INTERNATIONAL ORGANIZATION FOR STANDARDISATION
ORGANISATION INTERNATIONAL DE NORMALISATION
ISO/IEC JTC1/SC29/WG11
CODING OF MOVING PICTURES AND ASSOCIATED AUDIO INFORMATION

ISO-IEC/JTC1/SC2/WG11
MPEG93/107
AVC-~~407~~ 406
January 1993

Title: Experiments on structured packing with error concealment
Purpose: Information and discussion
Authors: M. Uz, H. Sun, W. Kwok
On behalf of: David Sarnoff Research Center

1. Introduction:

This contribution describes some experimental results on structured packing error concealment techniques, documented as core experiment F.8. In a simple experiment with frame structure MPEG-2 syntax, the number of macro-blocks between absolute-address macroblocks was varied. The overhead associated with each condition is different, resulting in a slight difference in basic quality where the large intervals perform better than in small intervals in the no-error case. The amount of the picture which is damaged in an error is also variable, which causes the small intervals to perform better than large intervals in the case of high error rates.

2. Experiment conditions:

The simulations were done using a frame-structure picture, field/frame prediction and TM-3 syntax. For these experiments, the absolute-MB interval was set to 4, 11, and 22 MB's. 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 Requirements document with a cell loss rate ranging from 10^{-3} to 10^{-2} . The test material was Mobile&Calender and Bus encoded at 4 Mbps, M=3 and N=15. The picture size was 704 x 480, 30 frames/sec. This experiment assumes an appropriate transport format which reliably detects transmission errors. The structured packing pointer is used to resynchronize the bitstream when errors occur.

When errors are detected, the following concealment was used.

> lost MBs in I-frame are replaced by co-located MBs in the previous frame. While lost MBs in P and B-frame is temporally replaced by the previously decoded anchor frame using motion vectors decoded for the MB immediately above.

3. Simulation Results:

An alternative to structured packing is to use small slices. The performance of small slices is shown inTables 1 and 2 for Mobi and Bus respectively. For the cases of slice size of 4 and 22, are compared to absolute-MB in Table 3 and 4. For this comparision, a slice size of 44 MB's was used in the absolute-MB case, however the absolute-MB intervals were varied. For small slices of 4 MB's, the absolute-MB method is 0.3 dB better for Mobi and identical for Bus. For 22 MB slices, the absolute MB method is 0.09 dB worse for Mobi and 0.3 dB worse for Bus. The channel conditions for structured packing are with no-errors and CLR of 10^{-2}. These results are given in Table 5 and 6. Use of small absolute-MB interval results greater that 2 dB improvement at CLR of 10^{-2}.

Mobi at 4 Mbps M=3, N=15	SNR (dB)			
	slice size of 4	slice size of 11	slice size of 22	slice size of 44
No loss	27.68	28.25	28.40	28.47
CLR of 10^{-2}	26.47	25.94	24.75	22.53

Table 1. Mobi simulation results for slice syntax while varying slice size.

Bus at 4 Mbps M=3, N=15	SNR (dB)			
	slice size of 4	slice size of 11	slice size of 22	slice size of 44
No loss	30.10	30.75	30.91	30.99
CLR of 10^{-2}	27.63	26.84	24.66	23.06

Table 2. Bus simulation results for slice syntax while varying slice size.

Mobi at 4 Mbps M=3, N=15		
	Slice-size	absolute MB
4	27.68	28.02
22	28.40	28.31

Table 3:Comparison of Slices versus absolute MB or Mobi

Bus at 4 Mbps M=3, N=15		
	Slice-size	absolute MB
4	30.10	30.09
22	30.91	30.38

Table 4:Comparison of Slices versus absolute MB or Bus

Absolute-MB interval	SNR (dB) at CLR	
	no-error	10^{-2}
4	28.02	26.01
11	28.25	24.84
22	28.31	23.60

Table 5: Concealment results for 150 frames of Mobi.

Absolute-MB interval	SNR (dB) at CLR	
	no-error	10^{-2}
4	30.09	26.63
11	30.38	24.84
22	30.75	24.60

Table 6: Concealment results for 150 frames of Bus.

A D-1 tape demonstrates the experimental results.

4. Conclusions:

The structured packing method permits efficient transmission of small slice-sizes by eliminating the need for a 32 bit slice start-code. Using absolute-MB intervals of 4 results in 0.3 dB loss in the no-error performance for Mobi relative small slices, while the results for Bus are identical. At a CLR of 10-2, the case of 4 MB interval has a 2.4 dB advantage over the 22 MB case with Mobi and a 2.06 dB advantage for Bus with the same parameters. The interval of absolute MB's is a channel coding decision, and depends on things like transport packet-size, etc., however the technique is generic.