THE POTENTIAL OF THE INTERACTIVE VIDEODISC

FOR INTERNATIONAL COOPERATION AS DOCUMENTED BY

PROJECT EMPEROR-I *

Ching-chih Chen

Simmons College, Boston

Laser optical videodisc technology harbors great possibilities for information organization, storage, retrieval and transfer. It is unique in that it permits high-density storage of multi-media, multi-formatted, and multi-dimensional information on a single disc. Thus, it will surely revolutionize libraries and their future services.

In regards to international cooperation, the relevant traits of optical videodisc technology will be addressed. However, the ultimate power of the videodisc is only revealed if, in an interactive mode, it is allied with a computer. An online demonstration of the interactive videodisc, "The First Emperor of China", a product of PROJECT EMPEROR-I, will vividly illustrate this.

"PROJECT EMPEROR-I: China's Treasure Revealed via Videodisc Technology", to which the author is the Project Director and Principal Investigator, is supported by the Humanities Project in Libraries, US National Endowment for the Humanities. In its presentation and interpretation of a most significant historical/archaeological period of China's pat, the Project utilizes the most current videodisc technology. The period is that of the First Emperor of China. The artifacts that are recorded and presented include the terra-cotta figures of warriors and horses found near his tomb in Xian.

This project exemplifies the significant role which new technology can play in information sharing. In doing so, it has furthered cross-cultural appreciation, and international cooperation and relationship.

_____

*In Impact of New Information Technology on International Library Cooperation, Proceedings of Essen Symposium, 1986. Essen, FRG: Univ. Essen, 1987.

INTRODUCTION

Long before microcomputers, videodisc technology existed. In the 1970s and 1980s, videodiscs were mainly employed for recreational purposes. In recent years, its full potential as a high-density, high-speed information storage and retrieval medium was realized. This realization was due to the rapidly progressing microcomputer industry. For, standing alone, the videodisc has very limited application potential. Yet, when united with a computer, especially low-cost, high-performance micros, the videodisc permits infinite information transfer possibilities. The prevailing use of micro-based videodisc technology for information-related applications illustrates the importance of this marriage.

Videodisc and Its Features

A brief introduction to the basics of videodisc technology will permit a better understanding on the potential possibilities of this technology for information management. The following summary is abstracted from Chen (1985) and several other papers by Chen on PROJECT EMPEROR-I (1985-1986).

Optical videodisc technology is unique in its ability to combine all types of information media into a simultaneous and continuous format. Such information media include, still pictures, meaning both slides and images from filmstrips, and motion pictures, being

films or video tapes. In addition to visual images, the videodisc can store stereo audio on dual-sound tracks.

A videodisc can be either analog or digital. A high-density storage medium, an analog optical videodisc stores 54,000 frames of image on a single-sided 12-inch disc. This is equal to the capacity of 675 80-slide carousel trays. When video image are stored, each single-sided disc contains one half-hour video of 30 frames per second and with dual sound tracks. In regards to a 12-inch digital disc, a double-sided disc can store approximately 800 MB of data. Depending upon the actual fineness of the resolution, this is about 10,000 to 20,000 pages of text, or approximately 75 hours of digital sound.

Of great importance is that the videodisc permits frames of images to be read on an individual basis in any identified sequence. In addition, a user may opt to randomly retrieve any specified still image or motion sequence of the 54,000-frame analog disc. The time required for retrieval is less than three seconds. It is also possible to retrieve a combination of still images, motion sequences and/or audio. For a digital videodisc, either the Boolean search and/or the full text search may be performed for information retrieval with specific software.

Optical videodisc technology utilizes a laser for recording and/or reading information. The laser can be focused to an accuracy of one micron or one degree of one millionth of a meter. Such accuracy permits a 12-inch disc to retain information with outstanding high-density inscription. The videodisc's information surface is made up of over 10 billion spiralling tracks per side. These tracks, called pits are of varying lengths.

An average spinning rate of the videodisc is 30 revolutions per second or 1800 revolutions per minute. A photo-detector collects the light which the laser beam focuses on the disc's surface. Upon striking a pit, the reflected beam is diffracted away from the detector. The video and audio signals are produced by a detector. The video and audio signals are produced by a variation in light intensity, caused by the varying pit lengths (see Figure 1). The videodisc's metallic surface is protected by a layer of plastic. This allows the laser beam to read the information on each disc without actual contact. Thus the stored information is protected from destruction, rarely damaged or lost. It is partially because of this trait, that the videodisc is reputed as being an ideal medium for archival preservation and conservation.
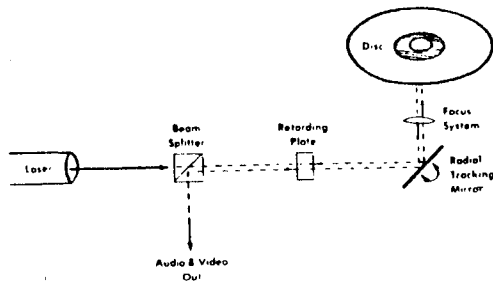

Figure 1. The Simplified mechanics of a reflective optical videodisc system (Taken from Chen, 1985)

For multiple reasons, the videodisc is ideal for information delivery and mass information storage. The first, and often primary reason being its affordability for storing multi-media information. As well, the videodisc's density and versatility permits inexpensive online storage, allowing expedient and random retrieval. Optical videodiscs are ideal for many functions. They are treasured by conservationists for archival storage, as well as by publishers for electronic publishers and database construction. Able to store video images, photographs, drawings, maps, charts, plans, formulas, narration, recordings, videotapings and more, videodiscs are ideal for the development of either audio and/or visual databases. It is thus the perfect storage solution for compact safekeeping of large amounts of multi-media and multi-formatted information. Visual images are clearly presented and preserved because of the videodisc's high color resolution. These most useful traits, make optical videodiscs an ideal solution for spatial, preservation and conservation problems.

To summarize, the versatility and characteristics of the videodisc are:
* High storage capacity,
* Multi-type information integration,
* High resolution and sharp color images,
* Ideal medium for archival and preservation purposes,
* Fast random access, and
* Interactive capability with computer systems.

Thus the optical videodisc is an ideal medium for uniting technology with scholarship; subject specialities with high technology; and education and

training with research and demonstration. The great promise videodisc's hold for international library development and cooperation, as well as information transfer and dissemination is revealed via PROJECT EMPEROR-I.

Interactive Videodisc

Even though the videodisc is highly acclaimed for the above characteristics, its true potential can only be realized in an interactive mode. Prerequisite to understanding this, is an understanding of just what is meant by an interactive mode. An interactive system is one in which a simultaneous and reciprocal interchange occurs between the user and the system. A prime example of such a system is human conversation. The key words here are simultaneity and interruptability. An interactive optical videodisc system depends on the viewer playing an essential role in the system. The system relies on the easily and randomly-accessed analog disc being connected to a computer system, specifically a microcomputer. By employing computer programs a system user may retrieve any of the visual and audio information contained on the analog disc and the textual information on the connected computer. Thus, the system user is intimately involved in the viewing/learning process, rather than merely being a passive observer.

The interactive videodisc system exemplifies the successful union of the computer with the audio, textual and visual information of the videodisc. The disc's allowance for easy information access, permits the development of a range of courseware with user-friendly menu-driver choices. Another factor is the variety of sophisticated course authoring software available in today's marketplace. The developed

courseware offers the user options regarding the availability of information, be it on the disc or in the computer.

Possessing characteristics which enhance easy information access and information sharing, the interactive videodisc, such as those of PROJECT EMPEROR-I, encourages appreciation of such subject matters as the humanities, as shown through actual demonstration. The discs have also made a valuable contribution to better international cooperation and relationship, and upgrade the general quality of life.

PROJECT EMPEROR-I

PROJECT EMPEROR-I: China's Treasure Revealed via Videodisc Technology employs the most current videodisc technology in order to present and interpret a major historical/archaeological period of China's past. The US National Endowment for the Humanities' Humanities Project in Libraries provides the needed support for this vivid presentation of the artifacts of the First Emperor of China (Qin Dynasty). The Emperor reigned for only fifteen short years. His accomplishments were many - the unification of warring states, the completion of the Great Wall, the institution of unified written scripts, and the construction of his spectacular tomb near Xian. Next to this tomb the 7,000 life-size terra-cotta figures of warriors and horses were found (see Figure 2). Throughout the world, people have been captivated by this most magnificent and significant archaeological discovery. Utilizing an interactive videodisc, PROJECT EMPEROR-I presents and interprets these intricate and amazing subjects.
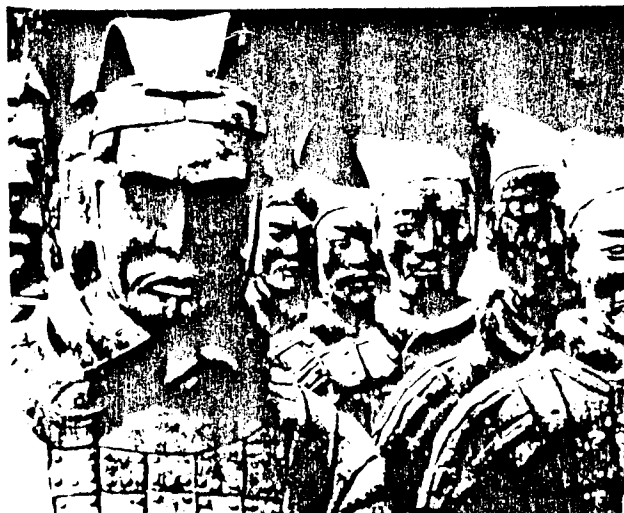
Figure 2 Qin Terra-Cotta Figures of Warriors.

and Horses (Courtesy of PROJECT EMPEROR-I)

Project Objectives

PROJECT EMPEROR-I illustrates how the videodisc can be used as a serious medium for large-scale multi-media information storage, processing and retrieval. It also weakens the division between new communications technologies and humanistic applications. In doing this, PROJECT EMPEROR-I provides a unique union of East and West, past and present, humanities and high technology, as well as scholarship and application. The result, which is vividly illustrated by PROJECT EMPEROR-I is the employment of a progressive technique for the presentation of multi-media, multi-formatted, and multi-dimensional information. Further is the enhancement of international cooperation via an increased understanding and appreciation for the humanities. Additionally is the excitement of unveiling a novel interactive educational and learning tool with visual, audio, and textual information, which is provided by means of a videodisc united to developed courseware and utilized with a micro-based system.

PROJECT EMPEROR-I's Products

1. "The First Emperor of China" videodiscs

Two double-sided 12" NTSC CAV videodiscs are the main products of PROJECT EMPEROR -I. Entitled "The First Emperor of China: Qin Shi Huang Di, 秦始皇帝 ", each disc is constructed of 108,000 frames of visual images along with musical interludes. As well is one full-hour of narration and/or interviews which are recorded in both Chinese and English.

As in an electric book, the visual information is organized on the disc in groups. Specifically, all

visual information is matched with appropriate bi-lingual narrations, which are than classified into "chapters". A specific theme is the focus of each chapter. For example, "Introduction on the First Emperor of China", "The Great Wall", and "The Qin Terra-Cotta Museum of Warriors and Horses". Swift retrieval of both the audio and visual information on a thematic topic is encouraged via this format. In addition, any one of the 108,000 frames of visual images is easily and randomly retrievable in less than three seconds.

The discs are not meant to be stand-alone ones, yet, the above-mentioned three chapters are self-contained introductory programs. In addition to these, the first disc also contains over two hundred segments of motion video and over four thousand still frame pictures.

The second disc is also double-sided and is composed of much valued oral history on this topic. Further, videotaped interviews present a historical perspective. Interviews and insights from ten of the field's most respected experts, totalling over 60 hours were critically selected and edited for inclusion. Those which were selected, are included on the second disc in the format of questions asked of and responded to by each expert. Once again the method of chapters is employed for organizing the answers provided to each question by the experts. It too may be retrieved randomly in three seconds.

2. Electronic Database

For the most significant visual images of the videodisc an extensive database is being developed on a micro-based system by using a relational database management software specifically oriented for the retrieval of visual information. Each record is to be made up of

approximately twelve fields. The fields will include disc side number, frame number, type of object, date of object, size of object, material of object, date of discovery, site where discovered, current location of object, information source, publication source, and comments. When the database information is used conjunctively with the videodisc, one will be able to interactively and simultaneously retrieve specific textual and visual data by means of a micro-based interactive videodisc system.

3. Courseware

With a hardware grant from the Digital Equipment Corporation, the DEC IVIS (Interactive Video Information System) has been used to develop a variety of computer-assisted instructional courseware. The hope in developing these courseware is to meet the needs of users with varying degrees of knowledge in both the fields of Chinese art history and archaeology. Currently three levels are considered. They are the intelligent laymen and school students, college students studying Chinese art history and archaeology, and graduate students and researchers in the field. For each level of audience, computer-assisted instructional lessons are being developed using Videologic's authoring software, DIRECTOR.

Each lesson will enable the system user to interactively choose the options given as menus and sub-menus on the monitor screen provided for selection making. By means of these menus and sub-menus, a user will be progressively led through each lesson with simultaneous and selected visual, audio and textual information in any combinations specified. In addition to topical and sub-topical choices (Figure 3), the main menu also includes various other options which include the following:

* Exploration - choices to view three-dimensional pictures or to browse through slide collection by going forward, backward, zooming in, zooming out, etc.
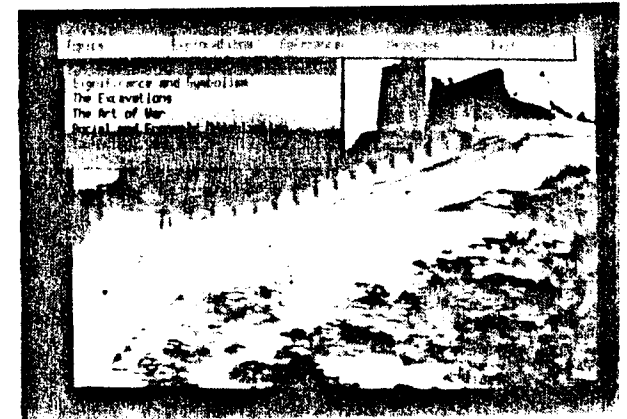

Figure 3. A typical menu showing the possible topical choices

* Reference - selection for checking in the "glossary" file or for viewing the "bibliography" file. Some items included in the bibliography can also be retrieved and viewed in full-text form.

* Announcements or messages.
It is expected that these coursewares will also be transported to IBM and IBM-compatible micro-based systems. Concurrently, since PROJECT EMPEROR-I is an R&D project, experiments with other authoring software are also ongoing so that various types of courses can be developed as well.

CONCLUSION

The humanities orientation of PROJECT EMPEROR-I has played a significant role in the tremendously successful achievement of the project objectives. Both laypersons and field specialists have benefited from such a technology-related product. By means of videodisc technology, with its capacity for instantaneously and easily retrieved, multi-media data and information and simultaneous spectacular visual images, many have been able to witness and appreciate a magnificent Chinese treasure in a way even more superior in many ways than being personally on site. To those who might never be able to visit China, the wonderful period of Chinese history on the First Emperor of China has come alive through multimedia, because this disc has treated the viewers to scenes reminiscent of the Twilight Zone. Thus, PROJECT EMPEROR-I has displayed how the new information technology can even merge with something ancient, and if applied in a particular manner can indeed contribute to mass appeal of the humanities and better

international understanding and cooperation among mankind.

While PROJECT EMPEROR-I has demonstrated this possibility vividly, the project has emerged also as a perfect research and development project for promoting the tremendously exciting opportunities of the interactive videodisc as a wide-ranging educational and experimental tool in the new wave of interactive learning and education. It should have much wider and broader implications for all professionals to whom "information" is a common word.

In an even more general sense, videodisc technology can be an universal tool for all of us and is expected to have a very positive influence in the future of information provision. It can provide information access insensitive of time limitation, distance, volume or complexity in a way impossible for us to contemplate before. This is the kind of dynamic and agressive library services and information provision which we as informational professionals in this information age should develop and strike for.

PROJECT EMPEROR-I is one attempt for the development of the new frontier in utilizing new information technology and in working with other professions for information development and cooperation. While the process and tasks involved have been difficult and at times frustrating, the experience and results have been most exciting and gratifying.

REFERENCE

Chen, Ching-chih, "Micro-based optical videodisc applications", Microcomputers for Information Management 2 (4): 217-239 (December 1985)

Chen, Ching-chih, "Online information and interactive videodisc technology: Case presentation about PROJECT EMPEROR-I". Proceedings of the 9th International Online Meeting. London: Learned Information, 1985. pp. 159-161.

Chen, Ching-chih, "Interactive videodisc & 'The First Emperor of China': Online access to multi-media information". Proceedings of the National Online Meeting. Medford, NJ: Learned Information, 1985. pp. 73-78.

Chen, Ching-chih, "Interactive Videodisc Technology and the Future of Information Provision". Proceedings of the Library Association of Australia Biennial Meeting, Darwin, Australia, June 30, 1986.

Chen, Ching-chih, "Potential of Videodisc Technology for International Information Transfer". Proceedings of the Seminar on Library Development and Cooperation, Taipei, Taiwan, Aug. 17-20, 1986 Taipei, Taiwan: National Central Library, 1986.

Chen, Ching-chih and Robert D. Stueart, "PROJECT EMPEROR-I: China's Treasure Revealed via Videodisc Technology", presented at the IFLA Annual Meeting, Tokyo, August 24, 1986.

Chen, Ching-chih, "Interactive videodisc technology, information transfer and communication: A case presentation on PROJECT EMPEROR-I". Proceedings of the FID Annual Meeting, Montreal, September 14, 1986.