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SOURCE : JAPAN

TITLE : EXPERIMENTS ON DATA PARTITIONING BY PBP

PURPOSE : Information

Relevant sub-group : Video

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1. Introduction

The data partitioning method by Priority Break Point (PBP) has been proposed as one of the error resilience techniques by layering.

The PBP method is different from other scalable layering schemes, because coder will use all layers information for next prediction in each layer. Therefore, if Main Profile decoder can decode the lowest layer (HP channel) only, mismatch error between coder and decoder will be caused to degrade the picture quality remarkably by accumulation of error.

In this document, the picture quality degradation has been examined, when only the lowest layer information partitioned by PBP is decoded from the bit stream coded according to Test Model. The reproduced picture will be shown by D1 demonstration.

2. Simulation conditions

TM3, low delay mode(M=1), Frame structure, Fr/Fi adaptive
Bitrate: 4Mbit/s
Rate control: without Step 3
Refresh period: 2 slice/frame (when refresh is on)
Sequence: Flower Garden, Mobile & Calender 5 seconds each (150 frame)
All coefficients were decoded in the first I picture.

Compared parameters

PBP value
- PBP= 0 (upto DC or 1st non zero coefficient)
- = 1 (upto 2nd non zero coefficient)
:
- = 4 (upto 5th non zero coefficient)

refresh by Intra Slice
- off (no refresh)
- on (all coefficients in forced Intra Slice were decoded)
- on+PBP (same PBP value was also applied for forced Intra Slice)

3. Results

Table 1 shows the luminance SNR and Table 2 shows the amount of the information assigned to the lowest layer.

By observing the reconstructed picture, the picture quality degraded remarkably and grew worse according to passing of time. Much degradation was observed at the newly appeared part from the picture edge by panning of a camera and the periphery of a trunk of a tree in "Flower garden", where was considered to be coded by Intra or had much prediction error. However, the quality degradation was relatively small where motion compensated prediction worked effectively.

Accumulation of error could be avoided and the picture quality was improved by utilizing the Intra Slice refreshing. It should be noted that forced Intra Slice was visible and annoying for human vision.

When the same PBP value was also applied to the forced Intra Slice, the picture quality became worse due to low resolution though error had not been accumulated. The area with small prediction error also had poor quality by Intra Slice updating with low resolution.

In case of PBP=3 or 4 with refresh on, good picture could be obtained even if the lowest layer only was decoded. However, more than 80 % of whole information is necessary to be assigned to the lowest layer.

Table 1 Comparison of luminance SNR (dB).

Sequence	Flower Garden			Mobile & Calender		
Intra Slice	off	on	on+PBP	off	on	on+PBP
PBP = 0	17.48	21.48	17.91	18.64	22.30	17.67
PBP = 1	19.11	22.84	18.86	20.38	23.32	18.66
PBP = 2	20.39	24.11	20.48	21.58	24.14	20.17
PBP = 3	21.32	25.10	21.65	22.45	24.76	21.06
PBP = 4	22.40	25.91	22.27	23.11	25.27	21.78
TM3 original	29.48	28.87	28.87	28.19	27.60	27.60

Table 2 Amount of the lowest layer information (%).

Sequence	Flower Garden			Mobile & Calender		
Intra Slice	off	on	on+PBP	off	on	on+PBP
PBP = 0	45.8	61.3	44.2	43.9	60.4	42.2
PBP = 1	59.8	72.4	57.2	56.3	70.3	54.0
PBP = 2	70.4	80.4	67.0	65.7	77.4	63.1
PBP = 3	78.4	86.2	74.3	72.9	82.6	69.9
PBP = 4	84.3	90.2	79.7	78.6	86.5	75.1
TM3 original	100.0	100.0	100.0	100.0	100.0	100.0

4. Conclusions

This document has examined the picture quality degradation, when only the lowest layer information partitioned by PBP was decoded.

Because of accumulation of mismatch error between coder and decoder, it was found to be difficult for the Main Profile decoder to obtain adequate picture quality for practical use from the lowest layer only, even if the Intra Slice updating was used.

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