#36

International Telegraph and Telephone
Consultative Committee
(CCITT)

Question 4/XV
Specialist group on coding
for visual telephony

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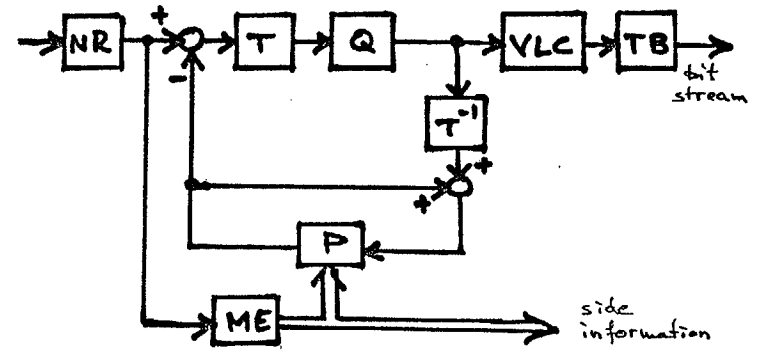
STUDY GROUP XV - CONTRIBUTION NO 36

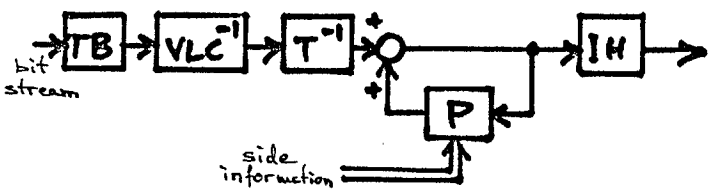
Sorce: SWEDEN, NETHERLANDS, FRANCE, FEDERAL REPUBLIC OF GERMANY, BRITISH TELECOM (UK), CSELT (ITALY)

Title: HYBRID CODING

We propose the use of a hybrid DPCM/Transform coding sceme, according to Figure 1, for compression of the standards converted video signal at both n•384 kbit/s and m•64 kbit/s. The translatability between bit rates can be garanteed with the proposed sceme.



CODER



DECODER

Figure 1

P Predictor

The predictor is suggested to work in three different modes:

(1)	Intra-frame	(no prediction)
(2)	Inter-frame	(previously coded picture)
(3)	Motion compensated inter-frame	

Mode (2) can be seen as a special case of mode (3), if motion is zero. The predictor mode is indicated with side information.

ME Motion Estimator

As the motion field is transmitted by side information, the motion estimation algorithm should not be standardized. The representation of the motion field (which may be continous over the picture or fixed over larger areas), needs a close study.

T Transform

2-dimensional discrete cosine transform on prediction error is proposed.
If motion compensation is not used the transform should be placed outside the coding loop (and inverse transform skipped), which also simplifies the swithching between intra- and interframe mode.
Blocksize 8•8 or 16•16 is subject for discussion.

Q Quantizer

The number of quantization levels should be large to avoid overload. We also mean by quantization things like skipping blocks (conditional replennishment) and skipping components (frequency weighting).
To cope with non-stationarities of image statistics, adaptive quantization should be used.

VLC Variable Length Coding

Non-zero components should be efficiently adressed, taking into account the statistical properties of the DCT (classification into scanning modes).
The components should then be variable length coded, to compensate for the large number of quantization levels.

TB Transmission Buffer

Allowable time delay caused by the buffer is subject for discussion.
Reasonalbe values might be 50-100 milliseconds.

NR Noise Reduction

Noise reduction may be introduced before coding in order to prevent noise from upsetting the coder. NR needs no standardization.

IH Image Enhancement

Image enhancement after decoding may improve subjective quality.
Examples are spatial noise reduction and temporal motion compensated interpolation. IH needs no standardization.