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CCITT SGXV
Specialists Group on Coding
for Visual Telephony

Doc. no. 437
Nov. 1988

Title: Definition of GOB for px64 kbit/s

Source: FRG, UK, F, I, NL, S, N

In the paper it is questioned what is the best definition of a Group of Macro Blocks (GOB) in a px64 kbit/s Codec (p = 1, ...30). For this purpose the theoretically possible GOB-definitions for CIF are considered (table 1).

		GOB-length (number of macro blocks in horizontal direction)		
		1,2	11	22
GOB-width (number of macro-blocks in vertical direction)	1	Number of GOBs much too high	36	18
	2		18	9*
	3		12**(Fig.1)	6
	6	delay time too high		
	9			
	18			

Tab. 1: Number of GOBs per picture for CIF (asterisks are explained later)

In Fig. 1 a GOB with length 11 and width 3 is depicted as an example.

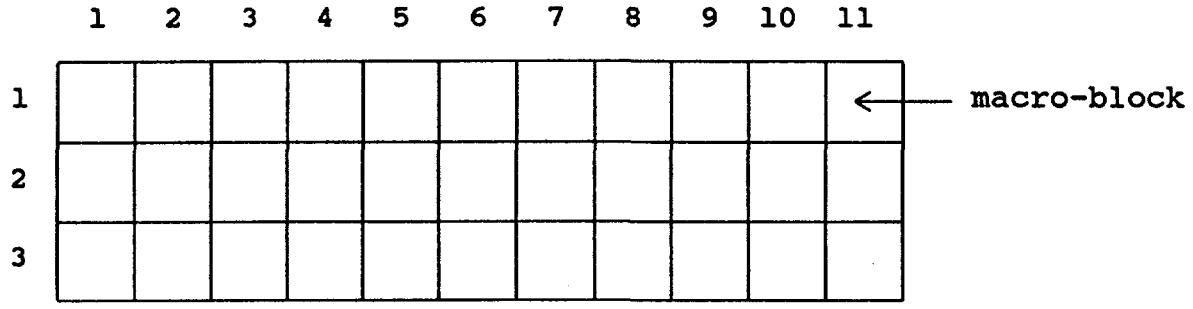

Fig.1 Example: GOB of width 3 and length 11

Dividing the number of macro blocks/picture (18 x 22) by GOB-width and GOB-length yields the number of GOBs outlined in table 1. For the example given in Fig. 1 the result would be 18x22/(3x11)=12 GOBs/picture.

Restrictions to GOB-definitions are listed in the following:

../2

Delay time

Due to an acceptable delay-time the GOB-width should not exceed 3 (table 1).

Side information for GOB-Header

Assuming 40 bits for a GOB-header 18 GOBs would result in 720 bits side information for GOB headers. That is more than 10% of a total bit rate of 64 kbit/s using a frame rate of 10 Hz. Thus the number of GOBs/picture should be less than 18.

Error-Recovery

For a fast error recovery the number of GOBs/picture should be larger than 6. Thus only two GOB-definitions remain marked with asterisks in table 1.

Side information for quantizer signalling and buffer control

Assuming 32 different quantizers, 5 bits for signalling the quantizer are required. As a consequence the GOB-definitions (*) and (**) in tab. 1 generate a negligible bit-rate for this kind of side information. On the other hand buffer control on GOB-basis might be not fast enough in special situations for these two GOB definitions, but solutions exist for changing the quantizer within a GOB /1/, /2/.

Side information for differential motion vectors

The effect of the GOB-definitions (*) and (**) of table 1 on side information for differential motion vectors is negligible.

Conclusion

Considering the features delay-time, side-information and error recovery it has been shown that two GOB-definitions are reasonable for a px64 kbit/s Codec. They do not affect buffer control speed if quantizer allocation is allowed within a GOB. An extended set of block attributes as proposed in /2/, which allows for adopting the quantizer to the local statistics of macro blocks, is recommended. Considering an identical sized GOB for full CIF and QCIF the GOB-definition (**) in table 1 /3/ has to be selected. Therefore this definition is proposed for a px64 kbit/s Codec.

/1/ Doc. 328: Signalling of loop filter, classification index and quantizer in a px64 kbit/s Codec (p = 1,2,...,30); March 1988.

/2/ Doc. 384: Quantizer Allocation by Type 3; Sept. 88

/3/ Doc. 385: An Identical Sized GOB for Full CIF and Quarter CIF; Sept. 88

Annex: Doc. 385

CCITT SG XV
Specialists Group on Coding
for Visual Telephony

Doc. No. 385
Sept. 88, Paris

Title: **An Identical Sized GOB for Full CIF and Quarter CIF**

Source: FRG

With the introduction of a second picture format the intercommunication of codecs with different formats has to be considered. The smaller format is especially intended for low cost picture phones, but realization of a second mode is a burden to all Full CIF codecs. A Full CIF codec must be able to receive and transmit Quarter CIF pictures. Since the formats vary by a factor of 2 in each direction and programmable digital video filters are available today, minor modifications are necessary in the pre- and postprocessing. The modifications in the present video multiplex encoder and decoder are more difficult to realize. But with the use of an identical structured GOB for both picture formats also the implementation of a 'bistandard multiplex' becomes manageable.Thereby the multiplex of CIF and QCIF only differs in the number of GOB's. This approach is outlined in the following:

For finding a suitable form of a GOB first the picture formats should be compared. According to the macro block of RM5 (Y0, Y1, Y2, Y3, U, V) a frame consists of:

Format	Pixel Lum.	Macro Blocks
CIF	352 x 288	22 x 18
QCIF	176 x 144	11 x 9

Fig.1: Picture Formats

To get a good balance between 'wasted' bits for GOB headers and a fast error recovery the number of GOBs for CIF should be about 8 to 18. By defining the area of a GOB to a third of a Quarter CIF frame the number 12 is reached.
A Group of Blocks consists of 3 lines of 11 macro blocks each, a total of 33 macro blocks or 198 blocks.

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

Width: 176 pels
Height: 48 lines

Fig.2: GOB with Macro Block Addresses

The block scan in Fig.2 respects a high correlation of the motion vectors of succeeding macro blocks and is an example.

The structure of the smaller format is identical to the upper left part of a CIF picture.
Applying this kind of GOB significantly simplifies the realisation of a fall back mode to QCIF without any drawbacks for the realisation of QCIF codecs.
Figure 3 shows the numbering of the GOBs of a Full CIF and a Quarter CIF picture.

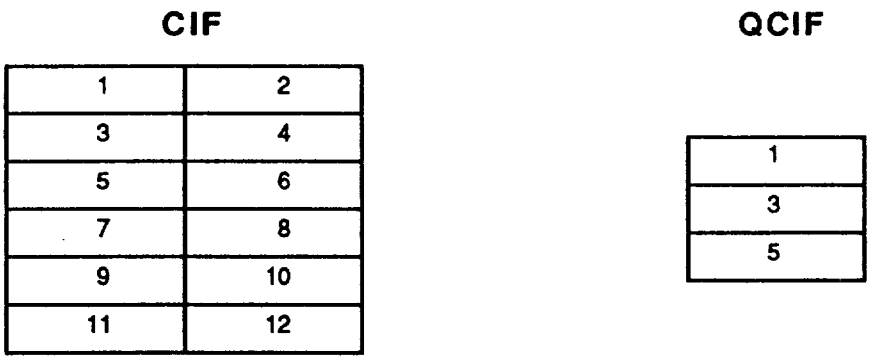

Fig.3: Group Numbers for a CIF Picture and a QCIF Picture

Furthermore the mixing of four coded Quarter CIF pictures to one Full CIF without decoding is very simplified. Only the group numbers have to be modified. This can be used for continuos presence multipoint conferencing.

For the 12 GOBs of a Full CIF picture group numbers with four bits are sufficient. The remaining four numbers can be used for other purposes.