

Source : THE NETHERLANDS, FRANCE

Title : STATISTICS ON THE REFERENCE MODEL

1. INTRODUCTION

This contribution gives the statistics measured on the Split/Trevor sequence, Checked Jacket and Miss America, using the reference model described in doc 104. For the luminance five different modes are monitored;

- 1 Intra :
- 2 Fixed : Interframe uncoded no disp
- 3 Inter : Inter frame no displacement
vectors , zero block, fixed.
- 4 Fixed MC : Only displacement vector
- 5 Inter MC : Displaced block difference

For the chrominance three different modes are to be distinguished;

- 1 Intra :
- 2 Fixed : Interframe uncoded no disp
- 3 Inter : Inter frame no displacement
vectors , zero block, fixed.

The number of bits spent for the coefficients and the End Of Block are monitored, as well as the number of bits for the YUV attributes. Eight bits are used for the motion vector.

The EOB-statistics will give some insight on the occurrences of the number of zeroes in a coefficient string. The results given on the next pages are based on the average of the whole sequences. The first frame and the first frame after the scene cut are excluded from the statistics.

2. USED MATERIAL

Picture format :

- * Y : 352 x 288
- * U,V : 176 x 144

Sequences used:

- * Split- Trevor : 10 Hz --> 48 frames
- * Checked Jacket: 15 Hz --> 28 frames
- * Miss America : 15 Hz --> 73 frames

Standard conversion:

- * Frame repeat 10 Hz to 30 Hz
- * Frame repeat 15 Hz to 50 Hz

Only results from France

- * Linear interpolation 1/2 (1 1) between 360 and 720 pels.
- * Linear interpolation from 30 Hz to 50 Hz according to BT-NTT document

3.RESULTS

		SPLIT-TREVOR		CHECKED JACKET		MISS
		France	Dutch	France	Dutch	Dutch
LUMINANCE						
1 Intra	:	16	85	2	8	12
2 Fixed	:	858	874	1129	1086	1122
3 Inter	:	85	72	213	250	104
4 Fixed MC	:	193	193	104	110	181
5 Inter MC	:	430	357	133	128	164

CHROMINANCE

1a Intra U	:		69		0	3
1b Intra V	:		96		27	19
1c Intra U+V	:	24	165	6	27	22
2a Fixed U	:		268		338	233
2b Fixed V	:		256		310	272
2c Fixed U+V	:	668	524	699	648	505
3a Inter U	:		58		57	159
3b Inter V	:		42		58	103
3c Inter U+V	:	98	100	86	115	262

NUMBER OF BITS

Y_attributes	:		3168		3168	3168
U_attributes	:		554		554	554
V_attributes	:		554		554	554
YUV_attributes	:	4752	4276	4752	4276	4276
EOB_word	:	2337	2393	1280	1327	1371
motion vectors	:	4990	4408	1904	1912	2764
quantizer step	:	1966	2349	1327	1594	1698
Y_coefficients	:		13981		9624	7125
U_coefficients	:		443		270	1411
V_coefficients	:		349		306	1006
YUV_coefficients	:	15689	14773	10172	10200	9542
TOTAL		29737	28199	19436	19309	19651

4. ADDITIONAL STATISTICS.

For the sequences described in paragraph 2 the occurrences of the quantization levels are monitored given in tabel 1 as well as the EOB statistics , tabel 2. The EOB statistics shows the occurrences of the number of non-zeroes and the length of a string of consecutive zeroes within in a coefficient block (zig-zag scanning is assumed).

SPLIT - TREVOR SEQUENCE

Quantization level 0 occurs : 268624 times.

level 1 occurs	0 times	level -1 occurs	0 times.
level 2 occurs	31948 times	level -2 occurs	32922 times.
level 3 occurs	8481 times	level -3 occurs	8551 times.
level 4 occurs	3448 times	level -4 occurs	3461 times.
level 5 occurs	1784 times	level -5 occurs	1832 times.
level 6 occurs	970 times	level -6 occurs	970 times.
level 7 occurs	558 times	level -7 occurs	584 times.
level 8 occurs	343 times	level -8 occurs	370 times.
level 9 occurs	251 times	level -9 occurs	273 times.
level 10 occurs	167 times	level -10 occurs	203 times.
level 11 occurs	145 times	level -11 occurs	149 times.
level 12 occurs	85 times	level -12 occurs	124 times.
level 13 occurs	78 times	level -13 occurs	96 times.
level 14 occurs	61 times	level -14 occurs	55 times.
level 15 occurs	41 times	level -15 occurs	68 times.
level 16 occurs	35 times	level -16 occurs	40 times.
level 17 occurs	36 times	level -17 occurs	41 times.
level 18 occurs	30 times	level -18 occurs	25 times.
level 19 occurs	17 times	level -19 occurs	24 times.
level 20 occurs	22 times	level -20 occurs	19 times.
level 21 occurs	10 times	level -21 occurs	14 times.
level 22 occurs	7 times	level -22 occurs	13 times.
level 23 occurs	8 times	level -23 occurs	14 times.
level 24 occurs	12 times	level -24 occurs	10 times.
level 25 occurs	4 times	level -25 occurs	10 times.
level 26 occurs	6 times	level -26 occurs	6 times.
level 27 occurs	2 times	level -27 occurs	6 times.
level 28 occurs	4 times	level -28 occurs	6 times.
level 29 occurs	5 times	level -29 occurs	4 times.
level 30 occurs	3 times	level -30 occurs	4 times.
level 31 occurs	7 times	level -31 occurs	17 times.

Table 1 Occurrences quantizer

EOB_STATISTICS SPLIT-TREVOR :

Nr of non zeroes	occurrence	length of zerostr	occurrence
1	16616	1	16345
2	5625	2	8520
3	3589	3	5597
4	2525	4	4390
5	1888	5	3650
6	1484	6	2629
7	1094	7	2095
8	825	8	1679
9	589	9	1412
10	466	10	1017
11	310	11	898
12	268	12	840
13	183	13	763
14	123	14	737
15	107	15	499
16	82	16	301
17	57	17	282
18	52	18	216
19	45	19	224
20	25	20	196
21	23	21	154
22	15	22	162
23	8	23	156
24	10	24	196
25	5	25	149
26	7	26	146
27	4	27	149
28	3	28	82
29	2	29	45
30	3	30	49
31	0	31	49
32	0	32	42
33	0	33	35
34	0	34	29
35	0	35	22
36	0	36	29
37	0	37	29
38	0	38	19
39	0	39	24
40	0	40	16
41	0	41	16
42	0	42	18
43	0	43	7
44	0	44	6
45	0	45	12
46	0	46	10
47	0	47	3

48	0	48	2
49	0	49	5
50	0	50	2
51	0	51	7
52	0	52	2
53	0	53	1
54	0	54	2
55	0	55	0
56	0	56	3
57	0	57	2
58	0	58	1
59	0	59	0
60	0	60	2
61	0	61	0
62	0	62	0
63	0	63	0
64	0	64	0

TABLE 2 EOB STATISTICS

EOB is 36033 times used.

Number of bits for EOB : 110084

--> 110084 NONZEROES in 378708 coefficients.

Average costs for EOB per block : 3.06 bits.