CCITT SGXV
Working Party XV/1
Specialists Group on Coding
for Visual Telephony

Doc no # 164
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TITLE: CLASSIFICATION OF QUANTIZED DATA

SOURCE: SWEDEN, NETHERLANDS, FRANCE

In Montreal it was agreed to use scanning technique in combination with a three bit end-of-block word for efficient coding of quantized transform indexes. It was also agreed to use no more than eight scanning classes, in order to be able to apply what is similar to transmission of a sub-rectangle of the transform block. These scanning classes are shown in annex 1 of this document. In order to simplify hardware requirements, simulations have been done with a fewer number of classes. In annex 2 a set of four classes is shown. This document presents gains over the Reference Model no 2 (doc. 141) by using four and eight classes respectively. The gains are measured in terms of average number of bits per picture on the reference model simulation (which has only one scanning class). In a closed loop system, these gains will result in finer quantization, and thus slightly better picture quality. Only the sequence SPLIT/TREVOR is taken into account.

Number of classes	Gain on luminance	Gain on chrominance
8	+1195 bits	-280
4	+1325 bits	-130

It can be seen that four classes gives higher gain than eight classes. Further, the gain is negative for the chrominance.

Proposals

The hardware specification should be changed to allow for a maximum of four (4) scanning classes.

Chrominance should be transmitted with zig-zag scanning by default, without transmission of side information.

Annex 1

1 line rectangle

1,	2,	3,	4,	5,	6,	7,	8
9,	10,	11,	12,	13,	14,	15,	16
17,	18,	19,	20,	21,	22,	23,	24
25,	26,	27,	28,	29,	30,	31,	32
33,	34,	35,	36,	37,	38,	39,	40
41,	42,	43,	44,	45,	46,	47,	48
49,	50,	51,	52,	53,	54,	55,	56
57,	58,	59,	60,	61,	62,	63,	64

2 line rectangle

1,	3,	5,	7,	9,	11,	13,	15
2,	4,	6,	8,	10,	12,	14,	16
17,	18,	19,	20,	21,	22,	23,	24
25,	26,	27,	28,	29,	30,	31,	32
33,	34,	35,	36,	37,	38,	39,	40
41,	42,	43,	44,	45,	46,	47,	48
49,	50,	51,	52,	53,	54,	55,	56
57,	58,	59,	60,	61,	62,	63,	64

3 line rectangle

1,	4,	7,	10,	13,	16,	19,	22
2,	5,	8,	11,	14,	17,	20,	23
3,	6,	9,	12,	15,	18,	21,	24
25,	26,	27,	28,	29,	30,	31,	32
33,	34,	35,	36,	37,	38,	39,	40
41,	42,	43,	44,	45,	46,	47,	48
49,	50,	51,	52,	53,	54,	55,	56
57,	58,	59,	60,	61,	62,	63,	64

4 line rectangle

1,	5,	9,	13,	17,	21,	25,	29
2,	6,	10,	14,	18,	22,	26,	30
3,	7,	11,	15,	19,	23,	27,	31
4,	8,	12,	16,	20,	24,	28,	32
33,	34,	35,	36,	37,	38,	39,	40
41,	42,	43,	44,	45,	46,	47,	48
49,	50,	51,	52,	53,	54,	55,	56
57,	58,	59,	60,	61,	62,	63,	64

Annex 1 (continued)

5 line rectangle

1,	6,	11,	16,	21,	26,	31,	36
2,	7,	12,	17,	22,	27,	32,	37
3,	8,	13,	18,	23,	28,	33,	38
4,	9,	14,	19,	24,	29,	34,	39
5,	10,	15,	20,	25,	30,	35,	40
41,	42,	43,	44,	45,	46,	47,	48
49,	50,	51,	52,	53,	54,	55,	56
57,	58,	59,	60,	61,	62,	63,	64

6 line rectangle

1,	7,	13,	19,	25,	31,	37,	43
2,	8,	14,	20,	26,	32,	38,	44
3,	9,	15,	21,	27,	33,	39,	45
4,	10,	16,	22,	28,	34,	40,	46
5,	11,	17,	23,	29,	35,	41,	47
6,	12,	18,	24,	30,	36,	42,	48
49,	50,	51,	52,	53,	54,	55,	56
57,	58,	59,	60,	61,	62,	63,	64

7 line rectangle

1,	8,	15,	22,	29,	36,	43,	50
2,	9,	16,	23,	30,	37,	44,	51
3,	10,	17,	24,	31,	38,	45,	52
4,	11,	18,	25,	32,	39,	46,	53
5,	12,	19,	26,	33,	40,	47,	54
6,	13,	20,	27,	34,	41,	48,	55
7,	14,	21,	28,	35,	42,	49,	56
57,	58,	59,	60,	61,	62,	63,	64

8 line rectangle

1,	9,	17,	25,	33,	41,	49,	57
2,	10,	18,	26,	34,	42,	50,	58
3,	11,	19,	27,	35,	43,	51,	59
4,	12,	20,	28,	36,	44,	52,	60
5,	13,	21,	29,	37,	45,	53,	61
6,	14,	22,	30,	38,	46,	54,	62
7,	15,	23,	31,	39,	47,	55,	63
8,	16,	24,	32,	40,	48,	56,	64

Annex 2

Ordinary zig-zag

1,	2,	6,	7,	15,	16,	28,	29
3,	5,	8,	14,	17,	27,	30,	43
4,	9,	13,	18,	26,	31,	42,	44
10,	12,	19,	25,	32,	41,	45,	54
11,	20,	24,	33,	40,	46,	53,	55
21,	23,	34,	39,	47,	52,	56,	61
22,	35,	38,	48,	51,	57,	60,	62
36,	37,	49,	50,	58,	59,	63,	64

Horizontal class

1,	2,	3,	4,	5,	8,	9,	10
6,	7,	11,	12,	13,	14,	15,	16
17,	18,	19,	20,	21,	22,	23,	24
25,	26,	27,	28,	29,	30,	31,	32
33,	34,	35,	36,	37,	38,	39,	40
41,	42,	43,	44,	45,	46,	47,	48
49,	50,	51,	52,	53,	54,	55,	56
57,	58,	59,	60,	61,	62,	63,	64

Vertical class

1,	6,	17,	25,	33,	41,	49,	57
2,	7,	18,	26,	34,	42,	50,	58
3,	11,	19,	27,	35,	43,	51,	59
4,	12,	20,	28,	36,	44,	52,	60
5,	13,	21,	29,	37,	45,	53,	61
8,	14,	22,	30,	38,	46,	54,	62
9,	15,	23,	31,	39,	47,	55,	63
10,	16,	24,	32,	40,	48,	56,	64

Fourth class

1,	3,	8,	12,	22,	23,	39,	40
4,	2,	6,	13,	21,	24,	38,	41
9,	7,	5,	11,	20,	25,	37,	42
14,	15,	10,	19,	26,	36,	43,	54
16,	17,	18,	27,	35,	44,	53,	55
30,	29,	28,	34,	45,	52,	56,	61
31,	32,	33,	46,	51,	57,	60,	62
49,	48,	47,	50,	58,	59,	63,	64