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Source: Mathias Wien
Institut für Elektrische
Nachrichtentechnik
RWTH Aachen
52074 Aachen, Germany
Tel: +49-241-80 7681
Fax: +49-241-8888 196
Email: wien@ient.rwth-aachen.de

Till Halbach
Department of Telecommunications
NTNU
7491 Trondheim, Norway
Tel: +47-73 59 44 88
Fax: +47-73 59 26 40
Email: halbach@tele.ntnu.no

Title: **Results of H.26L Core Experiment on Adaptive Block Transforms**

Purpose: Information

Introduction

In this document, simulation results are given for the proposed Adaptive Block Transforms. A detailed description of the new coding elements that were added to the TML-4 is given in document Q15K24.

Simulation Conditions

The test sequences HALL_MONITOR, CONTAINER, NEWS, FOREMAN, PARIS, SILENT, TEMPETE, and MOBILE were used for the simulations. The rate/distortion results for all sequences were measured with the quantization parameters

$$QP = [10, 15, 20, 25, 30] ;$$

The ABT coder employs scan blocks of size 16 and the non-optimized TML VLC for encoding of the ABT inter-coefficients. Since no deblocking filter is implemented for ABT, the deblocking filter in the TML was switched off. A R/D-quantization scheme like the one used in the TML is not yet implemented for ABT. Nevertheless, R/D-quantization was used in the TML. For single coefficient elimination, the thresholds from the TML were used in both coders. For ABT a `threshold0`, as described in document Q15K24, was added. The effect of this threshold is shown in Table 2 for the sequences FOREMAN, NEWS, and SILENT.

For ABT the performance of two different 8x8 transform matrices was evaluated: ABT_T17 uses the 8x8 matrix proposed in Q15K24, ABT_T13 uses the 8x8 matrix proposed in Q15I39.

The results for ABT_T17, ABT_T13, and TML are given in Table 1 and in the R/D plots are given at the end of this paper.

Hall_monitor @ 10Hz, QCIF						
ABT_T17	Rate	103781	48049	24919	12400	7689
	PSNR	40,94	37,68	34,08	30,56	26,97
ABT_T13	Rate	104942	48412	24900	12839	7889
	PSNR	41,05	37,74	34,18	30,62	27,01
TML	Rate	121763	54438	25947	13237	7364
	PSNR	41,75	38,15	34,46	30,75	26,96
Container @ 10Hz, QCIF						
ABT_T17	Rate	83591	34057	17100	9263	5986
	PSNR	39,85	36,53	33,38	30,09	26,63
ABT_T13	Rate	88124	35879	17536	9508	6083
	PSNR	40	36,72	33,48	30,21	26,67
TML	Rate	90821	40524	17858	9250	5145
	PSNR	41,02	37,25	33,78	30,39	26,71
News @ 10Hz, QCIF						
ABT_T17	Rate	110983	61549	36480	20409	12492
	PSNR	41,01	37,29	33,77	30,19	26,67
ABT_T13	Rate	112571	63114	37094	21096	12781
	PSNR	41,11	37,47	33,88	30,3	26,73
TML	Rate	116535	66316	36992	20400	11065
	PSNR	41,96	38,02	34,19	30,47	26,77
Foreman @ 10Hz, QCIF						
ABT_T17	Rate	184558	97699	55962	30188	19034
	PSNR	39,94	36,45	33,21	29,96	26,88
ABT_T13	Rate	188258	100961	57491	30896	19181
	PSNR	40,09	36,64	33,4	30,13	26,93
TML	Rate	203003	108620	60017	34551	20211
	PSNR	41,23	37,41	33,95	30,59	27,28
Paris @ 15Hz, CIF						
ABT_T17	Rate	678442	355693	194534	105354	63753
	PSNR	39,97	36,22	32,53	28,86	25,45
TML	Rate	743207	396960	208526	105616	52716
	PSNR	40,94	36,96	33,07	29,31	25,53
Silent @ 15Hz, QCIF						
ABT_T17	Rate	136461	73143	40580	19799	10676
	PSNR	40,28	36,48	33,03	29,79	26,61
ABT_T13	Rate	143406	77566	42309	20810	11078
	PSNR	40,35	36,57	33,07	29,81	26,57
TML	Rate	146941	80417	43798	23787	12356
	PSNR	40,96	36,99	33,43	30,16	26,7
Tempete @ 30Hz, CIF						
ABT_T17	Rate	3386311	1661351	776681	364406	196239
	PSNR	39,16	35,35	31,83	28,55	25,48
ABT_T13	Rate	3428724	1712227	801214	376375	197309
	PSNR	39,27	35,55	32,02	28,74	25,52
TML	Rate	3707498	1912301	896281	417615	210458
	PSNR	40,66	36,59	32,78	29,33	25,9
Mobile @ 30Hz, CIF						
ABT_T17	Rate	4185280	2137792	1036306	521378	308377
	PSNR	38,55	34,48	30,66	27,11	23,85
ABT_T13	Rate	4220929	2189712	1064514	537561	310697
	PSNR	38,66	34,69	30,89	27,38	23,98
TML	Rate	4447371	2373236	1160703	558797	296932
	PSNR	40,02	35,73	31,65	27,94	24,31

Table 1: Rate/Distortion results for the test sequences. The rate is given in bit/s, the PSNR is in dB.

Foreman						
TRS0=Off	Rate	188048	99060	56700	30316	19312
	PSNR	40,07	36,52	33,27	29,98	26,93
TRS0=0	Rate	184558	97699	55962	30188	19034
	PSNR	39,94	36,45	33,21	29,96	26,88
News						
TRS0=Off	Rate	112268	62292	36700	20586	12784
	PSNR	41,08	37,36	33,83	30,22	26,74
TRS0=0	Rate	110983	61549	36480	20409	12492
	PSNR	41,01	37,29	33,77	30,19	26,67
Silent						
TRS0=Off	Rate	137777	74027	40769	20055	10817
	PSNR	40,37	36,53	33,05	29,82	26,65
TRS0=0	Rate	136461	73143	40580	19799	10676
	PSNR	40,28	36,48	33,03	29,79	26,61

Table 2: Comparison of single coefficient elimination, using no threshold0 and using threshold0=0.

Summary

The rate/distortion performance of ABT is evaluated in this document. The results reveal equal or slightly better performance compared to the TML, especially at low bit rates. At high rates, the suboptimum coding method leads to a performance loss. Since a non-optimized VLC is used for the ABT-coefficients we expect a remarkable gain when employing an improved coding scheme.

We propose to continue the Core Experiment on Adaptive Block Transforms. Our future work will be focused on the design of the entropy coder. R/D-quantization, the application of ABT to chroma, and the design of a deblocking filter will also be future work topics.







