Telecommunication Standardization Sector
Study Group 15
Experts Group for ATM Video Coding
(Rapporteur's Group on Part of Q.2/15)

Document AVC-543
July 1993

INTERNATIONAL ORGANISATION FOR STANDARDISATION
ORGANISATION INTERNATIONALE DE NORMALISATION
ISO-IEC/JTC1/SC29/WG11
CODED REPRESENTATION OF PICTURE AND AUDIO INFORMATION

ISO-IEC/JTC1/SC29/WG11/MPEG93/635

Source: I. Parke, M.E.Nilsson, BT Labs
Title: Accuracy requirements of up-sampling
Purpose: Information and proposal

It is currently unclear how up-sampling of the lower layer coded picture for prediction of the upper layer should be specified. The aim of this experiment was to investigate how inaccurately the up-sampling could be specified without having a noticeable effect on the decoded higher layer pictures. This was investigated by using various different upsampling methods in the decoder, while retaining the same up-sampling in the encoder.

It was thought that this process would not need to be specified very accurately as errors in up-sampling would not accumulate: they would go into the loop once, and circulate until being replaced by other up-sampling errors.

Experiments

The calendar and cheerleader sequences were used. The lower layer was coded with MPEG-1 at 1.5Mbit/s, and the upper layer with an additional 2.5Mbit/s, using spatio-temporal switching.

Four tests were done:

1) Normal up-sampling was performed by the decoder, using a horizontal and vertical interpolator with taps -12 0 140 256 140 0 -12;

2) Up-sampling was performed by the decoder, using the same vertical interpolator as test 1, but a horizontal interpolator with taps 128 256 128;

3) Up-sampling was performed by the decoder, using the same horizontal interpolator as test 2, but a vertical interpolator with taps 128 256 128;

4) Up-sampling was performed by the decoder, using pel and line repeating to perform the up-sampling;

Results

The decoded pictures of test 1 were found to be exactly the same as those produced by the encoder.

There was no noticeable difference in subjective picture quality between tests 1, 2 and 3. The results of test 4 were poor: there was noticeable ringing on some edges, and more flicker than in the other tests.

Conclusion

The up-sampling process does not need to be performed exactly the same in the encoder and decoder to get the same subjective picture quality at the encoder and the decoder. The most simple interpolation in the decoder appears to provide satisfactorily pictures, but pel and line repeating produces poor pictures.

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