CCITT SGXV
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Title : Simulation results on half pixel accuracy motion estimation
Purpose : Information

1.INTRODUCTION

Motion compensation in half pixel accuracy is a very efficient scheme on moving picture data compression. Two methods are proposed for motion estimation in half pel accuracy. One is the estimation using the reconstructed pictures for reference picture. Another is using the input picture. Some simulations are performed to measure the coding efficiency of the half pixel motion prediction system with the two method.

2.SIMULATION

Coding scheme used for the simulations is based on MPEG92/79 which is a field base coding with multi_field prediction. Half pixel motion vectors are calculated with 2 step search. In the first step, integer pixel motion estimation is performed. In the second step, half pixel motion estimation is performed in eight neighboring position. In the second step, two types of estimation method are employed: 'SM3 method' and 'reconstructed method'. SM3 method is based on SM3 and motion estimation is performed using only input (non_coded) pictures in both steps. Reconstructed method is proposed by NTA (MPEG91/270). Reconstructed pictures are used in half pixel motion estimation. The coding efficiency of reconstructed method and SM3 method is compared in the simulations.

In order to measure the improvement of both method, the third simulation is performed without half pixel motion compensation ('without halfpel'). The specifications of the simulations are shown in Table 1.

Table 1 Specifications of simulation

	Reconstructed	SM3	without halfpel
Half pixel reference	reconstructed pic.	input pic.	no
Motion estimation	+- 15.5pel		+- 15.0pel
	Full search		
Base coding	MPEG92/79 (field base), SM3		
Halfpel interpolation	SM3 (linear interpolation)		
Sequence	Mobile&Calendar(120fields), Football(60fields), 4:2:0		
Bit rate	4Mbps		
Rate control	MPEG92/77 (without step3)		
Frame type ratio	N=24,M=3		

4.SIMULATION RESULTS

Table 2 shows the simulation results of S/N of luminance signals.

Table 2 Simulation results of half pixel motion estimation

		S/N (dB)		
sequence	picture type	Reconstructed	SM3	without halfpel
Mobile&Calendar	Total	27.29	27.29	25.32
	I	28.68	28.69	27.69
	P	27.94	27.94	26.00
	B	26.96	26.97	24.94
Football	Total	32.14	32.10	31.20
	I	34.18	34.19	33.92
	P	32.74	32.71	31.81
	B	31.79	31.74	30.83

5.CONCLUSIONS

In Mobile&Calendar sequence, SNR's of the two methods are almost same. In Football sequence, half pixel motion estimation with reconstructed picture exhibits better quality in SNR. However, the degree of the improvement is rather small in comparison with the improvement of half pixel motion estimation.