

SOURCE : Japan

TITLE : Simulation results on prediction and DCT mode coupling for S-FAMC
(Core Experiment No.8 on prediction modes)

PURPOSE : information

This document just informs the content of the contribution from Matsushita that will be submitted to CCITT/MPEG joint session at Tarrytown on 29 Sept. - 1 Oct.

1. Abstract

This document addresses the S-FAMC prediction and DCT mode coupling for inter macro block, which is related to core experiment No.8 on prediction modes. S-FAMC with frame DCT and with field/frame DCT have been compared and it is concluded that S-FAMC needs the field/frame DCT for rapid motion sequences. The simulation results will be demonstrated by D1 tape.

2. Simulation conditions

The S-FAMC with frame DCT and with field/frame DCT for inter macro block have been compared under the following conditions. For intra macro block, adaptive field/frame DCT have been always applied.

- Picture format = 4:2:0
- Bit rate = 4Mb/s with Step2 rate control
- Coding structure = frame structure with M=3, N=12
- Prediction = S-FAMC with frame based averaging as interpolation mode for B-picture
- ME = Telescopic ME for S-FAMC with half pel accuracy. (Appendix H in TM2)
- Sequence 0-59 frames (2 seconds)
- DCT mode: Intra macro block: field/frame DCT
Inter macro block: frame or field/frame DCT

3. Results

The simulation results are shown in Table 1 and Table 2.

Table 1 SNR for luminance (dB)

	frame DCT	frame/field DCT
Flower Garden	30.98	31.03 (+0.05)
Mobile&Calendar	28.91	28.89 (-0.03)
Football	31.84	32.20 (+0.36)
Bicycle	28.24	28.37 (+0.13)

Table 2 The ratio of each DCT mode in field/frame DCT method
(a) Flower Garden **(b) Mobile & Calendar**

		field DCT	frame DCT
Intra MB	I-frame	38.0 %	62.0 %
	P-frame	78.5 %	21.5 %
	B-frame	65.9 %	34.1 %
	Average	47.3 %	52.7 %
SFAMC MB	P-frame	37.5 %	62.5 %
	B-frame	33.0 %	67.0 %
	Average	35.0 %	65.0 %
Frame MB (Intp.)	B-frame	35.4 %	64.6 %

		field DCT	frame DCT
Intra MB	I-frame	26.1 %	73.9 %
	P-frame	24.9 %	75.1 %
	B-frame	9.0 %	91.0 %
	Average	23.6 %	76.4 %
SFAMC MB	P-frame	30.7 %	69.3 %
	B-frame	33.3 %	66.7 %
	Average	32.4 %	67.6 %
Frame MB (Intp.)	B-frame	27.6 %	72.4 %

(c) Football

		field DCT	frame DCT
Intra MB	I-frame	43.5 %	56.5 %
	P-frame	61.3 %	38.7 %
	B-frame	7.6 %	92.4 %
	Average	39.3 %	60.7 %
SFAMC MB	P-frame	29.7 %	70.3 %
	B-frame	25.8 %	74.2 %
	Average	27.3 %	72.7 %
Frame MB (Intp.)	B-frame	28.9 %	71.1 %

(d) Bicycle

		field DCT	frame DCT
Intra MB	I-frame	68.9 %	31.1 %
	P-frame	73.9 %	26.1 %
	B-frame	67.5 %	32.5 %
	Average	69.0 %	31.0 %
SFAMC MB	P-frame	58.7 %	41.3 %
	B-frame	52.7 %	47.3 %
	Average	54.8 %	45.2 %
Frame MB (Intp.)	B-frame	55.2 %	44.8 %

For the rapid motion sequence field/frame DCT improves SNR significantly from frame DCT. The less noise can be viewed at the rapid motion area by introducing the field/frame DCT. In field/frame DCT method, 30-50% macro blocks are selected to field DCT in inter macro block and 25-70% in intra macro block. The simulation results will be demonstrated by D1 tape.

4. Conclusion

It appears that field/frame DCT improves the image quality significantly at the rapid motion area on S-FAMC prediction. Therefore we think the adaptive field/frame DCT should be remain in Test Model for inter and intra macro blocks.