0% (ET 1.0, DT 1.0) LDP: 0.0% (ET 1.0, DT 1.0)	Intel

	W/o prediction from fixed filters vs whole package		AI: 0.3% (ET 1.0, DT 1.0) RA: 0.2% (ET 1.0, DT 1.0) LD: 0.1% (ET 1.0, DT 1.0) LDP: 0.1% (ET 1.0, DT 1.0)	
2.6	Modification of Merge candidate derivation SW released and unchanged since April, 19	JVET-C0035	RA: -0.1% (ET 1.0, DT 1.0) LD: -0.2% (ET 1.0, DT 1.0) LDP: -0.2% (ET 1.0, DT 1.0)	
	ATMVP simplification		RA: -0.0% (ET 1.0, DT 1.0) LD: -0.0% (ET 1.0, DT 1.0) LDP: -0.0% (ET 1.0, DT 1.0)	JVET-C0060 Samsung JVET-C0073 Sharp JVET-C0085 Huawei
	Merge pruning		RA: -0.1% (ET 1.0, DT 1.0) LD: -0.2% (ET 1.0, DT 1.0) LDP: -0.2% (ET 1.0, DT 1.0)	
2.7	TU-level non-separable secondary transform (***) SW released at April, 19, modified during EE.	JVET-C0053	AI: -0.5% (ET 0.8, DT 1.0) RA: ?% (ET ?, DT ?)	JVET-C0058 Samsung JVET-C0086 Sharp

			LD: -0.1% (ET 1.0, DT 1.0) LDP: -0.0% (ET 1.0, DT 1.0)	JVET-C0076 Orange, B-com
	W/o HyGT		AI: -0.1% (ET 0.8, DT 1.0) RA: ?% (ET 1.0, DT 1.0) LD: -0.1% (ET 1.0, DT 1.0) LDP: -0.0% (ET 1.0, DT 1.0)	
	All coeff. sub-groups use secondary transform		AI: -0.5% (ET 0.8, DT 1.0) RA: ?% (ET ?, DT ?) LD: -0.1% (ET 1.0, DT 1.0) LDP: -0.1% (ET 1.0, DT 1.0)	
	Secondary transform is applied for all non-zero TUs (default 2 non zero coeff)		AI: -0.2% (ET 0.8, DT 1.0) RA: ?% (ET ?, DT ?) LD: -0.1% (ET 1.0, DT 1.0) LDP: -0.1% (ET 1.0, DT 1.0)	
	Secondary transform is applied for transform-skip and LM mode		AI: -0.5% (ET 0.8, DT 1.0)	

			RA: ?% (ET ?, DT ?) LD: -0.1% (ET 1.0, DT 1.0) LDP: -0.1% (ET 1.0, DT 1.0)
	CU-level signalling with HyGT		AI: -0.6% (ET 1.5, DT 1.1) RA: ?% (ET ?, DT ?) LD: -0.1% (ET 1.1, DT 1.0) LDP: -0.0% (ET 1.1, DT 1.0)

Comments:

(*) Full tests data available in cross-check report (not in original contribution), significant chroma gain is observed (~5% AI, LDB and LDP, ~8.5% in RA), significant Class F gain (not included in the previous average number by the CTC template) is observed (AI Y: ~4%, UV: ~7%, RA Y: ~5%, UV: ~9%, LDB Y: ~8%, UV: ~10%, LDP Y: ~8%)

(**) Tested vs HM16.6.

(***) Luma BD-rate gain is accompanied by chroma drop. Only partial test data available by May 24.

EE1: QTBT: Gain is slightly higher with other tools off (using QTBT with HM), Has significant increase in encoder runtime, particularly for AI

EE2: Gives some evidence how much of the QTBT gain comes from non-square transform

EE3: NSST/PDPC: Most gain is obtained via removing the PDPC restriction. NSST gives about 0.2%, but is not increasing the complexity

EE4: Dequant: Late document, further review needed

EE5: ALF modifications provide gain without change in encoding/decoding runtime. Modification of chroma filter gives only small benefit.

EE6: No loss by ATMVP simplification; the second aspect avoids duplicate merge candidate, which gives a small gain.

EE7: Secondary transform (hypercubic Givens transform) Results (RA) not fully available yet. AI provides most gain (0.5% on average). While there is gain in luma, some losses occur in chroma in some cases. Reduction of run time because TU level operation does not require a second prediction.

EE1: Quad-tree plus binary-tree (QTBT)

CITATION

E. Alshina, J. Boyce, Y.-W. Huang, S.-H. Kim, L. Zhang, "Exploration Experiments on Coding Tools Report", JVET-C0010, 3rd Meeting: Geneva, May 2016.

REFERENCES

1. [K. Rapaka, J. Chen, L. Zhang, W.-J. Chien, M. Karczewicz, "Non Square TU Partitioning", JVET-B0047, 2nd Meeting: San Diego, February 2016.](#)
2. [S.-H. Kim, A. Segall, "Further improvement of intra coding tools", JVET-B0051, 2nd Meeting: San Diego, February 2016.](#)
3. [X. Zhao, A. Said, V. Seregin, M. Karczewicz, J. Chen, R. Joshi, "TU-level non-separable secondary transform", JVET-B0059, 2nd Meeting: San Diego, February 2016.](#)
4. [J. Chen, E. Alshina, G. J. Sullivan, J.-R. Ohm, J. Boyce, "Algorithm description of Joint Exploration Test Model 2", JVET-B1001, 2nd Meeting: San Diego, February 2016.](#)
5. [H. Huang, K. Zhang, Y.-W. Huang, S. Lei, "EE2.1: Quadtree plus binary tree structure integration with JEM tools", JVET-C0024, 3rd Meeting: Geneva, May 2016.](#)
6. [S. Lee, W.-J. Chien, L. Zhang, J. Chen, M. Karczewicz, "EE2.6: Modification of Merge candidate derivation: ATMVP simplification and Merge pruning", JVET-C0035, 3rd Meeting: Geneva, May 2016.](#)
7. [M. Karczewicz, L. Zhang, W.-J. Chien, X. Li, "EE2.5: Improvements on adaptive loop filter", JVET-C0038, 3rd Meeting: Geneva, May 2016.](#)
8. [S.-H. Kim, A. Segall, "EE2.3: NSST-PDPC Harmonization", JVET-C0042, 3rd Meeting: Geneva, May 2016.](#)
9. [X. Zhao, A. Said, V. Seregin, M. Karczewicz, J. Chen, R. Joshi, "EE2.7: TU-level non-separable secondary transform", JVET-C0053, 3rd Meeting: Geneva, May 2016.](#)
10. [M. W. Park, B. Jin, E. Alshina, C. Kim, "Cross-check of JVET-C0024 \(QTBT\)", JVET-C0056, 3rd Meeting: Geneva, May 2016.](#)
11. [K. Choi, M. Park, E. Alshina, C. Kim, "Cross-check of JVET-C0053 \(TU-NSST\)", JVET-C0058, 3rd Meeting: Geneva, May 2016.](#)
12. [K. Choi, M. Park, E. Alshina, C. Kim, "Cross-check of JVET-C0042 \(NSST-PDPC\)", JVET-C0059, 3rd Meeting: Geneva, May 2016.](#)
13. [A. Tamse, E. Alshina, C. Kim, "Cross-check of JVET-C0035 \(Modification of merge candidate derivation\)", JVET-C0060, 3rd Meeting: Geneva, May 2016.](#)
14. [D. B. Sansli, D. Rusanovskyy, J. Sole, A. K. Ramasubramonian, M. Karczewicz, "On Coefficient Scaling", JVET-C0066, 3rd Meeting: Geneva, May 2016.](#)
15. [K. Rapaka, J. Chen, L. Zhang, W.-J. Chien, M. Karczewicz, "EE2.2: Non Square TU Partitioning", JVET-C0077, 3rd Meeting: Geneva, May 2016.](#)