

1. Introduction

This document discusses the following two simulation results on scene change detection.

- (1) The difference between the method without any specific scene change detection(normal RM8) and the method with scene change detection that all the Macro blocks are fixed to Intra Mode at the scene change frame on assumption that scene change was known previously
- (2) The improvement in SNR when all the Macro Blocks in the next frame of scene change are fixed to quantizer stepsize 32 with either inter or intra judged by inter/intra switch

2. Simulation and Result

The following simulation is performed under these conditions.

- 1)The transmission buffer size is assumed infinite.
- 2)The scene change is from Claire sequence to Salesman sequence
- 3) $q = 1$, 10Hz and FCIF

(1)Simulation 1

Two methods are compared.

Method 1 : Without any specific scene change detection(normal RM8)

Method 2 : All the Macro Blocks at the scene change frame are fixed to Intra Macro blocks on assumption that scene change was known previously

The simulation results are shown in Table 1,2 and Fig.1. The results show that approximately 90% of Macro Blocks are judged as Intra mode without any specific scene change detection and there is no difference in SNR.

(2)Simulation 2

Two methods are compared.

Method 1: Without any specific scene change detection(normal RM8)

Method 3: With scene change detection (A frame is decided scene change if Macro Blocks which are judged Intra by the inter/intra switch exceeds 80% within the frame.) All the Macro Blocks in the next frame of scene change are fixed to quantizer stepsize 32 with either inter or intra judged by inter/intra switch.

The simulation result is shown in Fig.2. According to Fig.2, the luminance SNR improved approximately 0.3dB within 60 frames(6 seconds) after the scene change. However, the improvement gradually decreases after the 60th frame.

3. Conclusion

- (1) It is considered that RM8 works well for scene change sequence without any specific scene change detection.
- (2) If improvements are required, the scene change may be detected using inter/intra information(Any frame with more than certain percentage of Intra may be judged as scene change.). The SNR improves (for example about 0.3dB) by fixing all the Macro Blocks of the next frame of scene change to certain quantizer stepsize (for example 32) with either inter or intra judged by inter/intra switch at the cost of one frame delay.

STATISTICS RM8
MODIFICATION :
SEQUENCE : Scene Change

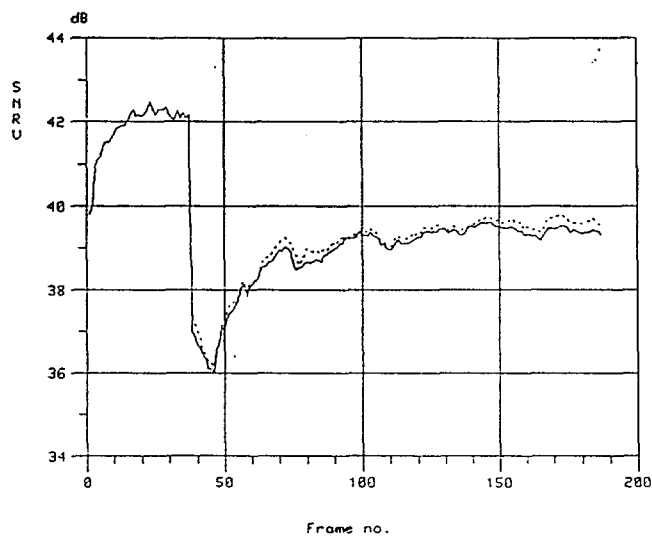
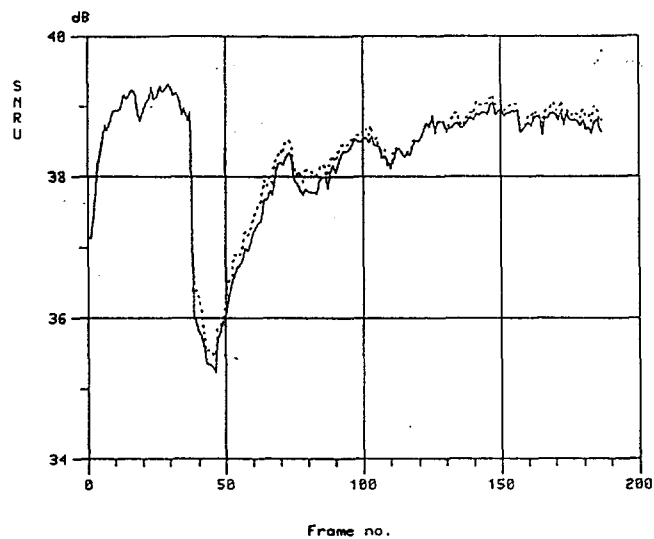
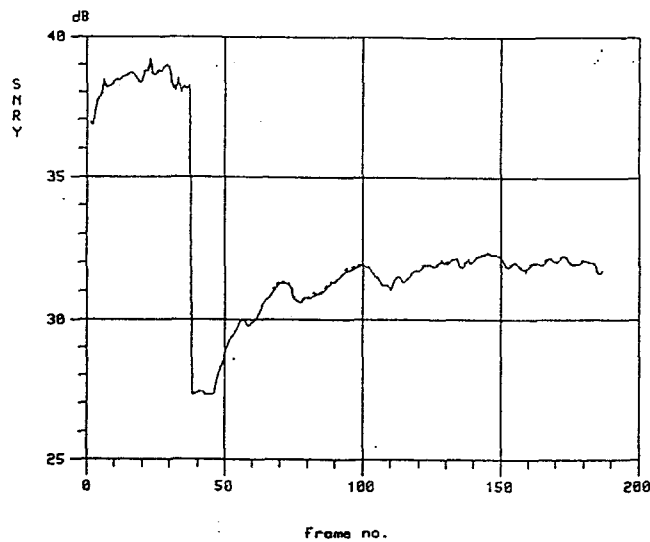
INSTITUTE Matsushita Comm.
FRAME RATE: 10 Hz
— CLAIR —><— SALESMAN —

Frame NO.		37	38	39	40	41
1. RMS FOR LUMINANCE		3.11	11.04	10.99	10.90	10.89
2. SNR FOR LUMINANCE		38.27	27.27	27.31	27.38	27.39
FOR CHROMINANCE(U)		38.93	36.07	35.94	35.80	35.74
FOR CHROMINANCE(V)		42.19	36.97	36.90	36.70	36.60
3. MEAN VALUE OF STEP SIZE		18.83	62.61	64.00	64.00	64.00
4. MEAN VALUE OF THE NUMBER OF NON-ZERO COEFFICIENTS		2.71	1.75	2.57	1.60	1.67
5. MEAN VALUE OF THE NUMBER OF ZEROEZ BEFORE THE LAST NZ-COEFFICIENT		4.89	1.64	6.26	3.41	2.22
6. BLOCK TYPE OF MACRO	! NO MC NOT CODED	279	0	323	307	265
	! INTRA	0	357	0	0	7
	! INTRA Q	0	2	0	0	0
	! NO MC CODED	57	11	17	35	33
	! NO MC CODED Q	5	0	0	0	0
	! MC NOT CODED	7	0	39	36	38
	! MC CODED	46	26	17	18	53
	! MC CODED Q	2	0	0	0	0
7. BLOCK TYPE OF Y	! NO MC NOT CODED	1268	8	1341	1325	1144
	! INTRA	0	1436	0	0	28
	! NO MC CODED	96	36	19	43	48
	! MC NOT CODED	79	27	207	184	276
	! MC CODED	141	77	17	32	88
7. BLOCK TYPE OF UV	! NO MC NOT CODED	666	0	680	684	595
	! INTRA	0	718	0	0	14
	! NO MC CODED	16	22	0	0	1
	! MC NOT CODED	79	8	101	108	178
	! MC CODED	31	44	11	0	4
9. NUMBER OF BITS	! MB ADDRESS	295	396	259	249	286
	! TYPE3	207	1505	168	179	281
	! QUANT2	35	10	0	0	0
	! CBP	550	258	156	226	389
	! END OF BLOCK	568	4666	94	150	366
	! MOTION VECTORS	369	347	433	396	789
	! Y	3518	8225	251	569	964
	! COEFFICIENTS ! U	218	1612	205	0	82
	! V	77	1590	220	0	84
	! TOTAL	3813	11427	676	569	1130
	! DC COEFFICIENTS	0	17232	0	0	336
	! TOTAL	5837	35841	1786	1769	3577

Table 1 Result of Method 1 (RM8)

Frame NO.		37	38	39	40	41
1. RMS FOR LUMINANCE		3.11	10.93	10.92	10.81	10.85
2. SNR FOR LUMINANCE		38.27	27.36	27.37	27.46	27.42
FOR CHROMINANCE(U)		38.93	36.69	36.44	36.28	36.10
FOR CHROMINANCE(V)		42.19	37.40	37.27	37.06	36.88
3. MEAN VALUE OF STEP SIZE		18.83	62.61	64.00	64.00	64.00
4. MEAN VALUE OF THE NUMBER OF NON-ZERO COEFFICIENTS		2.71	1.75	2.63	1.62	1.68
5. MEAN VALUE OF THE NUMBER OF ZEROEZ BEFORE THE LAST NZ-COEFFICIENT		4.89	1.59	6.22	3.84	2.16
6. BLOCK TYPE OF MACRO	! NO MC NOT CODED	279	0	330	306	271
	! INTRA	0	394	0	0	8
	! INTRA Q	0	2	0	0	0
	! NO MC CODED	57	0	17	30	30
	! NO MC CODED Q	5	0	0	0	0
	! MC NOT CODED	7	0	34	38	40
	! MC CODED	46	0	15	22	47
	! MC CODED Q	2	0	0	0	0
7. BLOCK TYPE OF Y	! NO MC NOT CODED	1268	0	1368	1308	1162
	! INTRA	0	1584	0	0	32
	! NO MC CODED	96	0	20	36	42
	! MC NOT CODED	79	0	180	203	266
	! MC CODED	141	0	16	37	82
7. BLOCK TYPE OF UV	! NO MC NOT CODED	666	0	694	672	602
	! INTRA	0	792	0	0	16
	! NO MC CODED	16	0	0	0	0
	! MC NOT CODED	79	0	88	120	170
	! MC CODED	31	0	10	0	4
9. NUMBER OF BITS	! MB ADDRESS	295	396	255	245	281
	! TYPE3	207	1590	149	188	276
	! QUANT2	35	10	0	0	0
	! CBP	550	0	148	224	345
	! END OF BLOCK	568	4752	92	146	352
	! MOTION VECTORS	369	0	377	444	759
	! Y	3518	7920	250	580	918
	! COEFFICIENTS ! U	218	1459	203	0	82
	! V	77	1506	220	0	82
	! TOTAL	3813	10885	673	580	1082
	! DC COEFFICIENTS	0	19008	0	0	384
	! TOTAL	5837	36641	1694	1827	3479

Table 2 Result of Method 2 (Ideal Scene Change detection)

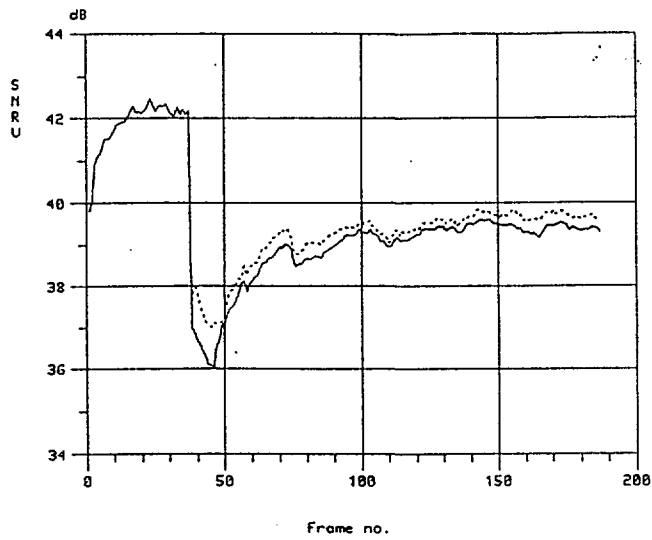
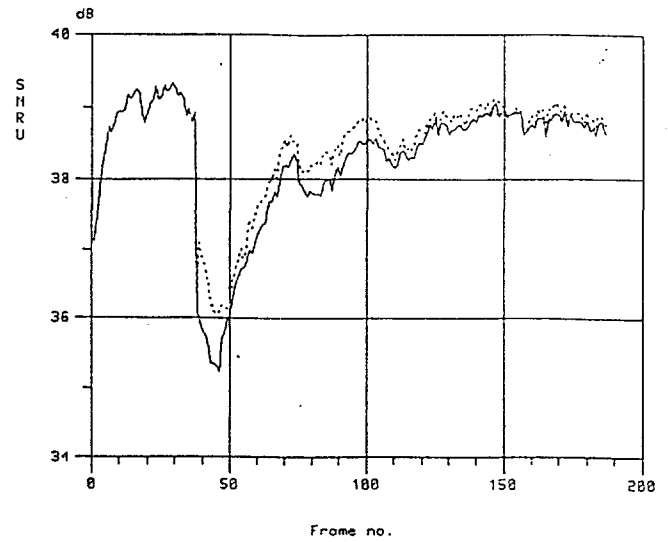
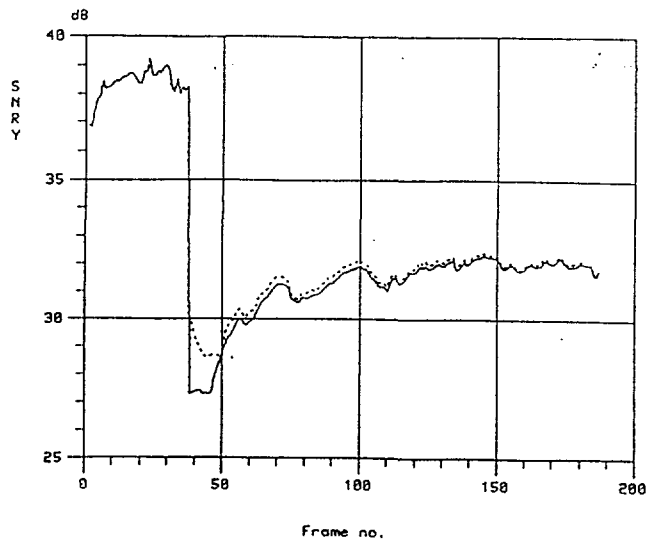


q=1 (10Hz)
FCIF
Scene Change

— Method 1 (RM8)

..... Method 2

Fig 1 SNR for Y U V



--- Method 3

— Method 1(RM8)

Fig. 2 SNR for Y, U, V