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CCITT SGXV
WORKING PARTY XV/1
SPECIALISTS GROUP ON
CODING FOR VISUAL TELEPHONY

DOCUMENT #430
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ORLANDO

TITLE: Bits per INTRA Coded picture

SUBJECT: An Investigation into the Number of Bits Produced by INTRA Coding a Whole Picture.

SOURCE: UK

Aim:

To investigate the number of bits produced when coding a complete picture in INTRA mode. This will affect the fast update performance of the codec and will allow a maximum number of bits per picture to be specified.

Procedure:

The flexible prototype hardware was used to forcibly code one complete picture in INTRA mode and calculate the number of bits generated.

Schemes were evaluated where the Quantizer Index (QI) was fixed for the whole picture, or where the QI varied according to buffer status as in normal operation. For the fixed QI scheme, different values of QI were examined.

Scenes from the 'split screen' and 'Trevor' sequences were evaluated, along with a more detailed picture of a traction engine.

Measurements were made at 704 kbits/sec. with a 128k buffer to prevent buffer overflow, but should be independent of bit rate. For the traction engine picture, measurements were made at 1856 kbits/sec.

Results:

The results are shown in Table 1 and should be correct to within +/- 3 kbits allowing for calculation errors.

A wide range of results is obtained for the variable QI case as the actual values of QI through the picture depend on the buffer content at the start of the picture and these results are also dependent on bit rate.

The minimum number of bits needed to code a picture in INTRA mode (with TYPE2 bit 1 set to 1, PEI = GEI = 000 and with QI indicated in QUANT1) is:

30856 bits.

The results obtained from the codec with a completely blank black picture input were:

35 kbits (+/-3kBits).

Subjectively, only the fixed QI of 10 gave acceptable visible results, although the effects were still quite disturbing.

	QI	kbits produced
'Split screen':	fixed 10	115
	fixed 15	83
	fixed 31	67
	variable	80 - 102
'Trevor':	fixed 10	67
	fixed 15	51
	fixed 31	51
	variable	70 - 82
'Traction engine':	fixed 10	) unmeasurable due
	fixed 15	) to buffer overflow.
	fixed 31	99
	variable	146 - 164

Table 1

Conclusions:

1). The results shown above indicate that typical videoconference scenes produce large numbers of bits when INTRA coded, in the range 50 - 120 kbits.

2). There is a potential problem at lower bit rates as the amount of bits produced can amount to several seconds worth of transmission time, even with the highest quantizer step size.

3). Quarter CIF will reduce this problem at the lowest bit rates.

4). Buffer overflow is a problem on detailed scenes with a 128kbit buffer, even at 1856 kbits/sec.

5). The fast update is visible at step sizes as high as 10, but this also depends on picture content and bit rate.

6). There is a compromise to be made between speed of response of fast update and amount of disturbance to the continuously monitored picture.