

Question(s):	VQEG	Meeting, date:	Oct. 18-22, 2004
Study Group:	Working Party:	Intended type of document (R-C-D-TD):	
Source:	NTT (Nippon Telegraph and Telephone Corporation), Japan		
Title:	Results of preliminary tests at NTT and proposed subjective assessment method.		
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Please don't change the structure of this table, just insert the necessary information.

1. Introduction

NTT previously proposed that possible combinations of spatial and temporal distortion should be included in HRCs. Here, we propose a procedure for making HRCs considering the suitable range of packet loss rate and so on.

2. Proposals

- (1) We propose a procedure for making HRCs considering the suitable range of packet loss rate for each SRC rather than only having good- or bad-quality HRCs.
- (2) We propose using several SRCs with different amounts of motion for teleconferencing application.
- (3) We propose using a capturing system that can capture every application video and which does not make the quality worse.
- (4) We propose using a single LCD monitor with a fast response time for subjective assessment at every assessment laboratory.
- (5) We propose using a single player (Real player or Windows media player)

3. Study items

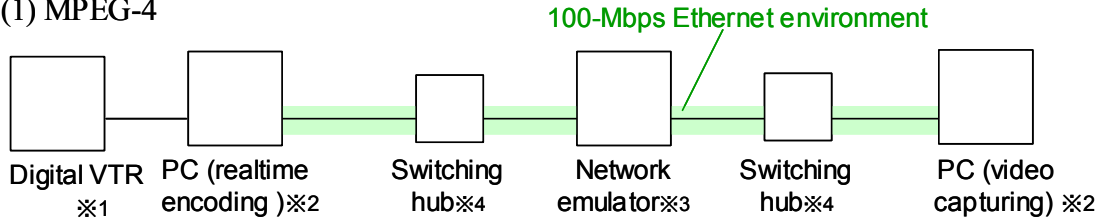
- (1) The effect of both bit-rate and packet-loss degradation on quality
- (2) Appropriate capture methods
- (3) The effect of different LCD monitors on quality
- (4) The effect of different players on quality

4. Test-bed and conditions

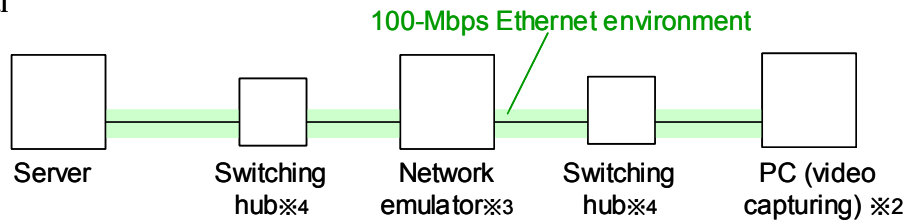
Table 1. Common experimental conditions.

Assessment method	ACR
Monitor type	LCD (2 types)
Viewing distance	6H (H: Window height)
Number of subjects	32
Image size	VGA (640 x 480)
Monitor resolution	960 x 720 pixels
Image format	Uncompressed AVI (captured)

(1) MPEG-4



(2) WMT/Real



※1 Sony DVW A-500

※2 Dell Precision 360 (CPU: P4 3.2 GHz, 512k L2 Cache, FSB: 800 MHz,
HDD: SATA 10,000 rpm 36GBx2 RAID0,
RAM: 4 GB DDR-SDRAM PC3200 400MHz ECC
Video card: NVIDIA Quadro NVS 280
OS: Windows2000/XP, DirectX over 8.1)

※3 NTT-AT Network emulator NE3000

※4 BUFFALO NetSeeker switch LSM 10/100-8W

Figure 1 Test-bed.

5. Results

(1) Effect of both bit-rate and packet-loss degradation on quality.

Table 2. Conditions of study (1).

Codec	Bitrate	PLR	SRC	Play format	Player
-	-	-	6 (3: phase 1, 3: original)	original AVI	Windows media player
MPEG-4	512, 1024, 2048 kbps	-		captured AVI	
MPEG-4	2 Mbps	6 degrees (0.05%-3.2%)			

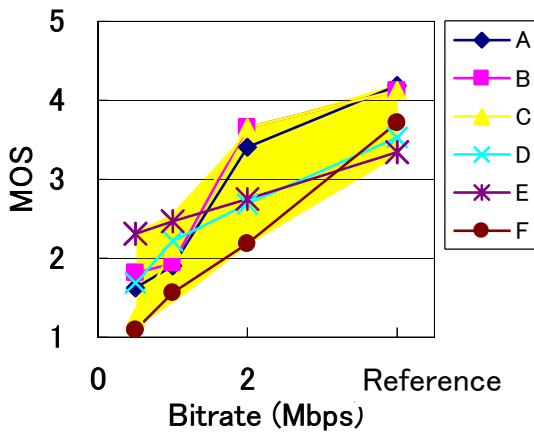


Figure 2-a. Effect of bit-rate
(all SRCs).

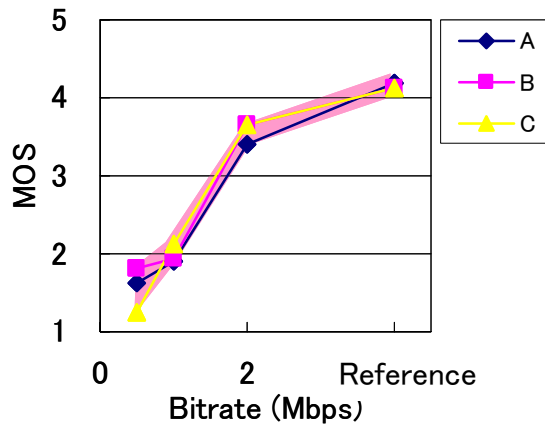


Figure 2-b. Effect of bit-rate
(SRCs for teleconferencing).

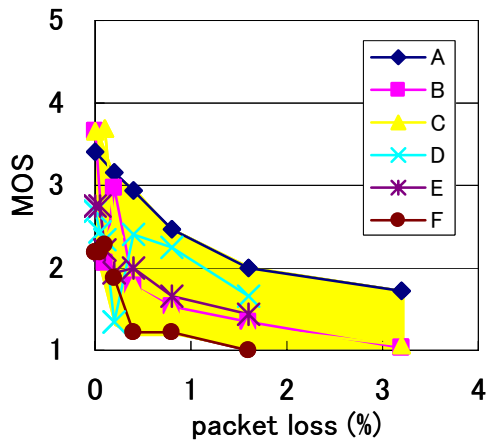


Figure 3-a. Effect of packet loss
(all SRCs).

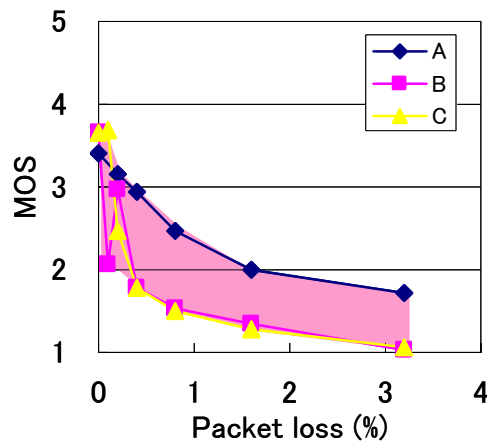


Figure 3-b. Effect of packet loss
(SRCs for teleconferencing).

1) In the quality analysis of each SRC, when both bit-rate and packet loss are the same, the difference in quality is very large. So, we propose a procedure for making HRCs considering the suitable range of packet loss rate for each SRC, rather than having only good- or bad-quality HRCs.

a) We investigated and chose the range of packet loss for each application.

b) We made distorted sequences that included packet loss.

c) We selected distorted sequences of suitable quality levels* by screening.

* We should have several reference sequences with different distorted levels to cover the human perception range.

2) Narrowing down the analysis sources to teleconferencing, SRCs for teleconferences have the same quality characteristics at the same bit-rate, but they do not have the same characteristics at the same packet loss. The distortions of each sequence differ greatly depending on the size of the region containing movement and the motion speed. So, we must use a certain number of SRCs with different movement sizes and speeds for teleconferences. NTT will be able to provide the SRCs required for teleconferencing.

(2) Appropriate study capture methods

Table 3. Conditions of study (2).

Codec	Bitrate	SRC	Play format	Player
Real9	512, 1024, 2048 kbps	8 (3: phase I, 5: original)	Real9	Real9
			captured AVI	Windows media player

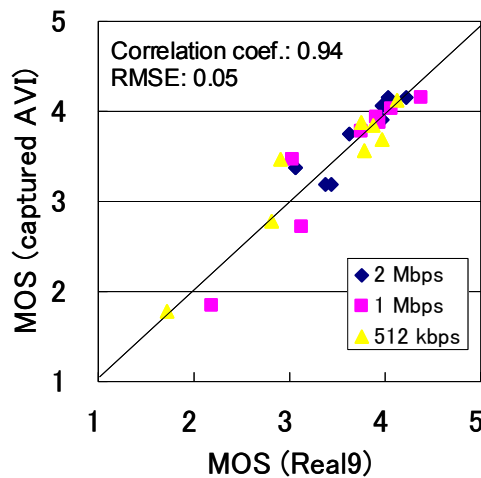


Figure 4. Effect of capturing.

We compared the quality of video compressed using a real encoder and played back using a real player with the quality of a played-back AVI file captured at a constant 30 fps from the aforementioned real video. The qualities were almost the same (correlation coefficient: 0.94, RMSE: 0.05). We could not recognize any effect of the capture method on quality when we captured at 30 fps constantly. This capturing method did not depend on any applications or viewing method. So we propose using this capturing system. We will describe the capture tool put into practice using hardware in another proposal document.

(3) Effect of different LCD monitors on quality

Table 4. Conditions of study (3).

LCD	Codec	Bitrate	SRC	Play format	Player
EIZO (CG21)	-	-	8 (3: phase I, 5: original)	original AVI	Windows media player
	MPEG-4	512k, 2M		captured AVI	
	Real	1M		captured AVI	
Dell (US2001FP)	-	-	8 (3: phase I, 5: original)	original AVI	
	MPEG-4	512k, 2M		captured AVI	
	Real	1M		captured AVI	

Table 5. Comparison of LCD specifications.

	EIZO CG21	DELL UltraSharp 2001FP HAS
Size	21 inch	20.1 inch
Brightness	250 cd/m2	250 cd/m2
Response time	50 ms	16 ms
Contrast ratio	400:1	400:1
Viewing angle	170° / 170°	176° / 176°
Pixel pitch	0.270 mm	0.255 mm
Native resolution	1600 x 1200	1600 x 1200

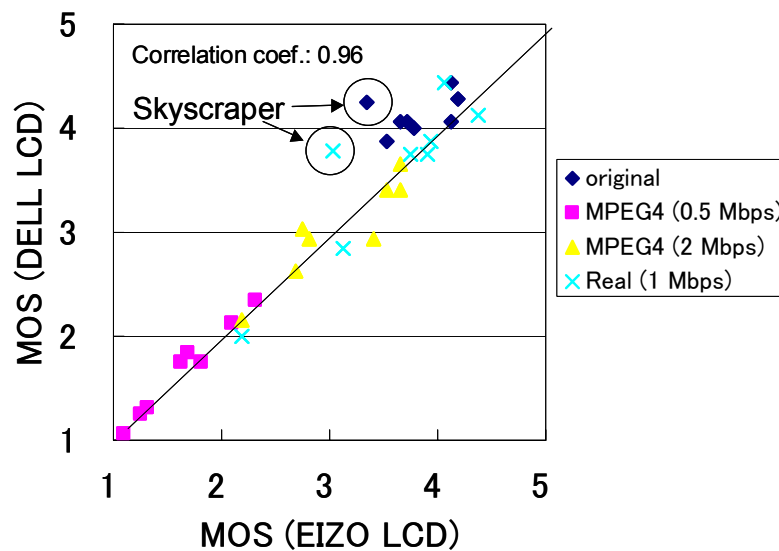


Figure 5. Effect of different LCDs.

The analysis of watching the same sequences on different LCDs showed that the qualities of the LCDs were the same for HRCs that was assessed as being low quality, but not for high-quality ones. As the outliers were both for “Skyscraper” (include panning camera work), we suspect the effect of the response time of the LCD monitor. It would be better to use the same monitor in the VQEG contest in order to eliminate the effect of different response times.

(4) Effect of different players on quality

Table 6. Conditions of study (4).

Codec	Bitrate	SRC	Play format	Player
-	-	8 (3: phase I, 5: original)	captured AVI	Real 9
MPEG-4	2M			WMP 9
-	-			
MPEG-4	2M			

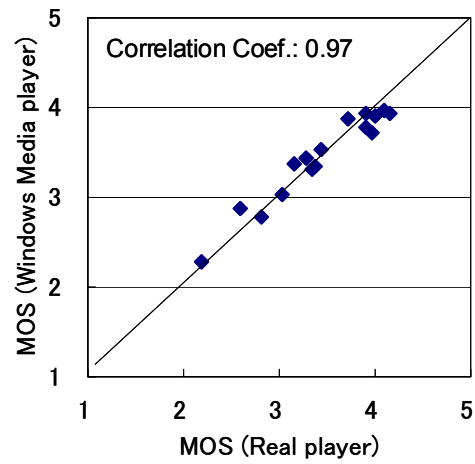


Figure 6. Effect of different players.

When we played the same captured AVI sequences using two different players (Real player, Windows media player), the qualities were the same. We propose using only one player to remove the error factors.

Supplement



(a). Tele-conferencing 1(Reading)



(b) Tele-conferencing 2 (Block construction)



(c). Tele- Conferencing 3(Numbering)



(d) Mobile and Calender



(e) Skyscraper



(f) Baloon



(g).Tele-conferencing4 (Block-construction)



(h) Table Tennis

Figure 7. Sample SRCs