CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding

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SOURCE : UK
TITLE : Cell Loss Resilience in a Two-Layer Coding Scheme.
PURPOSE: Information

1. Introduction

This paper investigates the effect of cell loss in a two-layer coding scheme that has a guaranteed path for the base layer. It highlights the coding schemes resilience to heavy cell loss (1 in 10 cell loss ratio) when the number of bits in the base layer is approximately 50% of the total mean bit rate.

2. Protection Against Cell Loss

Cell loss in ATM networks may be due either to bit errors in the cell header or buffer overflows in the network. The effect is to lose several hundred bits of the data stream.

In the case of two-layer coding there is a cbr channel which has no cell loss and a vbr channel in which cell loss can occur.

The cbr channel transmits a base picture to the decoder, this is RM8. As there is no cell loss in this channel this picture is always decoded error free.

The vbr channel transmits an enhancement picture to the decoder. This is the difference between the DCT coefficients of the base layer and their quantized values. On this channel cell loss can occur. Detection of cell loss is by inconsistenties in the sequence number at the start of cells.

To synchronize the two layers each cell in the vbr layer has a temporal reference number inserted after the cell number. Furthermore to prevent propagation of cell loss errors through further cells the first block address in a cell is an absolute block address.

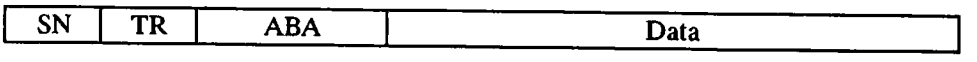

Figure 1: Cell Format in vbr layer.

For lost cells in the vbr layer the decoder will output just the base picture as a fall back mode.

3. Simulation Model

The base layer is RM8, the vbr layer codes the difference between the DCT coefficients of the base layer and their quantized values. The vbr bit stream has cell loss introduced (cell loss ratio of 1 in 10 and a mean burst length of 3) before being reconstructed at the decoder.

4. Results

Simulations are presented of two-layer coding under heavy cell loss on 'Table Tennis' and 'Salesman'. Both are in CIF format. Also plots of signal-to-noise ratio are presented for the sequences with cell loss.

Figures 1 and 2 show plots of signal to noise ratios for the two sequences. The curve for the vbr picture with cell loss comes in between the curves for the base picture SNR and the vbr picture with no cell loss SNR. The curve for the vbr picture with cell loss does not maintain a constant gap from the vbr picture with no cell loss, the gap is dependent on the number of cells in the vbr layer (figures 3 and 4).

Sequence	Base bitrate bits/sec	Total mean bitrate bits/sec	Total number of vbr packets	Luminance Signal to Noise Ratio		
				Base Layer	VBR Layer No cell loss	VBR Layer 10% Cell loss
Table Tennis	1536k with inter gob	3112823	35978	34.443	36.990	36.440
Salesman	192k with inter gob	446467	9943	35.692	36.839	36.637

Table 1: Summary of Signal to Noise Ratio Figures.

5. Conclusion

Preliminary investigations show that coding with 50% of the bits in the base channel allows the decoder to accept vbr data that has been heavily corrupted by the ATM network. For cell loss ratios of 1 in 10 the degradation in the picture quality is negligible.

Figure 1:

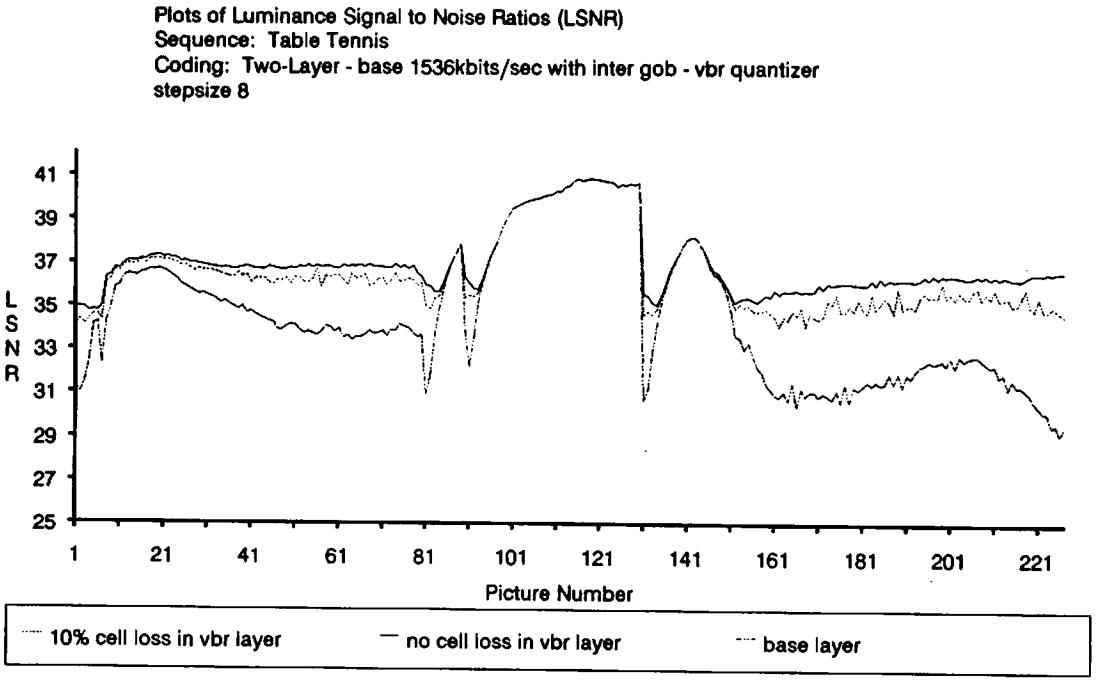

Figure 2:

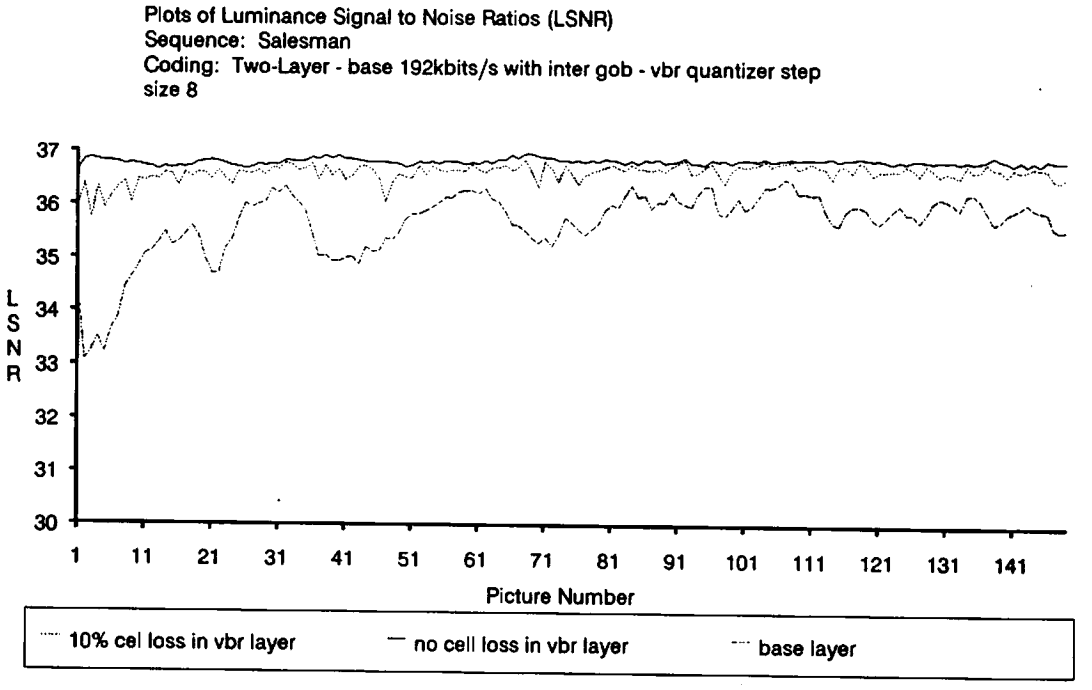

Figure 3:

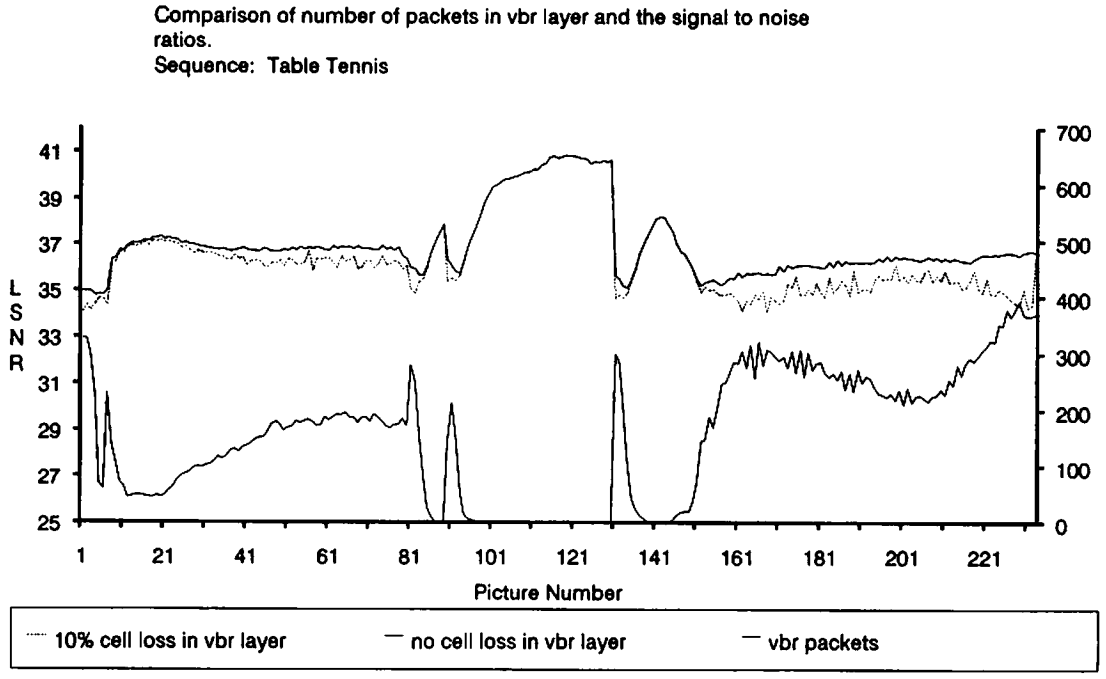

Figure 4: