

**Development of method for efficient archive and storage of medical motion images**

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**INTRODUCTION**

The large sized medical motion image data such as digital coronary angiography require efficient storage system with big memory capacity. In order to realize such system, we surveyed compression methods for medical motion images and found the most efficient method especially for coronary angiography. And also we studied performance of DVD-RAM based system developed as a storage system for digital angiography.

**METHOD**

Our method of obtaining, filing, and displaying digital motion pictures is shown in Fig.1. To find the most efficient compression method and its compression ratio, we compared original image with compressed image by several motion compression methods employing ITU-R(International Telecommunication Union Radio Communication Sector) subjective evaluation term shown in Fig.2 by doctors in the field of diagnosis of coronary diseases.

To evaluate economic efficiency of DVD-RAM, we compared Read/Write speed and cost with that of CD-R.

**RESULTS**

Comparison of compression methods among 5 schemes in terms of compression ratio and image quality is shown in Table 1. We found MPEG-2 was the fittest method to our requirement as shown in Table 2. Subjective score of MPEG-2 in various compression ratios is shown in Fig.3. The score of 4 is the limit to our image quality requirement, so that we adopt 1/72 compression ratio. Also from results comparing MPEG-2 image at 1/72 to other four compression methods, we found image quality of MPEG-2 is higher than other methods at same compression ratio of 1/72.

Speed of compression calculation of MPEG-2 is the fastest in the five schemes of compression methods as shown in Fig.4.

Read/Write speed of DVD-RAM is slightly lower than that of CD-R as shown in Fig.5. But economic efficiency of DVD-RAM based library system is higher than that of CD-R case shown in Table.2.

## DISCUSSION

MPEG-2 is most efficient method for compressing digital coronary image because of its image quality and efficiency. As MPEG-2 has flexibility to change compression ratio arbitrarily and requires shorter time to compress than that of other method, MPEG-2 is deduced to be the best compression method for digital coronary angiography.

Read/Write speed of DVD-RAM and its economic efficiency are slightly lower than those of typical CD-R. This is not critical because it is evolving rapidly recently.

## CONCLUSION

- MPEG-2 is most acceptable compression method for digital coronary angiography.
- Optimized compression ratio of MPEG-2 is 72.
- Present DVD-RAM performance and economic efficiency is slightly lower than CD-R, but it's not critical.

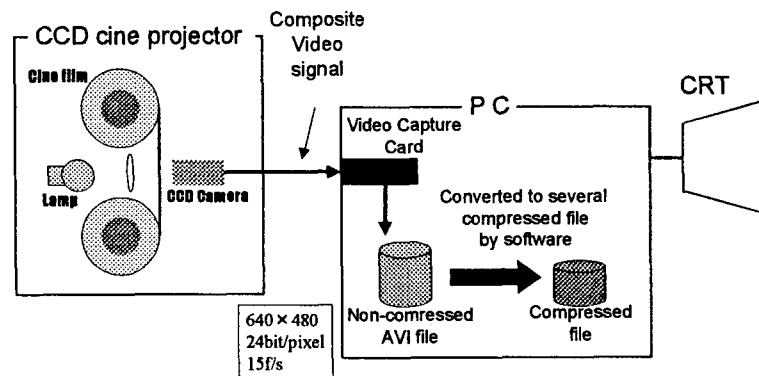


Fig.1 Our method of obtaining, filing and displaying digital motion pictures

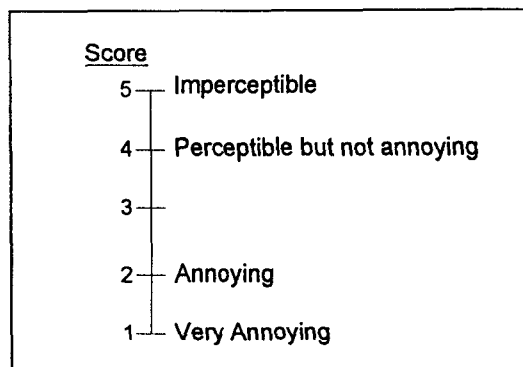


Fig.2 Subjective evaluation term used for motion image

Method	Software for encoding	Compression ratio	Image Quality Index
<b>MPEG-2</b>	<b>Ligos MPEG Encoder</b>	<b>12, 18, 36</b>	<b>none</b>
		<b>45, 54, 72</b>	
		<b>108, 144, 198</b>	
<b>MPEG-1<sup>11</sup></b>	<b>Ligos MPEG Encoder</b>	<b>72</b>	<b>none</b>
<b>Indeo5</b>	<b>Ulead Media Studio ver.5.2</b>	<b>33, 102, 189</b>	<b>none</b>
<b>CinePak</b>	<b>Ulead Media Studio ver.5.2</b>	<b>13</b>	<b>50, 75, 100</b>
<b>Real Video</b>	<b>Real Producer ver.6.3</b>	<b>239</b>	<b>none</b>

Table.1 Compression Method for Motion Pictures

	DVD-RAM Drive	DVD-RAM Library (150Disks include, 390GB Capacity)	CD-R Drive	CD-R Library (500Disks include, 325GB Capacity)
Price of Drive system only	US\$ 606	US\$ 58,166	US\$ 748	US\$ 17,083
Price of Media	US\$ 19.16	US\$ 2,875 (150disks)	US\$ 2.5	US\$ 1,250 (500disks)
Price per 1GB	US\$ 7.36	US\$ 156.5	US\$ 3.8	US\$ 56.4

Table 2. Comparison of economic efficiency of DVD-RAM and CD-R

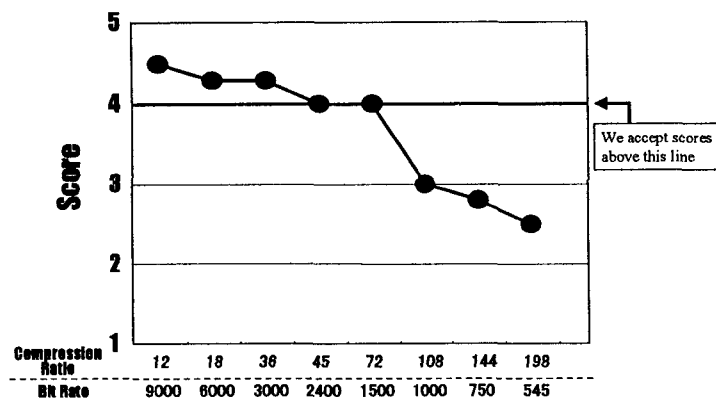


Fig.3 Image Quality Evaluation Result of Compressed motion pictures using MPEG-2

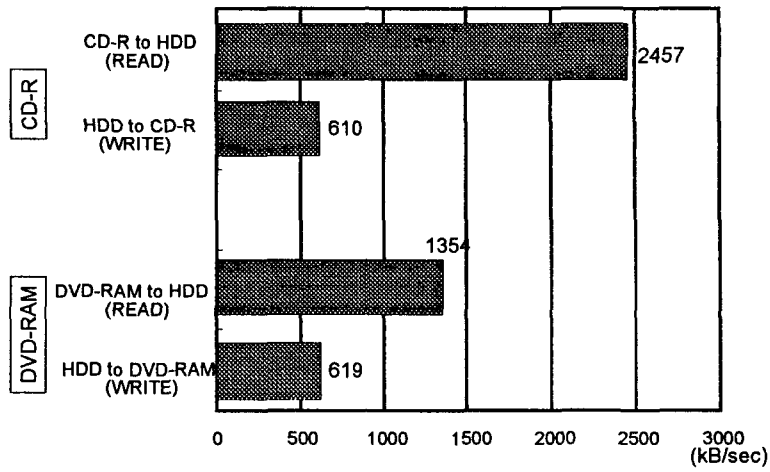


Fig.4 Result of measurement comparison of required time to compress

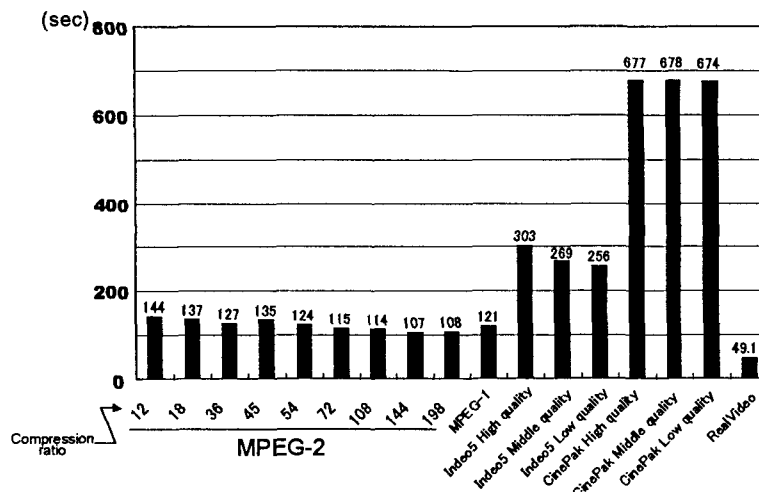


Fig.5 Read/Write speed of DVD-RAM and CD-R