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CCITT
STUDY GROUP XV
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TITLE: CODING OF REPETITIVE MOTION WITH REFERENCE MEMORIES

1. The principle of the reference method

In video telephony / video conference the camera often sees a stationary background with one or more persons gesticulating in front. Sometimes the video coding algorithm is overloaded with large movement in the picture, like for instance when a person is changing place or waving hands or when somebody is moving behind the front person.

During this kind of movement the stationary background is partly

a) hidden by the leading edge of the moving object
b) revealed by the trailing edge of the object.

In both cases the corresponding picture areas are considered to be chanced and need to be coded and transmitted to the receiver. The coding of the latter case, where previously known background is once again revealed, can be greatly simplified by using at least one reference memory both in the coder and in the decoder.

A reference memory is a picture memory, whose contents do not change as often as the contents of the normal picture memory. When the video picture repeats previously displayed and stored patterns, blocks from these areas can be fetched from the reference memory, displayed as such or used as prediction values.

In the example depicted above, only a few code words are needed to restore the stationary background with perfect accuracy, however detailed it might be!

2. How to update reference memories

The contents of the reference memories can be stored from the transmitted picture in various ways:

- storing the received picture at camera switch on and at regular/irregular time intervals thereafter,

- integrating new pictures into the old picture with different time constants, or

- combining the updating of the reference memory with the codec refresh method

The number of reference memories need not be restricted to one. Several memories can be used with different updating strategies.

3. Implementation of the reference method in the CCITT codec

Implementation of the reference memory principle is straightforward in any conditional replenishment codec.

Coder

When motion compensation is used, the coder searches for the best match of each new block in its old picture memory. Now the coder has to check for matches in the reference memory (-ies) as well. Comparing the new block to reference memory is, however, easy to implement as no address offsets need to be calculated.

Signalling

The use of reference memory can be signalled to the receiver as a special motion vector code or in block type code.

Decoder

In the decoder only the old picture memory has to be larger. No extra constraints on memory speed etc.

4. Conclusion

The reference method is easy to implement in any conditional replenishment codec. It supports the codecs normal coding algorithm in situations, where the codec is often overloaded. It is especially valuable in low-bit rate coding, where codec overloading is reached all too easily.

DEMONSTRATION TAPE