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Working Party on Visual Telephony
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Title : VQ based Hybrid Coder.

INTRODUCTION

In recent years Vector Quantisation (VQ) has raised considerable interest. It appears to be a new powerful coding method. In VQ the input vector is quantised by representing it by a binary codeword. The number of available codewords determines both the compression rate and the distortion introduced by the quantisation.

The complexity of VQ increases exponentially with the number of available codewords. That is why tree search methods are very attractive alternatives. Besides that, with Tree Search VQ, variable rate coding is possible. Channel capacity requirements can be met with a rate equalising buffer.

Usually the codetable is trained off-line on a training set of data. However the robustness of the codetable should be guaranteed. Multi-stage VQ appears to show a better performance on new data, having a greater robustness.

An intraframe VQ with conditional replenishment coding scheme was simulated on the sequences "Trevor" and "Split Screen".

At present a Motion Compensated Interframe VQ Coder is under study. Such a scheme should exploit the properties of VQ:

- simple VQ-decoder
- variable rate adaptive codetables
- relation between motion vectors and codebook entries

The on-line generation and the partly updating of the codetables is under study.

BASIC CONFIGURATION

The configuration is based on interframe prediction. The prediction error can be further decreased using motion compensated prediction. Those blocks (e.g. motion compensated) which are indexed as changed, are vector quantised.

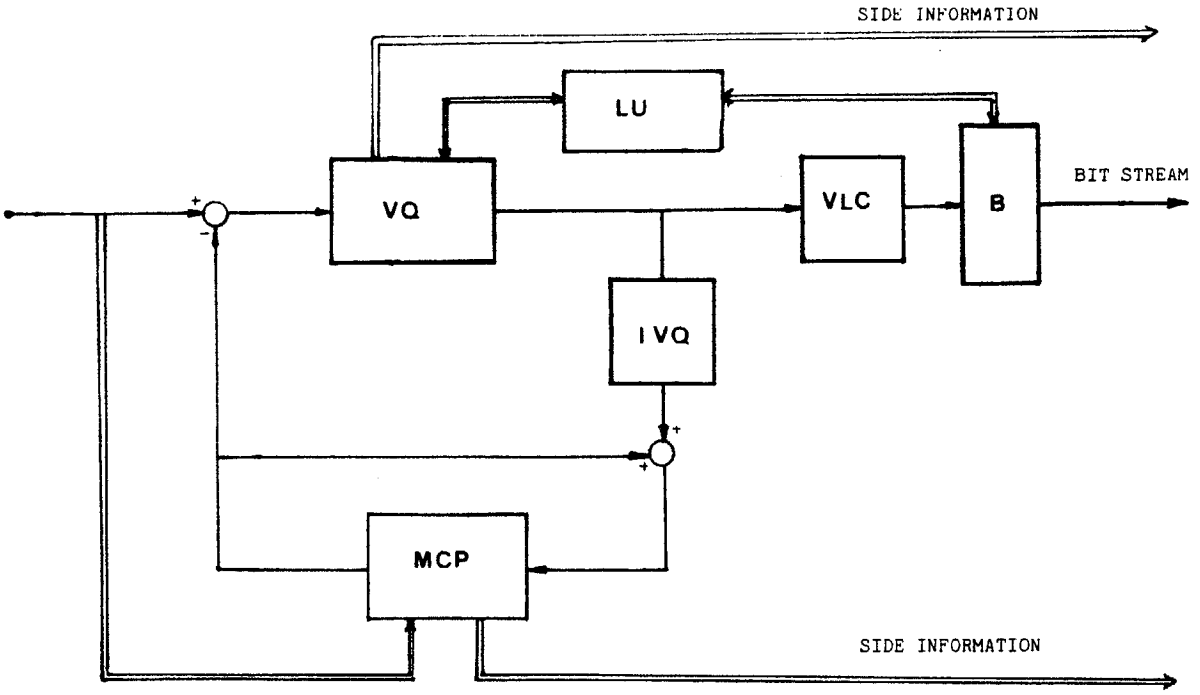

figure 1. VQ based hybrid codec

VQ : Vector quantisation
MCP : Motion compensated prediction
IVQ : Reconstruction
B : Buffer
LU : Logical Unit
PP : Post processing

MOTION COMPENSATION PREDICTION

From a comparison between the previous and actual coded frames displacement indices can be obtained. These indices can be transmitted as side information.

VECTOR QUANTISATION

A multi-stage tree structured vector quantiser is adopted. Adaptive quantization is suggested in order to meet the non-stationarity of the image data. The variable rate adaptive vector quantiser is controlled by a logical unit monitoring the buffer status.

VARIABLE LENGTH CODING

The resulting codebook indices are variable length coded.

BUFFER REGULATION

The variable bitrate caused by the coding strategy, is equalised with a buffer. The size of it is limited to one frame e.g. 21.000 bits for the 384 kbit/s coder.
A better adaptation to motion is achieved by using apriori knowledge together withe the buffer status.

POST-PROCESSING

To reconstruct the missing frames motion adaptive interpolation (MAI) is suggested. This technique is independant of the configuration but should be considered. Image enhancement can improve the picture quality but need not to be standardised.