CCITT SGXV

Working Party XV/1 Specialists Group on Coding for Visual Telephony SOURCE : Japan TITLE : Scene Change Detection Document #505 June 89

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

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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.

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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						
rran	ie nu.				40	41		
1. RMS FOR L	UMINANCE	3. 11	11.04	10.99	10.90	10.89		
2. SNR FOR L	UMINANCE	38.27	27.27	27.31	27.38	27.39		
FOR C	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 VALU BEFORE TH	VE OF THE NUMBER OF ZEROEZ	4, 89	1.64	6, 26	3. 41	2. 22		
					007	0.05		
D. DLUUK TVDE	INTEA	279	. U 957	323	307	265		
11PE	I INTRA	U	301	0	U	1		
UF MACPO	ININA Q	U 57	4	-17	0 25	U 22		
MACRU	INO MC CODED	51	11	11	30	33		
	INC NOT CODED Q	Э 7	0	20	26	20		
	I MC CODED	1	26	55 17	20 19	30 52		
	! MC CODED Q	40 2	20	0	18	0		
7. BLOCK	I NO MC NOT CODED	1268		1341	1325	1144		
TYPE	! INTRA	1200	1436	0	0	28		
OF	! NO MC CODED	96	36	19	43	48		
Y	! MC NOT CODED	79	27	207	184	276		
	! MC CODED	141	77	17	32	88		
7. BLOCK	NO MC NOT CODED	666	0	680	684	595		
TYPE	! INTRA	0	718	0	0	14		
OF	! NO MC CODED	16	22	0	0	1		
UY	! MC NOT CODED	79	8	101	108	178		
	! MC CODED	31	44		0	4		
9. NUMBER	! MB ADDRESS	295	396	259	249	286		
OF	! TYPE3	207	1505	168	179	281		
BITS		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		
	! <u>1</u> 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		

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Table 1 Result of Method 1 (RM8)

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MODIFICATION: Secure Change CLARE ><	STATISTICS RM8		INSTITUTE Matsushita Comm.						
SEQUENCE : SCHE LARRE LLARE	- MODIFICATIO	N :	FRAME RATE: 10 Hz						
Frame NO. 37 38 39 40 41 1. RMS FOR LUMINANCE 3.11 10.93 10.92 10.81 10.85 2. SNE FOR LUMINANCE 38.97 27.36 27.37 27.46 27.42 POR CHROMINANCE (V) 38.93 35.69 35.44 36.28 36.10 FOR CHROMINANCE (V) 42.19 37.40 37.27 37.06 36.86 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 COEFFICIENT 4.88 1.59 6.22 3.84 2.16 5. MEAN VALUE OF THE NUMBER OF ZEROEZ EBFORE 1E LAST MZ-COEFFICIENT 4.88 1.59 6.22 3.84 2.16 6. BLOCK 1 MOK CODED 275 0 30 306 271 TYPE 1 INTRA Q 0 34 38 40 1 MC CODED 7 0 34 38 162 11 NMC CODED 1268 0 1584	SEQUENCE	: Scene Unange	CLAIRE	>< :	SALESMAN —				
1. RMS FOR LUMINANCE 3. 11 10. 93 10. 92 10. 81 10. 85 2. SNR FOR LUMINANCE FOR CEROMINANCE(U) 38. 93 36. 69 36. 44 36. 28 36. 69 3. MEAN VALUE OF STEP SIZE 18. 83 62. 61 64. 00 64. 00 64. 00 4. MEAN VALUE OF THE NUMBER OF NOM-ZERC COEFFICIENT 2.71 1.75 2.63 1. 62 1. 68 5. MEAN VALUE OF THE NUMBER OF NOM-ZERC COEFFICIENT 4. 89 1. 59 6. 22 3. 84 2. 16 6. BLOCK 1 NOM C NOT CODED 275 0 330 306 271 TYPE 1 INTRA Q 0 24 0 0 0 0 NG CODED 57 0 17 30 30 16 21 41 WC CODED 4 0 128 0 136 116 0 32 0F 1 INTRA Q 0 1286 0 128 0 0 0 0 0F 1 MOK CODED 1265 <	Fram	e NO.	37	38	39	40	41		
2. SNR FOR LUMINANCE 38. 27 27. 36 27. 37 27. 45 27. 42 FOR CROMINANCE(U) 38. 83 35. 69 35. 44 35. 28 36. 69 J. MEAN VALUE OF STEP SIZE 18. 83 62. 61 64. 00 64. 00 64. 00 4. MEAN VALUE OF THE NUMBER OF NOM-ZERC COEFFICIENTS 2.71 1.75 2.63 1.62 1.68 5. MEAN VALUE OF THE NUMBER OF INOM-ZERC COEFFICIENTS 2.71 1.75 2.63 1.62 1.68 5. MEAN VALUE OF THE NUMBER OF INOM-ZERC COEFFICIENT 4.89 1.59 6.22 3.84 2.16 6. BLOCK ! NO MC NOT CODED 273 0 330 306 271 TYPE ! NITRA 0 354 0 0 8 0 MC CODED 2 0 0 0 0 0 0 0 0 MC CODED 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 <td< td=""><td colspan="2">1. RMS FOR LUMINANCE</td><td>3. 11</td><td>10.93</td><td>10.92</td><td>10.81</td><td>10.85</td></td<>	1. RMS FOR LUMINANCE		3. 11	10.93	10.92	10.81	10.85		
POR 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 ! NO MC NOT CODED 278 0 330 306 2711 TYPE ! INTRA 0 394 0 0 8 OF ! INTRA 0 320 306 2711 370 TYPE ! INTRA 0 17 30 30 306 271 MC CODED 7 0 34 38 40 0 33 OF ! INTRA 0 1568 1308 1162 37 TYPE ! NO MC CODED<	2. SNR, FOR LUMINANCE		38. 27	27.36	27.37	27.46	27.42		
POR CHROMINANCE (V) 42.19 37.40 37.27 57.06 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 REPORE THE LAST NZ-COEFFICIENT 4.89 1.59 6.22 3.84 2.16 6. BLOCK ! NO MC NOT CODED 276 0 330 300 8 0F ! INTRA 0 94 0 0 8 0F ! INTRA 0 34 38 40 0 MCRO ! NO MC CODED 7 0 34 38 40 . MC CODED 7 0 34 38 40 0 32 . PO MC CODED 26 0 1584 100 32 47 . MC CODED 1268 0 1368 1308 1162 17 . PO MC CODED 79 0	FOR C	HROMINANCE (U)	38.93	36.69	36.44	36.28	36.10		
3. MEAN VALUE OF STEP SIZE 18. 83 52. 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 EBFORE THE LAST NZ-COEFFICIENT 4. 89 1. 59 6. 22 3. 84 2. 16 6. BLOCK ! NO MC OT CODED 279 0 330 306 271 TYPE ! INTRA 0 394 0 0 8 OF ! INTRA 0 394 0 0 0 0 MC CODED 57 0 17 50 0 0 0 MC CODED 7 0 34 38 40 15 22 47 MC CODED 46 0 15 22 47 10 30 32 OF ! NO MC CODED 1268 0 1368 1308 1162 TYPE ! NTRA 0 72 0 61 0	FOR C	HROMINANCE (V)	42.19	37.40	37. 27	37.06	36.88		
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 ! NO MC NOT CODED 279 0 330 306 271 TYPE ! INTRA Q 0 32 0 0 8 OF ! INTRA Q 0 2 0 0 0 0 MACRO INO MC CODED 57 0 17 30 30 MC CODED 7 0 34 38 40 MC CODED 1268 0 1368 1308 1162 TYPE ! NTRA 0 1584 0 0 32 OF ! MOK CODED 1268 0 1360 203 266 Y ! MC CODED 79 0 180 203 266 Y ! MC NOT CODED 79 0 180	3. MEAN VALUE OF STEP SIZE		18.83	62.61	64.00	64.00	64.00		
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 ! NO MC NOT CODED 279 0 330 306 2711 TYPE ! INTRA 0 384 0 0 8 OF ! NO MC CODED 57 0 17 30 30 I MO MC CODED 7 0 34 38 40 0 0 MC ROT CODED 7 0 34 38 40 0 0 0 0 MC ROT CODED 7 0 34 38 40 32 47 1 MC CODED 79 0 186 203 266 1 16 37 82 1 16 0 0 0	4. MEAN VALUE OF THE NUMBER OF NON-ZERO COEFFICIENTS		2. 71	1.75	2.63	1.62	1.68		
BEFORE THE LAST NZ-COEFFICIENT 4.89 1.59 6.22 3.84 2.16 6. BLOCK ! NO MC NOT CODED 279 0 330 306 271 TYPE ! INTRA 0 294 0 0 0 0 MACRO ! NO MC CODED 57 0 17 30 30 MACRO ! NO MC CODED 7 0 34 38 40 MACRO ! NO MC CODED 7 0 34 38 40 MC CODED 46 0 15 22 47 MC CODED 1268 0 1368 1308 1162 TYPE ! NTRA 0 1584 0 0 32 OF ! NO MC CODED 79 0 180 203 266 MC CODED 79 0 180 203 266 MC CODED 79 0 88 120 170 UV ! MC NOT CODED	5. MEAN VALU	E OF THE NUMBER OF ZEROEZ							
6. BLOCK TYPE ! NO MC NOT CODED 279 0 0 330 394 0 0 8 OF ! INTRA 0 0 2 0 0 0 8 OF ! INTRA 0 0 2 0 0 0 0 0 0 MACRO 10 MC CODED Q 5 0 0 0 0 0 0 0 MC ROT CODED 7 0 34 38 40 0 0 0 0 MC ROT CODED 46 0 15 22 47 1 MC CODED 1268 0 1368 1308 1162 TYPE ! NOM C NOT CODED 1268 0 154 0 0 32 66 OF ! NOM C NOT CODED 79 0 180 203 266 MC CODED 79 0 180 203 266 16 0 0 0 0 0 16 0	BEFORE TH	E LAST NZ-COEFFICIENT	4.89	1.59	6.22	3.84	2.16		
TYPE ! INTRA 0 334 0 0 8 OF ! INTRA Q 0 2 0 0 0 0 0 MACRO ! NO MC CODED 57 0 17 50 30 INO MC CODED Q 5 0 0 0 0 0 MC CODED Q 2 0 0 0 0 0 IMC CODED Q 2 0 0 0 0 0 7. BLOCK ! NO MC NOT CODED 1268 0 1368 1308 1162 TYPE ! INTRA 0 1584 0 0 32 OF ! NO MC CODED 96 0 203 266 Y MC CODED 141 0 16 37 82 7. BLOCK ! NO MC NOT CODED 666 0 694 672 602 TYPE ! INTRA 0 792 0 0 16	6. BLOCK	! NO MC NOT CODED	279	0	330	306	271		
OF ! NTRA Q 0 2 0 0 0 0 MACRO ! NO MC CODED 57 0 17 30 30 ! NO MC CODED 7 0 34 38 40 ! MC CODED 2 0 0 0 0 ! MC CODED 2 0 0 0 0 0 1 MC CODED 2 0 0 0 0 0 7. BLOCK ! NO MC CODED 1268 0 1368 1308 1162 TYPE ! INTRA 0 1584 0 0 32 OF ! NO MC CODED 79 0 180 203 266 Y ! MC NOT CODED 141 0 16 37 82 7. BLOCK ! NO MC CODED 16 0 0 0 0 UV ! MC NOT CODED 16 0 0 0 0 UV ! MC NOT CO	TYPE	! INTRA	0	394	0	0	8		
MACRO ! NO MC CODED 57 0 17 30 30 ! NO MC CODED Q 5 0 0 0 0 0 0 ! MC CODED 7 0 34 38 40 15 22 47 ! MC CODED 46 0 15 22 47 ! MC CODED Q 2 0 0 0 0 7. BLOCK ! NO MC NOT CODED 1268 0 1368 1308 1162 TYPE ! INTRA 0 1584 0 0 32 OF ! NO MC CODED 96 0 20 36 42 Y ! MC NOT CODED 141 0 15 37 82 7. BLOCK ! NO MC CODED 166 0 694 672 602 TYPE ! INTRA 0 792 0 16 0 0 0 OF ! NO MC CODED 16 0 0	OF	! INTRA Q	0	2	0	0	0		
I NO MC CODED Q 5 0 0 0 0 0 I MC NOT CODED 7 0 34 38 40 I MC CODED 46 0 15 22 47 I MC CODED Q 2 0 0 0 0 7. BLOCK I NO MC NOT CODED 1268 0 1368 1308 1162 TYPE I NTRA 0 1584 0 0 32 OF I NO MC CODED 79 0 180 203 266 Y I MC NOT CODED 79 0 16 203 266 TYPE I NTRA 0 792 0 0 16 OF I MO MC CODED 166 0 0 0 0 UV ! MC NOT CODED 79 0 88 120 170 UV ! MC NOT CODED 79 0 88 120 170 WC CODED 31 0 <td>MACRO</td> <td>! NO MC CODED</td> <td>57</td> <td>0</td> <td>17</td> <td>30</td> <td>30</td>	MACRO	! NO MC CODED	57	0	17	30	30		
I MC NOT CODED 7 0 34 38 40 I MC CODED 46 0 15 22 47 I MC CODED Q 2 0 0 0 0 0 7. ELOCK I NO MC NOT CODED 1268 0 1368 1308 1162 TYPE I NTRA 0 1584 0 0 32 OF NO MC CODED 96 0 20 36 42 Y I MC NOT CODED 79 0 180 203 266 I MC NOT CODED 141 0 16 37 82 7. BLOCK I NO MC NOT CODED 666 0 694 672 602 TYPE I NTRA 0 792 0 0 0 0 UV ! MC NOT CODED 16 0 0 0 0 0 UV ! MC NOT CODED 79 0 88 120 170 IW		! NO MC CODED Q	5	0	0	0	. 0		
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I MC CODED Q 2 0 0 0 0 7. BLOCK TYPE I NO MC NOT CODED 1268 0 1368 1308 1162 TYPE I INTRA 0 1584 0 0 32 OF ! NO MC CODED 96 0 20 36 42 Y ! MC NOT CODED 79 0 180 203 266 ! MC CODED 141 0 16 37 82 7. BLOCK ! NO MC NOT CODED 666 0 694 672 602 TYPE ! INTRA 0 792 0 0 16 OF ! NO MC CODED 16 0 0 0 0 UV ! MC CODED 16 0 0 0 0 4 9. NUMBER ! MB ADDRESS 295 396 255 245 281 OF ! TYPE3 207 1590 149 188 276		! MC CODED	46	0	15	22	47		
7. BLOCK TYPE INO MC NO MC CODED 1268 0 1368 1308 1162 OF INTRA 0 1584 0 0 32 OF INO MC CODED 96 0 20 36 42 Y MC NOT CODED 79 0 180 203 266 MC CODED 141 0 16 37 82 7. BLOCK ! NO MC NOT CODED 666 0 694 672 602 TYPE ! INTRA 0 792 0 0 16 OF ! NO MC CODED 16 0 0 0 0 UV ! MC CODED 31 0 10 0 4 9. NUMEBER ! MB ADDRESS 295 396 255 245 281 OF ! TYPE3 207 1590 149 188 276 BITS ! QUANT2 35 0 <td></td> <td>! MC CODED Q</td> <td>2</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td>		! MC CODED Q	2	0	0	0	0		
TYPE ! INTRA 0 1584 0 0 32 OF ! NO MC CODED 96 0 20 36 42 Y ! MC NOT CODED 79 0 180 203 266 ! MC CODED 141 0 16 37 82 7. BLOCK ! NO MC NOT CODED 666 0 694 672 602 TYPE ! INTRA 0 79 0 88 120 170 UV ! NO MC CODED 16 0 0 0 0 0 UV ! MC NOT CODED 79 0 88 120 170 WC CODED 31 0 10 0 4 9. NUMBER ! MB ADDRESS 295 396 255 245 281 OF ! TYPE3 207 1590 149 188 276 BITS ! QUANT2 35 10 0 0 0	7. BLOCK	! NO MC NOT CODED	1268	0	1368	1308	1162 ·		
OF ! NO MC CODED 96 0 20 36 42 Y ! MC NOT CODED 79 0 180 203 266 ! MC CODED 141 0 16 37 82 7. BLOCK ! NO MC NOT CODED 666 0 694 672 602 TYPE ! INTRA 0 792 0 0 16 OF ! NO MC CODED 16 0 0 0 0 UV ! MC NOT CODED 16 0 0 0 0 UV ! MC NOT CODED 31 0 10 0 4 9. NUMBER ! MB ADDRESS 295 396 255 245 281 OF ! TYPE3 207 1590 149 188 276 BITS ! QUANT2 35 10 0 0 0 ! COEFF ICLENTS ! Y 3518 7920 250 580 918	TYPE	! INTRA	0	1584	0	0	32		
Y ! MC NOT CODED 79 0 180 203 266 ! MC CODED 141 0 16 37 82 7. BLOCK ! NO MC NOT CODED 666 0 694 672 602 TYPE ! INTRA 0 792 0 0 16 OF ! NO MC CODED 16 0 0 0 0 UV ! MC NOT CODED 79 0 88 120 170 WC CODED 31 0 10 0 4 9. NUMBER ! MB ADDRESS 295 396 255 245 281 OF ! TYPE3 207 1590 149 188 276 BITS ! QUANT2 35 10 0 0 0 ! CBP 550 0 148 224 345 ! CDEFFICIENTS 369 0 377 444 </td <td>OF</td> <td>! NO MC CODED</td> <td>96</td> <td>0</td> <td>20</td> <td>36</td> <td>42</td>	OF	! NO MC CODED	96	0	20	36	42		
MC CODED 141 0 16 37 82 7. BLOCK ! NO MC NOT CODED 666 0 694 672 602 TYPE ! INTRA 0 792 0 0 16 OF ! NO MC CODED 16 0 0 0 0 UV ! MC CODED 16 0 0 0 0 WC CODED 13 0 10 0 4 9. NUMBER ! MB ADDRESS 295 396 255 245 281 OF ! TYPE3 207 1590 149 188 276 BITS ! 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 ! OCEFFICIENTS ! U 218 1459	Y	! MC NOT CODED	79	0	180	203	266		
7. BLOCK ! NO MC NOT CODED 666 0 694 672 602 TYPE ! INTRA 0 792 0 0 16 OF ! NO MC CODED 16 0 0 0 0 UV ! MC NOT CODED 79 0 88 120 170 ! MC CODED 31 0 10 0 4 9. NUMBER ! MB ADDRESS 295 396 255 245 281 OF ! TYPE3 207 1590 149 188 276 BITS ! 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 ! END OF BLOCK 568 4752 92 146 352 ! MOTION VECTORS 369 0 377 444 759 ! OCEFFICIENTS ! U 218 1459 <td< td=""><td></td><td>! MC CODED</td><td>141</td><td>0</td><td>16</td><td>37</td><td>82</td></td<>		! MC CODED	141	0	16	37	82		
TYPE ! INTRA 0 792 0 0 16 OF ! NO MC CODED 16 0 0 0 0 0 UV ! MC NOT CODED 79 0 88 120 170 MC CODED 31 0 10 0 4 9. NUMBER ! MB ADDRESS 295 396 255 245 281 OF ! TYPE3 207 1590 149 188 276 BITS ! 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 ! NOTION VECTORS 369 0 377 444 759 ! V ?77 1506 220 0 82 ! V ?77 1506 220 0 <td>7. BLOCK</td> <td>! NO MC NOT CODED</td> <td>666</td> <td>0</td> <td>694</td> <td>672</td> <td>602</td>	7. BLOCK	! NO MC NOT CODED	666	0	694	672	602		
OF UV ! NO MC CODED 16 79 0 88 120 10 0 4 9. NUMBER ! MB ADDRESS 295 396 255 245 281 OF ! TYPE3 207 1590 149 188 276 BITS ! QUANT2 35 10 0 0 0 ! CBP 550 0 148 224 345 ! END OF BLOCK 568 4752 92 146 352 ! END OF BLOCK 568 4752 92 146 352 ! MOTION VECTORS 369 0 377 444 759 ! OEFFICIENTS ! U 218 1459 203 0 82 ! Y 3518 7920 250 580 918 ! DC COEFFICIENTS 0 1908 0 0 384 ! DC COEFFICIENTS 0 19008 0 0 384 ! TOTAL 5837 36641 1694 1827 3479<	TYPE	! INTRA	0	792	0	0	16		
UV MC NOT CODED 79 0 88 120 170 9. NUMBER MB ADDRESS 295 396 255 245 281 OF TYPE3 207 1590 149 188 276 BITS QUANT2 35 10 0 0 0 CBP 550 0 148 224 345 IEND OF BLOCK 568 4752 92 146 352 MOTION VECTORS 369 0 377 444 759 IEND OF BLOCK 568 4752 92 146 352 MOTION VECTORS 369 0 377 444 759 IEND OF FICIENTS U 218 1459 203 0 82 IV 77 1506 220 0 82 IEND 102 1813 10885 673 580 1082 IEND 102 3813 <	OF	! NO MC CODED	16	0	0	0	0		
MC CODED 31 0 10 0 4 9. NUMBER MB ADDRESS 295 396 255 245 281 OF TYPE3 207 1590 149 188 276 BITS 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 COEFFICIENTS 1 218 1459 203 0 82 IV 77 1506 220 0 82 1082 1082 IDC COEFFICIENTS 0 19008 0 0 384 1082 3479	UV	! MC NOT CODED	79	0	88	120	170		
9. NUMBER MB ADDRESS 295 396 255 245 281 OF 1 TYPE3 207 1590 149 188 276 B1TS QUANT2 35 10 0 0 0 0 ! QUANT2 35 10 0 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 ! Y 77 1506 220 0 82 ! ! Y 77 1506 220 0 82 ! ! Y 77 1506 220 0 82 ! ! Y 77 1506 200 <t< td=""><td>••</td><td>! MC CODED</td><td>31</td><td>0</td><td>10</td><td>0</td><td>4</td></t<>	••	! MC CODED	31	0	10	0	4		
OF Image: Type3 207 1590 149 188 276 BITS QUANT2 35 10 0 0 0 Image: CBP 550 0 148 224 345 Image: CBP 550 0 148 224 345 Image: CBP 550 0 148 224 345 Image: CBP 568 4752 92 146 352 Image: MOTION VECTORS 369 0 377 444 759 Image: MOTION VECTORS 149 149 203 0 82 Image: V 77 1506 220 0 82 Image: V 77 1506 220 0 82 Image: V 77 1506 200 0 384 Im	9. NUMBER	! MB ADDRESS	295	396	255	245	281		
BITS 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 ! MOTION VECTORS 369 0 377 444 759 ! 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	OF	! TYPE3	207	1590	149	188	276		
CBP 550 0 148 224 345 ! END OF BLOCK 568 4752 92 146 352 ! MOTION VECTORS 369 0 377 444 759 ! MOTION VECTORS 369 0 377 444 759 ! MOTION VECTORS 369 0 377 444 759 ! OEFFICIENTS ! U 218 1459 203 0 82 ! V 77 1506 220 0 82 ! V 77 1506 220 0 82 ! DC COEFFICIENTS 0 19008 0 0 384 ! TOTAL 5837 36641 1694 1827 3479	BITS	! QUANT2	35	10	0	0	0		
END OF BLOCK 568 4752 92 146 352 MOTION VECTORS 369 0 377 444 759 Image: Provide the state of the state		! CBP	550	0	148	224	345		
MOTION VECTORS 369 0 377 444 759 ! ! Y 3518 7920 250 580 918 ! Question Que		END OF BLOCK	568	4752	92	146	352		
! 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		MOTION VECTORS	369	0	377	444	759		
! 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		! ! Y	3518	7920	250	580	918		
! ! V 77 1506 220 0 82 ! ! TOTAL 3813 10885 673 580 1082 ! DC COEFFICIENTS 0 19008 0 0 384 ! . <td></td> <td>! COEFFICIENTS ! U</td> <td>218</td> <td>1459</td> <td>203</td> <td>0</td> <td>82</td>		! COEFFICIENTS ! U	218	1459	203	0	82		
! ! TOTAL 3813 10885 673 580 1082 ! DC COEFFICIENTS 0 19008 0 0 384 ! .		! ! V	77	1506	220	0	82		
Image: DC COEFFICIENTS 0 19008 0 0 384 Image: I		! ! TOTAL	3813	10885	673	580	1082		
! TOTAL 5837 36641 1694 1827 3479		DC COEFFICIENTS	0	19008	0	0	384		
		! TOTAL	5837	36641	1694	1827	3479		

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

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Fig. 2 SNR for Y, U, V