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TITLE: Simulation result on spatio-temporal weighting
PURPOSE: Discussion

1. Introduction

A simulation was carried out on compatibility within a framework of spatio-temporal weighting like TM2 core experiment 1(b): case 2 description. Combinations of weighting coefficients were partly different from those of core experiment.

2. Simulation condition

The simulation conditions were as follows.

TM2 (Rio version) M=3, N=15 Fr structure, Fr/Fi prediction
bitrate MPEG1 layer : SM3 1.15 Mbps Total bit rate : 4 Mbps
sequences; Football (new), Flower Garden (2 seconds)
Motion vector search range
base layer ±7.5 pel/fr (FG), ±15 pel/fr (FB)
upper layer ±15 pel/fr (FG), ±30 pel/fr (FB)

Prediction signal was selected from the base layer, upper layer, and the weighted addition of both for odd and even field independently. So, if we use the same description as TM2 core experiment, the combinations of weighting coefficients (w1,w2) were
(1,1/2), (1,0), (1/2,1), (1/2,1/2), (1/2,0), (0,1), (0,1/2), (0,0),
and the most proper combination was selected to make prediction signal. For these 8 combinations, compatible type was extended from 2 bits to 3 bits and applied.

3. Simulation result

Table 1 shows the simulation result. The table shows the SNR and the percentage of compatible mode selection in the form of;

SNR for a whole sequence (SNR for I pictures; SNR for P pictures; SNR for B pictures)

and

the percentage of compatible mode selection for I pictures; the same for P pictures; the same for B pictures.

The results show that a 0.08 dB higher SNR was obtained for " Football " and a 0.25 dB higher SNR was obtained for " Flower Garden " by weighting.
It seems that prediction efficiency itself was improved by weighting, as the percentage of compatible mode selection was increased. Although, the improvement of SNR

comparing the prediction from the base layer mode was smaller than was expected. The reason is thought to be from the difference between the amount of motion vector information spent for each method. When the prediction from base layer is applied, it is not necessary to transmit motion vector information. On the other hand, spatio-temporal weighting method cannot make use of this merit.

4. Problem for spatio-temporal weighting

Spatio-temporal method use 3 reference picture simultaneously when weighting was applied to an interpolated upper layer prediction picture in B picture and to a base layer prediction picture. There seems to be a memory bandwidth increase for spatio-temporal weighting method.

5. Conclusion

A simulation was carried out on spatio-temporal weighting. Improvement obtained by weighting was 0.25 dB for Flower Garden and 0.08 dB for Football. A problem of memory bandwidth increase was also pointed out. This improvement seems to be small compared with the hardware complexity. Our feeling is that the current prediction from the base layer seems to be more adequate, considering total performance.

END

Table 1 Simulation result

Football

	(I; P; B)	compatible mode (%)
Simulcast (2.85 Mbps)	33.45 (34.42; 33.42; 33.38)	
prediction from base layer	35.31 (35.76; 35.82; 35.08)	100; 76.9; 41.0
spatio-temporal weighting	35.39 (35.66; 35.87; 35.19)	100; 92.0; 67.1

Flower Garden

	SNR (I; P; B)	compatible mode (%)
Simulcast (2.85 Mbps)	27.92 (28.38; 27.65; 27.99)	
prediction from base layer	28.79 (28.55; 28.72; 28.85)	99.9; 52.5; 15.2
spatio-temporal weighting	29.04 (28.65; 29.06; 29.07)	99.9; 77.2; 37.7