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CODED REPRESENTATION OF PICTURE AND AUDIO INFORMATION

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MPEG 92/...

Title: **TM1 Pure Field coding simulation results**
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Introduction

This document describes an experiment on the pure field based coding option of TM1 for the purpose of comparison with the adaptive frame/field based coding option of TM1.

Comparisons showed an about equal performance of the pure field based mode in picture quality compared with the adaptive frame/field based mode. Important advantages over the adaptive frame/field based mode are:

- Reduced hardware complexity in especially the encoder
- Low delay (33 ms-40 ms less than frame coding)
- Limited number of macroblock coding modes

Parameter settings

The pure field based coding structure is described in Appendix E of TM1. The following settings for the algorithm were used:

- Motion vector prediction for 16 * 16 blocks
- M = 3, N = 12
- Prediction structure as in figure 1, odd fields are only predicted from odd and even fields are predicted from odd and even.
- Zig-zag scanning as in MPEG1.

Results

Simulations have been performed on Mobile Calendar, Flower Garden and Table Tennis all at 4 Mbit/s.

Detailed statistical results are shown in table 1, 2 and 3.

An accompanying tape is available.

Conclusion

Simulation results of TM1 are presented for the purpose of comparison.

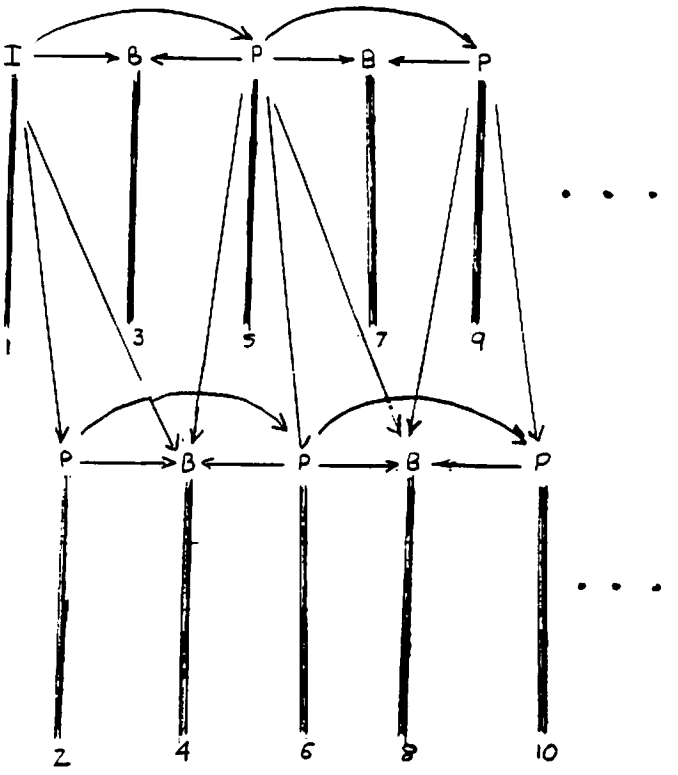

Figure 1: Field based prediction structure for M = 2

For simplicity M = 2 is depicted in figure 1, for the simulation M = 3 is used.

MPEG TM1 RNL, Leidschendam
19 Jun 1992

Sequence :
Frames : 124

	Item		All	Intra	Predicted	Interpolated
1.	RMS for luminance		7.22	6.49	7.10	7.37
2.	SNR for luminance		30.96	31.89	31.10	30.78
	SNR for chrominance		33.68	34.08	33.44	33.72
	SNR for chrominance		34.65	35.07	34.43	34.67
3.	Mean value of QP		17.53	15.02	13.61	19.35
4.	Non-zero coeffs/cod blck		7.67	14.88	6.42	4.19
5.	Zero coeffs/coded block		18.86	16.05	21.14	17.85
6.	Intra	Pred	Interp			
	M	Fixed	Fixed	0	1	200
	B	MC,C	Int NC	0	737	122
	T	noMC,C	Int C	0	11	247
	Y	MC,noC	For NC	0	23	14
	P	Intra	For C	792	20	56
	E		Bak NC			51
			Bak C			102
			Intra			0
	Compatible prediction			0	0	0
7.	No. of coded MB		659	792	791	592
	No. of coded blocks		1800	4752	3143	896
8.	Diff DC		3114	32946	724	16
9.	MBTYPE		2422	1327	2952	2368
	Quantiser		1909	2675	2572	1556
	MB address		812	792	792	822
No.	Vector data		3427	0	3286	3940
of	CBP		2414	0	4324	2015
bits	EOB		3600	9504	6287	1792
	Coeffs Y		71660	336343	108704	22149
	Coeffs U		6608	45820	8208	743
	Coeffs V		5809	40103	6952	776
	Extra data		795	788	796	796
	Seq. Extra data		6			
	Total		99462	437352	144874	3695

Table 1: Calendar Odd Field

MPEG TM1 RNL, Leidschendam
19 Jun 1992

Sequence :
Frames : 124

	Item		All	Intra	Predicted	Interpolated
1.	RMS for luminance		7.38	7.54	7.12	7.45
2.	SNR for luminance		30.77	30.59	31.08	30.68
	SNR for chrominance		34.66	34.85	34.60	34.66
	SNR for chrominance		35.81	36.16	35.73	35.80
3.	Mean value of QP		17.64	14.53	13.57	19.60
4.	Non-zero coeffs/cod blck		5.16	6.95	5.60	3.72
5.	Zero coeffs/coded block		20.80	23.21	22.09	17.88
6.	Intra	Pred	Interp			
	M	Fixed	Fixed	0	0	181
	B	MC,C	Int NC	771	766	155
	T	noMC,C	Int C	5	3	258
	Y	MC,noC	For NC	10	23	16
	P	Intra	For C	7	0	36
	E		Bak NC			49
			Bak C			97
			Intra			0
7.	No. of coded MB		672	792	792	611
	No. of coded blocks		1511	2872	2904	803
8.	Diff DC		28	245	13	5
9.	MBTYPE		3419	2945	3701	3376
	Quantiser		1883	2645	2588	1514
	MB address		814	792	792	825
No.	Vector data		3803	3124	2927	4226
of	CBP		2653	3847	4185	1913
bits	EOB		3023	5745	5808	1605
	Coeffs Y		45369	116164	92001	18244
	Coeffs U		1645	3134	4168	492
	Coeffs V		1240	1838	3039	479
	Extra data		801	796	796	804
	Seq. Extra data		0			
	Total		64650	141031	120005	33477

Calendar Even Field

MPEG TM1 RNL, Leidschendam
19 Jun 1992

Sequence :
Frames : 124

	Item		All	Intra	Predicted	Interpolated
1.	RMS for luminance		4.54	4.09	4.45	4.64
2.	SNR for luminance		34.99	35.90	35.15	34.81
	SNR for chrominance		38.93	39.36	38.88	38.90
	SNR for chrominance		39.62	40.27	39.69	39.51
3.	Mean value of QP		10.12	8.36	8.16	11.10
4.	Non-zero coeffs/cod blck		6.52	13.34	5.70	3.47
5.	Zero coeffs/coded block		16.93	17.66	18.88	14.12
6.	Intra	Pred	Interp			
	M	Fixed	Fixed	0	14	155
	B	MC,C	Int NC	0	459	117
	T	noMC,C	Int C	0	233	247
	Y	MC,noC	For NC	0	8	24
	P	Intra	For C	792	78	54
	E		Bak NC			56
			Bak C			137
			Intra			1
	Compatible prediction		0	0	0	0
7.	No. of coded MB		686	792	778	637
	No. of coded blocks		1988	4752	3429	1072
8.	Diff DC		2821	24267	2514	60
9.	MBTYPE		2110	1050	2239	2204
	Quantiser		1110	1288	1320	1006
	MB address		809	792	797	816
No.	Vector data		4623	0	3698	5593
of	CBP		2362	0	3665	2187
bits	EOB		3976	9504	6858	2144
	Coeffs Y		71194	332179	110684	21255
	Coeffs U		3978	23847	5610	696
	Coeffs V		5091	25739	7583	1379
	Extra data		795	788	796	796
	Seq. Extra data		6			
	Total		96054	395186	143250	38075

Table 2: Table Tennis Odd Field

MPEG TM1 RNL, Leidschendam
19 Jun 1992

Sequence :
Frames : 124

	Item		All	Intra	Predicted	Interpolated
1.	RMS for luminance		4.63	4.76	4.46	4.68
2.	SNR for luminance		34.82	34.59	35.14	34.73
	SNR for chrominance		39.68	39.71	39.62	39.70
	SNR for chrominance		40.47	40.72	40.47	40.44
3.	Mean value of QP		10.00	8.49	7.92	10.99
4.	Non-zero coeffs/cod blck		4.38	6.79	4.54	3.08
5.	Zero coeffs/coded block		18.62	20.65	20.25	15.85
6.	Intra	Pred	Interp			
	M	Fixed	Fixed	0	6	135
	B	MC,C	Int NC	731	577	126
	T	noMC,C	Int C	6	191	240
	Y	MC,noC	For NC	15	11	24
	P	Intra	For C	41	7	47
	E		Bak NC			52
			Bak C			168
			Intra			1
7.	No. of coded MB		701	792	786	657
	No. of coded blocks		1821	3718	3140	1068
8.	Diff DC		194	1309	242	26
9.	MBTYPE		3053	1986	2802	3291
	Quantiser		1125	1295	1341	1021
	MB address		807	792	793	814
No.	Vector data		4927	3775	3114	5766
of	CBP		2789	3877	3880	2230
bits	EOB		3643	7436	6281	2137
	Coeffs Y		47540	145546	84638	20368
	Coeffs U		1558	5411	3011	491
	Coeffs V		2213	6327	4066	961
	Extra data		801	796	796	804
	Seq. Extra data		0			
	Total		68455	177241	110723	37883

Table Tennis Even Field

MPEG TM1 RNL, Leidschendam
19 Jun 1992

Sequence :
Frames : 124

Item			All	Intra	Predicted	Interpolated
1. RMS for luminance			7.27	5.94	6.89	7.59
2. SNR for luminance			30.90	32.65	31.37	30.53
SNR for chrominance			32.84	33.46	32.75	32.80
SNR for chrominance			34.27	34.64	34.11	34.28
3. Mean value of QP			18.39	15.31	14.16	20.41
4. Non-zero coeffs/cod blck			5.94	11.74	5.86	3.18
5. Zero coeffs/coded block			17.48	14.03	17.57	19.07
6. Intra	Pred	Interp				
M	Fixed	Fixed		0	7	73
B	MC,C	Int NC		0	653	173
T	noMC,C	Int C		0	12	308
Y	MC,noC	For NC		0	22	20
P	Intra	For C		792	98	64
E		Bak NC				31
		Bak C				123
		Intra				0
Compatible prediction			0	0	0	0
7. No. of coded MB			742	792	785	719
No. of coded blocks			2142	4752	3439	1301
8. Diff DC			3262	29735	2478	7
9. MBTYPE			2637	1224	2840	2749
Quantiser			1854	2158	2086	1725
MB address			813	792	796	822
No. Vector data			6450	0	4385	8096
of CBP			2340	0	3293	2294
bits EOB			4284	9504	6879	2603
Coeffs Y			72380	287420	113233	28089
Coeffs U			4973	30824	6717	845
Coeffs V			2817	21840	3036	182
Extra data			795	788	796	796
Seq. Extra data			6			
Total			99349	354548	144060	48202

Table 3: Flower Garden Odd Field

MPEG TM1 RNL, Leidschendam
19 Jun 1992

Sequence :
Frames : 124

Item			All	Intra	Predicted	Interpolated
1. RMS for luminance			7.07	6.94	6.87	7.15
2. SNR for luminance			31.15	31.30	31.39	31.04
SNR for chrominance			33.97	34.16	33.82	34.00
SNR for chrominance			35.55	35.63	35.35	35.61
3. Mean value of QP			18.61	14.83	14.25	20.76
4. Non-zero coeffs/cod blck			4.70	5.65	5.99	2.82
5. Zero coeffs/coded block			19.67	21.24	21.90	16.43
6. Intra	Pred	Interp				
M	Fixed	Fixed		0	0	100
B	MC,C	Int NC		745	685	247
T	noMC,C	Int C		3	3	280
Y	MC,noC	For NC		39	102	18
P	Intra	For C		5	2	40
E		Bak NC				32
		Bak C				74
		Intra				0
7. No. of coded MB			726	792	792	692
No. of coded blocks			1500	2802	2677	880
8. Diff DC			37	217	61	3
9. MBTYPE			3491	2553	3421	3644
Quantiser			1630	2090	2039	1413
MB address			817	792	792	830
No. Vector data			7103	4553	4892	8281
of CBP			2298	3396	3127	1838
bits EOB			3000	5603	5354	1760
Coeffs Y			43425	98974	94796	16552
Coeffs U			1213	2325	2813	459
Coeffs V			434	880	1194	87
Extra data			801	796	796	804
Seq. Extra data			0			
Total			64212	121962	119224	35668

Flower Garden Even Field