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CONCEPT OF A PREDICTIVE VIDEOCONFERENCE CODEC FOR TRANSMISSION RATES BETWEEN 64 KBIT/S AND 2 MBIT/S

This contribution describes the concept of a predictive videoconference codec for transmission rates between 64 kbit/s and 2 Mbit/s. The codec combines motion compensating predictive and interpolative techniques and provides an adaptive spatial resolution.

1. Pre- and Postprocessing

Fig. 1 shows the overall blockdiagram of the video codec. The coder input accepts 50 interlaced fields per second with 288 lines each. Each line contains 352 luminance samples, 88 R-Y samples, and 88 B-Y samples. The number of lines is reduced to 144 for the chrominance components. The signals are preprocessed by noise reduction filtering and field subsampling. The field frequency should be chosen such that a balance of motion reproduction and overall picture quality results for a given transmission rate.

At the receiver the omitted fields are reconstructed by motion-compensating interpolation. A reconstruction by field repeat is optional for a simplified receiver. The omitted chrominance lines are interpolated by an intrafield filter.

2. Motion-compensating DPCM coder with adaptive spatial resolution

Fig. 2 shows the structure of the motion-compensating DPCM coder with adaptive spatial resolution. Prediction is done by an adaptive three-dimensional predictor. The spatial resolution of the signal is adaptively reduced by a combination of spatial subsampling and interpolation. The coder is entirely forward-controlled and the adaptation mode information is transmitted.

2.1 Intraframe prediction

The intraframe predictor uses a linear combination of previously transmitted and reconstructed samples of the current field for prediction. The set of samples used for prediction has to take into account the subsampling mode of the surround.

2.2 Motion-compensating prediction

The displacement vector field is determined from the input signal and used for motion-compensating prediction. Displacement vectors are coded and transmitted for only those areas of a picture where motion-compensating prediction is used. Interframe prediction without motion-compensation is included as a special case of motion-compensating prediction, if the displacement vector is zero.

2.3 Background prediction

A background predictor is used to predict uncovered areas that have been transmitted previously and were covered temporarily by a moving object. If the reconstructed signal does not change for a certain time interval, it is inserted

into the background memory.

2.4 Predictor selection unit

The predictor selection unit estimates, which amount of data will result from either intraframe prediction, motion-compensating prediction, or background prediction, and selects the best prediction algorithm. The prediction mode is coded jointly with the displacement vectors and transmitted.

2.5 Quantization

A set of quantizers with different numbers of representative levels is used. The quantizer selection is forward-controlled and the quantization mode is transmitted. The choice of the quantizer should take into account both the subsampling mode and the disposable amount of bits.

2.6 Spatial interpolation and conditional replenishment

For a flexible adaptation of the codec to spatial detail of the scene contents and to the transmission rate adaptive spatial subsampling and interpolation is used. A subsampling mode signal indicates, which samples shall be transmitted in a certain area of a field. Further, the transmission of prediction errors can entirely be suppressed for other areas. An optional lowpass filtering before subsampling improves the overall picture quality. The reconstruction of the omitted samples is done by a spatial interpolation of the reconstructed signal or by insertion of the prediction signal.

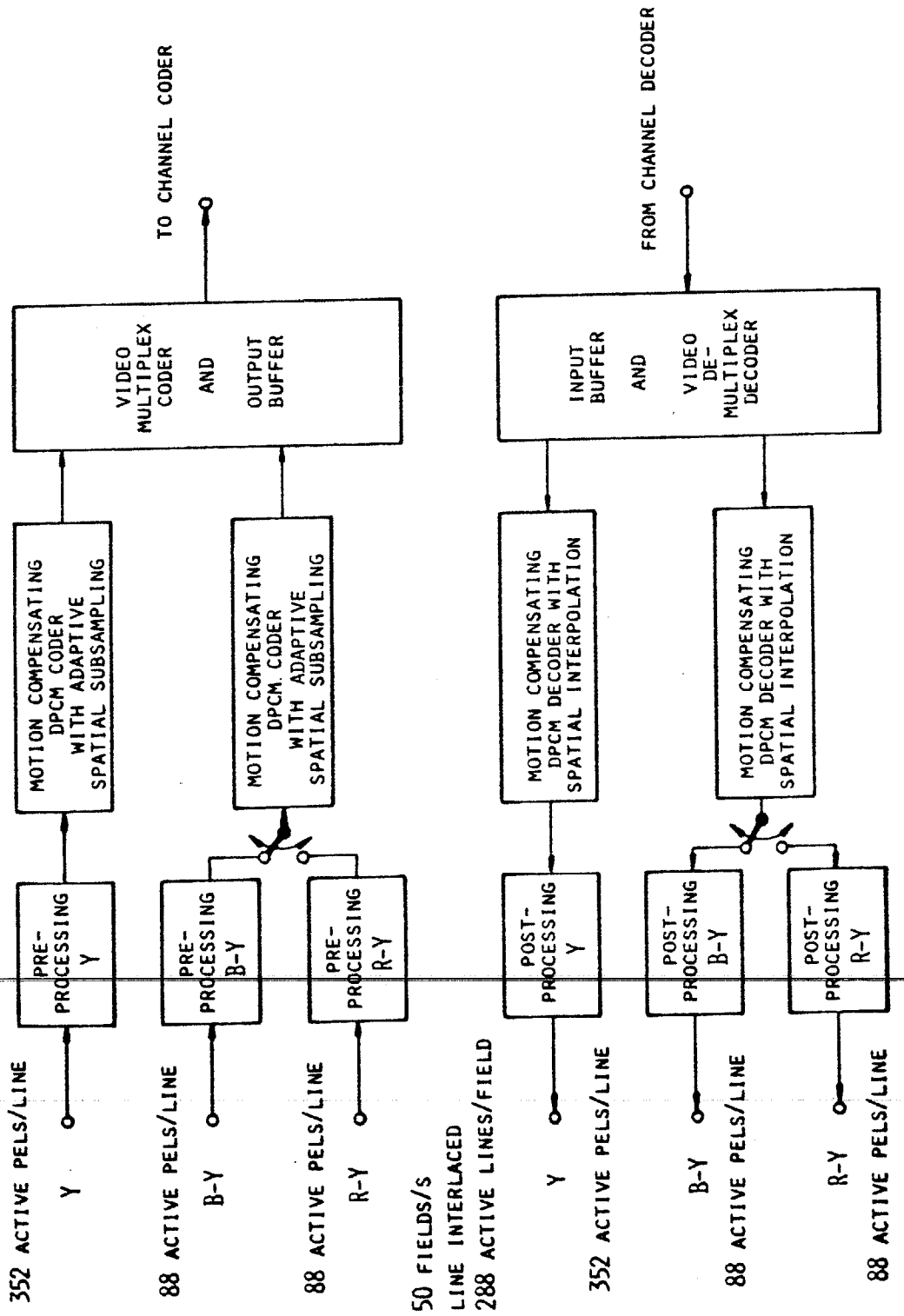

FIG.1 - BLOCKDIAGRAM OF THE PREDICTIVE VIDEOCONFERENCE CODEC

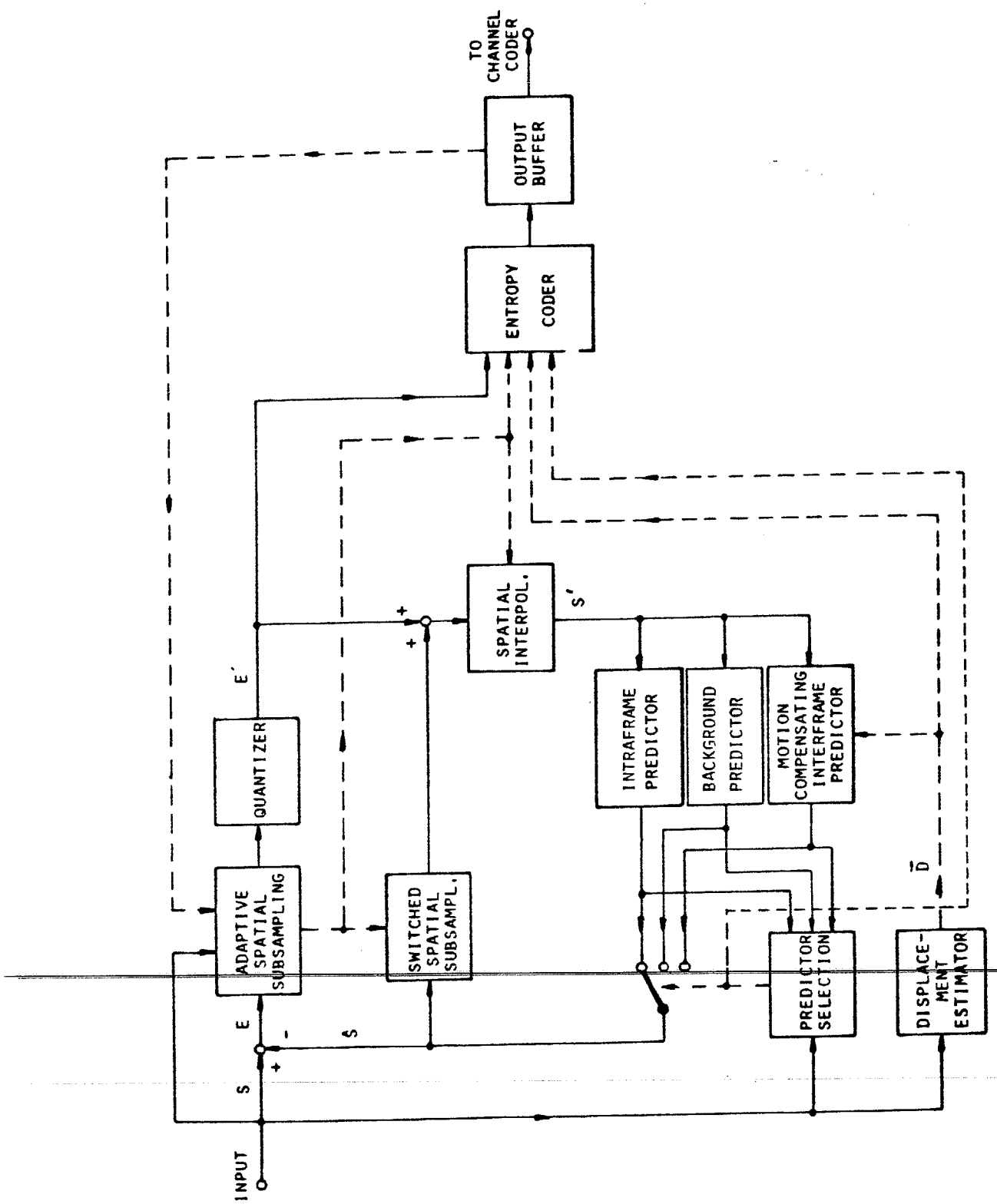

FIG.2 - MOTION-COMPENSATING DPCM-CODER WITH ADAPTIVE SPATIAL RESOLUTION