ISO/IEC JTC1/SC29/WG11
MPEG93/
March, 1993

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

Document AVC-458
April, 1993

Source : Japan
Title : Experiments on error concealment with Data Partitioning
Purpose : Information

1.Introduction

Data Partitioning is proposed as an effective technique for error resilience such as cell loss (MPEG93/240). In this document, the results of experiments for Data Partitioning is described. In the experiments, MPEG2 bitstream is partitioned into two bitstream (base and additional) and the bitstreams are transmitted via two prioritized channels. Cell loss is generated only in lower priority channel which transmits additional bitstream. Some simple error concealments are applied for damaged macroblocks at decoder.

2.Simulations

Data Partitioning and the concealments are implemented on TM3. Simulation conditions are shown in Table 1. Syntax and semantics have not been fixed, so the definition of PBP shown in Fig.1 is adopted. The syntax and semantics are based on the description in MPEG93/240 . Any headers are not contained in the additional bitstream.

First I-picture is assumed to be decoded without error.

seq.header GOP header pic.header	MB type	MC vector	CBP	DC or 1st nonzero COEF	2nd nonzero COEF	3rd nonzero COEF	...	EOB

PBP67 <==========> <----------
PBP0 <==========> <----------
PBP1 <==========> <----------

<==> data transmitted via High Priority Channel (HPC)
<----> data transmitted via Low Priority Channel (LPC)

Fig.1 Definition of PBP

Table 1 Simulation conditions

bitrate	4Mbps
(N,M)	(150,1)
prediction	frame/field adaptive
structure	frame
rate control	TM3 (step 3)
sequence	Flower Garden 30 frames
	Football 30 frames
PBP	0 (up to 1st coef), 67 (up to MCV) ,1 (up to 2nd coef)
CLR	1E-2,1E-3 (burst length 2)
refresh	Intra-slice (PBP=63 : all data are transmitted via High Priority Channel)
concealment	-substitute with the co-located macroblock (1 layer, intraMB in PBP=67)
	-substitute with the base layer macroblock (otherwise)
re-synchronization point	slice_start_code (44 macroblocks per slice)
rate control in base layer	none

3.Simulation results

Table 2 shows the simulation results.

Table 2 Simulation Results

CLR	method	Flower Garden			Football		
		SNR for Y (dB)	HPC bits(%)	CLR in LPC	SNR for Y (dB)	HPC bits(%)	CLR in LPC
0	TM3	28.61	0	0	31.48	0	0
1E-3	TM3	27.21	0	0.73E-3	30.38	0	0.74E-3
	PBP0	28.53	46.6	1.36E-3	31.25	40.8	1.25E-3
1E-2	TM3	22.83	0	0.75E-2	25.63	0	0.74E-2
	PBP0	27.66	46.6	1.40E-2	30.69	40.8	1.26E-2
	PBP1	27.91	60.3	1.89E-2	30.82	54.2	1.62E-2
	PBP67	27.52	28.2	1.04E-2	29.87	23.3	0.97E-2

4.Conclusion

Data partitioning is a effective technique for error resilience. With PBP value 0 most of the errors are concealed completely even in a very high cell loss rate such as 0.01. However, in intra macroblocks, concealment is not enough. In order to conceal the error in intra macroblocks, more coefficients are required to be transmitted via high priority channel. Table 3 shows the example of the modification based on MPEG93/240.

Table 3 Example of PBP(k) values and their modified semantic interpretation

PBP(k)	Data carried in Cannel k	
	for inter macroblocks	*for intra macroblocks*
65	All data at Sequence, GOP, Picture and slice layers down to the PBP(k) code.	
66	All data at covered by PBP(k)=65, plus MB data starting with MB stuffing and ending with MB type.	
67	All data at covered by PBP(k)=66, up to MB motion vectors.	*All data at covered by PBP(k)=66, up to DC coefficient.*
0	All data at covered by PBP(k)=67, plus MB data starting with CBP and up to DC coefficient or first nonzero coef.	*All data at covered by PBP(k)=67, up to first following DC coefficient after the 2nd coefficient in the scan order*
1	All data at covered by PBP(k)=0, up to first following DC coefficient or first nonzero coefficient after the first coefficient in the scan order	*All data at covered by PBP(k)=67, up to first nonzero coefficient after the 3rd coefficient in the scan order*
2	All data at covered by PBP(k)=0, up to first nonzero coefficient after the 2nd coefficient in the scan order	*All data at covered by PBP(k)=67, up to first nonzero coefficient after the 4th coefficient in the scan order*
...		
j	All data at covered by B(k)=0, up to first nonzero coefficient after the j-th coefficient in the scan order	*All data at covered by B(k)=67, up to first nonzero coefficient after the (j+2)-th coefficient in the scan order*