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Specialists Group on Coding for Visual Telephony

SOURCE: VideoTelecom, Bellcore, PictureTel
TITLE: Modification of Quantizer Step Size

The quantizer step size, g, presently has a range from 4 to 64, in steps of 2. Some experiments have been run using a flexible hardware system, and it seems that values of g above 24 give excessive quantization error. Some implementations may choose to limit the range of the quantizer to values below 24.

If the value of g is limited between 4 and 18, there are only 8 values available for buffer control. This causes the buffer control to be quite coarse.

Two modifications are proposed here. The first is to change the mapping of the quantizers as follows:

$$g = QUANT + 1$$

This would give a range from 2 to 32 in steps of one. This would be applied only for the QCIF resolution. The full CIF resolution would use the current quantizers.

The second proposal is to have a psuedo exponential mapping of the quantizer so that the spacing between the quantizers is roughly proportional to the value of the quantizer. This can be expressed as:

$$g = \begin{cases} QUANT + 1 & 1 \le QUANT \le 15 \\ QUANT*2 - 14 & 16 \le QUANT \le 23 \\ QUANT*3 - 37 & 24 \le QUANT \le 27 \\ QUANT*4 - 64 & 28 \le QUANT \le 31 \end{cases}$$

This mapping produces a range from 2 to 60. This scheme would be used for both QCIF and FCIF.

Figure 1 shows a plot of the present set of g values and the two proposed sets of values. Proposal 1 has a simple definition and provides a finer control of the quantizer than the present quantizer definition. Proposal 2 is more complex to define, but it covers a range almost as large as the present quantizer. Proposal 2 is identical to proposal 1 for values of QUANT below 16.

Flexible hardware tests have been conducted between PictureTel and VideoTelecom with the modified quantizer step size curves. All three sets of quantizers were tried and no significant

difference in performance was observed.

There was a visiable quantizer overload artifact in the periodic refresh when using step sizes of 2 or 3. This occurred when an area in the picture with a high contrast edge was being refreshed.

This problem can be solved by checking the range of coefficients prior to quantization, and using a larger quantizer step size if an overload would have occurred. Some manufacturers could choose to never encode with a step size lower than 4.

FIGURE 1 - MAPPING OF QUANT TO C