INTERNATIONAL ORGANIZATION FOR STANDARDISATION

ORGANISATION INTERNATIONAL DE NORMALISATION

ISO/IEC JTC1/SC29/WG11

CODING OF MOVING PICTURES AND ASSOCIATED AUDIO INFORMATION

Title:	Experiments on coefficient scanning (F.5)
Purpose:	Information and discussion
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1. Introduction:

This contribution describes experimental results comparing the performance of coefficient scanning for transmission as a method of spatial/temporal localization of errors and normal slice based transmission as in TM3. Coefficient scanning is proposed as a method of separating MPEG data into a High Priority (HP) and Low Priority (LP) components and transmitting the data so that the loss rate suffered by the HP component during transmission is negligible. When losses occur on the LP channel the error concealment at the decoder is done using the partial HP data that is available for each part of the image. An experiment is carried out in which the image quality performance of coefficient scanning, with particular values for the data breakup between HP and LP channels for the different frames-types, at particular values of LP loss rate, is compared to the performance of a standard TM3 bitstream at equivalent overall packet loss rate.

2. Simulation conditions:

The simulations were done using a frame-structure picture, field/frame prediction and TM-3 syntax. The coefficient scanning approach was implemented as described in the F.5 core experiment. The packet transmission was modeled with a packet structure as in TM-3, where errors are reliably detected and signalled by the network level. The MPEG-2 bitstream was packetized into 47-byte data packets as suggested in TM-3, where the errors are generated as suggested in the document. Experiments 3 and 4 of core experiment F.5, which specify the nature of the error concealment to use, were carried out at packet loss rates of 10^{-2} and 10^{-3}. These were run for the Mobile and Bus sequences with N=15, M=3 and HPfrac of 0.6, 0.25 and 0.15 for the I, P and B frames respectively.

3. Simulation Results:

The experiments basically compared performance at the same overall loss rate for the two transmission approaches, with and without coneffieient scanning and separtion of data. It was basically observed that the coefficient scanning approach gives performance gains compared to conventional TM3. The gains are more signifcant at the higher loss rate of 10^{-2} packets/sec and is in the order of 4-5 dB at this point.

Priority Experiment	PSNR (dB)		
Conditions of expt.	No. Error	10^{-3}	10^{-2}
Bus with coeff. scanning	30.700	30.446	29.493
Bus without coeff. scanning		29.486	24.760
Mobile with coeff. scanning	28.018	27.977	27.562
Mobile without coeff. scanning		27.426	23.622

Table 1: Comparison of performance with and without coefficient scanning

A D-1 tape demonstrates the experimental results.

4. Conclusions:

The coefficient scanning approach for transmission provides an additional measure of robustness to the transmitted MPEG bitstream and offers added protection from channel errors. The gains are more significant for higher loss rates. An added advantage is that the error concealment approaches with coefficient scanning are less critical in determining the decoder performance. With this approach the transport mechanism is hierarchical while the image coding is not a scalable algorithm. Hence there is minimal image coding penalty in the no error case.