CCITT SGXV
Warking Party XV/1
Specialists Group on Coding for Visual Telephony

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SOURCE : NTT, KDD, NEC and FUJITSU

TITLE : DISCARDING OF SIGNIFICANT COEFFICIENTS

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1. Introduction

Based on the reference model, this document states the results of the adaptive coding control using human-visual perception which was shown in the document # 79. The good results like the ones which were shown in the annex of the document # 79 have not been obtained at this time. But we think that it may be preferable to incorporate the adaptive control method in the prototype hardware implementation because of the potential improvement in the coding performances.

2. Experiment

Three control methods described below are examined using the new reference model.

2-1 Discarding of significant coefficients

Main object of this item is to confirm that some coefficients could be discarded without affecting reproduced picture quality and thus could reduce the trasmission bit rate. One good example applicable to zonal coding is that a smaller zone can be selected by means of discarding some coefficients which are not important to the reproduced picture quality. In this document the next two methods are examined to find the effect of applying the discarding method to the reference model with threshold coding.

Isolated coefficient discarding (ID) : A coefficient which satisfies all of the following conditions is forced to zero.

- It is the least significant coefficient in the zigzag scanning.
- It has a minimum quantized step size.
- There are more than 6 insignificant coefficients between it and the next significant one in reverse zigzag scanning order.

This procedure is repeated until the first significant one which does not satisfy the above conditions is found.

Motion vector control discarding (MD) : A coding zone is predetermined as follows. When a motion vector is greater than 3 a coding zone is reduced to a narrower area, for

example 21 coefficients in low band region, otherwise full area.

These two methods do not have a influence on the compatibility property at the reference model. But in the zonal coding, MD method should be used under the consideration of the compatibility property.

2-2 Adaptive quantization (AQ)

Motion vector control (MC) : The quantizer step is adaptively controlled by the motion vector as follows. Let us define NMC as the norm of a motion vector.

if NMC $\leq$ 1 then one step lower quantizer is used
if 1 $<$ NMC then a normal quantizer is used

This method has a direct influence on the compatibility property at not only the refernce model but also other coding algorithms.

2-3 Simulation results

The results for four scenes are shown in the tables 1 - 3. One of these performances will be demonstrated by VTR at the meeting. As is shown in the table 1 - 3 and the VTR demonstration, the adaptive control has the probability of giving better S/N ratio and picture quality compared to that of the reference model. But we can not find such nice results like the annex of the document # 79. We do not know the reason why we can not obtain the same results on the reference model. Anyway we would like to study the effects of the adaptive coding control so far as the reference model shall be improved.

3. Conclusion

Based on the reference model, we stated the results of the adaptive coding control using human-visual perception. We think that it may be preferable to incorporate the adaptive control in the prototype hardware implementation because of the potential improvement in the coding performances.

What control is the most favourable is for further study at this moment.

Table 1 Simulation Results
(The effect of ID)

		REF	ID
S/N (dB)	MA	39.36	39.45
	(59th)	19668	19749
	CJ	37.88	38.05
	(39th)	19960	19897
(bit/frm)	SP	33.97	34.13
	(31th)	30307	30069
	TR	38.13	38.33
	(100th)	29002	28665

Table 2 Simulation Results
(The effect of MD)

		REF			MD		
		Total	Motion < 3	Motion ≥ 3	Total	Motion < 3	Motion ≥ 3
S/N (dB) (bit/frm)	MA (59th)	39.36 19668	35.59	35.65	39.41 19632	35.89	34.65
	CJ (39th)	37.88 19960	34.86	33.33	37.89 19523	35.27	31.93
	SP (31th)	33.97 30307	32.50	30.36	34.03 30222	32.75	30.19
	TR (100th)	38.13 29002	35.58	33.93	38.24 29343	36.11	33.34

Table 3 Simulation Results
(The effect of MC)

		REF			MC		
		Total	NMC ≤ 1	NMC > 1	Total	NMC ≤ 1	NMC > 1
S/N (dB)	MA	39.36	35.67	35.49	39.36	36.15	35.21
	(59th)	19668			20202		
	CJ	37.88	34.99	33.31	37.89	35.51	33.18
	(39th)	19960			19366		
(bit/frm)	SP	33.97	33.14	30.34	33.92	33.57	30.09
	(31th)	30307			30105		
	TR	38.13	36.42	33.79	38.13	36.69	33.63
	(100th)	29002			28816		

Annex/ Document #109

Discarding of Significant Coefficients

--- VTR Demonstration of Simulation Results ---

Simulation results obtained by the coding process described in Section 2 will be demonstrated on VTR at the meeting.

Contents of VTR are as follows :

- Miss America
  (1) ID (Table 1)
- Traver
  (2) ID (Table 1)
- Miss America
  (3) MD (Table 2)
- Traver
  (4) MD (Table 2)
- Miss America
  (5) MC (Table 3)
- Checked Jacket
  (6) MC (Table 3)

The decoded images are displayed under the condition of 2:1 frame droping rate.