

JOURNAL OF LIBRARY & INFORMATION SCIENCE
Volume 12, Number 2/October, 1986

CONTENTS

Potential of Videodisc Technology for International Information Transfer Ching-chih Chen 105

RUBILA — A Concept in Rule-Based Integrated Library Automation Karl K. Lo, Zy-kaan Ding 121

Shared Information Online: The LINCOLNET . . . Tze-chung Li 131

OCLC Present and Future Rowland C. W. Brown 147

Chinese Information Systems and Speech Recognition
 Nelson Chou 160

A Study of the Continuing Education for University Librarians in the Republic of China Li-hong Huang 176

Universal Decimal Classification 222

Twenty-Five Years of Academic Library Building Planning
 David Kaser, Tr. by Margaret Fung 240

New Publications

History of Chinese Librarianship 252

A Study of Philosophy of Library Science 253

**POTENTIAL OF VIDEODISC TECHNOLOGY
 FOR INTERNATIONAL INFORMATION TRANSFER†**

*Ching-chih Chen**

ABSTRACT

1985 has been hailed as a milestone in the development of videodisc-based applications in information services. We have witnessed the explosive growth of CD-ROM and optical videodisc-based information products, which undoubtedly will change libraries' modes of operations and services, as well as enhance library development and cooperation.

Laser optical videodisc technology is unique in that it makes possible high-density storage of multi-media, multi-formatted, and multi-dimensional information on a single disc. Thus, it has tremendous potential for information organization, storage, retrieval and transfer. It should therefore have a significant and lasting impact on libraries and their future services.

In relation to the potential for library development and cooperation, characteristics of optical videodisc technology will be explored. However, it should be recognized that the true power of the videodisc can only be fully appreciated when the disc is combined with a computer in an interactive mode. This part of the presentation will be vividly illustrated by an online demonstration of the interactive videodisc, entitled "The First Emperor of China," a product of PROJECT EMPEROR-I. The speaker is the Principal Investigator and Project Director of PROJECT EMPEROR-I.

† Paper presented at the Library Cooperation & Development Seminar, National Central Library, Taipei, Taiwan, R.O.C., August 17-18, 1986.

* Ching-chih Chen, Professor & Associate Dean, Graduate School of Library & Information Science, Simmons College, Boston, Massachusetts, U.S.A.

“PROJECT EMPEROR-I: China’s Treasure Revealed via Videodisc Technology,” is supported by the Humanities Project in Libraries, via the U.S. National Endowment for the Humanities. This project applies the latest in videodisc technology in order to present and interpret a major historical/archaeological period of China’s past. The site and artifacts to be recorded and presented are from the period of the First Emperor of China, including the terracotta figures of warriors and horses near his tomb in Xian.

This project perfectly illustrates how new technology has contributed to the promotion of information sharing on a subject which otherwise would be unattainable to most of the population. It has thus furthered cross-cultural appreciation which has resulted in better understanding and international cooperation among people. Its implications for library development and cooperation and international information transfer should therefore not be difficult to imagine!

PRELUDE

My dear friends, it is indeed both a privilege and pleasure to participate at this celebration of the opening of the new building of the National Central Library (NCL). It seems most fitting for the NCL to choose library development and cooperation as the theme for this conference since the NCL, under the leadership of Director C. K. Wang, has made great accomplishments in promoting and furthering international cooperation, in addition to fulfilling its complex and mammoth domestic role.

Library and information professionals have long considered their primary responsibility to be that of providing information access, the *raison d’être* for library development and cooperation. Yet, up to now, information has not always been easy to access. In the international arena, this has been particularly true regarding information on and about other countries. At best it has been transmitted or shared mainly via printed sources and public media.

To expand on this matter and to promote the spirit of this conference in development and cooperation, I would like to take

this opportunity to address the topic of new technologies, specifically optical videodisc technology. My talk will focus on the role of the optical videodisc in increasing our options to provide better, more comprehensive, speedier and multiple access to available information. Thus, the optical videodisc can play an essential role in furthering more effective international and national development and cooperation.

The highly significant advances which occurred in videodisc-based applications marked 1985 as a milestone in information services. Optical videodisc-based information products mushroomed both quantitatively and qualitatively. For instance, even the technology of CD-ROM has emerged to a point at which it will profoundly change libraries’ modes of operations and services.

This presentation will focus on videodisc technology, specifically the analog one for interactive use. Because of limited time, a discussion on CD-ROMs is not feasible, except to recognize CD-ROM as a high-density storage medium which possesses great potential for electronic publishing, and therefore will have a considerable impact on libraries.

INTRODUCTION

Videodisc technology has existed far longer than microcomputers. During the 1970s and 1980s, videodiscs were primarily used for recreational purposes. Its significant role as a high-density, high-speed information storage and retrieval tool was not recognized until recently. The dilatant and dynamic developments of interactive videodiscs were due to the swiftly advancing microcomputer industry. It is the union of computers, in particular low-cost, high-performance micros coupled with the videodisc which yields unlimited information transfer possibilities. Without this alliance, the videodisc possesses limited potential for application. The significance of this union explains the incredible popularity of micro-based videodisc technology in information en-

vironments.

Another significant factor is the advancement of information technology communication beyond alphanumeric, and the emphasis on textual and numerical information. Clearly, this has been hindrance for applications which involve a visual image.

Present videodisc technological achievements, coupled with the union of this technology with computerized databases, have expanded the possibilities of graphic images employing textual and numerical information along with large-scale storage and retrieval. To begin to possess an understanding of how this is feasible, one must first obtain some knowledge of videodisc fundamentals.

What is a Videodisc?

Optical videodisc technology has the unique feature of joining into one continuous and simultaneous format all information media. For example, it can be employed for slide pictures, meaning both slides and filmstrips. It also may be used for motion pictures, whether it be films or video tapes. In addition to visual information, it also contains a dual-sound track, stereo audio. The optical videodisc is a high-density storage medium. For example, an analog videodisc can, on a single, one-side 12-inch disc, store 54,000 images, which is comparable to 675 80-slide carousel trays. It is also equivalent to a 30-frame-per-second video running for one-half hour. In terms of a 12-inch digital disc this is equal to about 800 MB or more of data. Though this varies depending upon the resolution fineness required, this is approximately equal to 10,000 to 20,000 pages of text. Lastly, it is comparable with 75 hours of digital sound, or to any arrangement of the above. The analog optical videodisc permits frames to be read individually in any specified sequence. Another valuable trait, which this 54,000-frame analog disc possesses, is the option of allowing any one still image or part of a motion sequence to be retrieved randomly in a time of less than three seconds. Still images can also be mixed with the motion sequences and audio. The audio

may then be recorded on either or both channels, totalling 30 minutes per side. The digitized videodisc gives one the capability to retrieve any desired information in seconds by employing the Boolean search and/or the full text search with an identified code-word.

In optical videodisc technology, information is recorded and/or read via a laser. The laser is capable of being focused with incredible accuracy. In fact, an accuracy to a degree of one millionth of a meter, which is equal to one micron, is possible. This accuracy allows a 12-inch disc to possess information with an extraordinarily high-density inscription. Spiralling tracks of microscopic valleys, referred to as pits, compose the videodisc's information surface. These pits number more than 10 billion per side. The videodisc spins at a rate of 1800 revolutions per minute, which is equivalent to 30 revolutions per second. The laser beam's reflected light is focused on the disc's surface and collected by means of a photo-detector. When it hits a pit, the reflected beam light is diffracted away from the detector. Both the video and audio signals are products of the variation of light intensity, which is caused by the varying lengths of the pits (see Figure 1). A layer of plastic covers the video-disc's metallic surface. This allows the information on each disc to be read via laser beam without actual contact. This is significant in that it yields the information on the disc to be nearly indestructible, for it can rarely be damaged and the information burned on the disc will not be lost in any way. Because of this trait, the videodisc has come to be considered as an ideal medium for archival preservation and conservation.

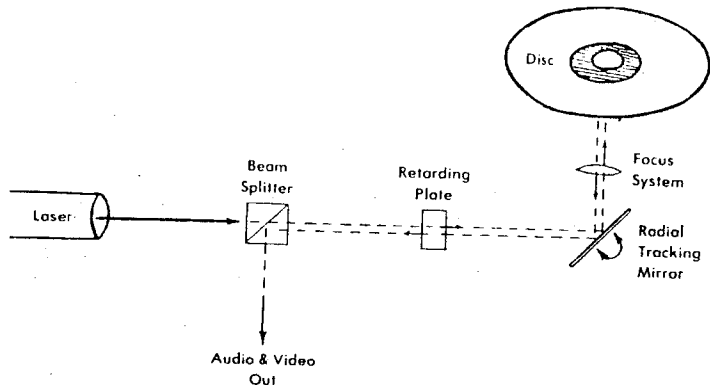


Figure 1. The simplified mechanics of a reflective optical videodisc system (Taken from Chen, 1985.)

Characteristics of Videodisc

As stated above, with the expansion of the home entertainment industry came the realization of the capabilities of optical videodiscs for information storage and retrieval. In addition to the storage of digital information is the storage and retrieval of random access graphics.

There are several reasons behind the videodisc's successfulness in information delivery and mass information storage. A key reason is its most reasonable affordability as a medium for information storage and retrieval. This is true when it is employed for both video and digital data. Also the density and versatility of the optical videodisc allows for inexpensive online storage. The creation of great potential for archival storage is a plus, especially with conservationists. It allows all stored information to be expeditiously and randomly accessed. Optical videodiscs are also appropriate for electronic publishing and large information database construction. These discs are ideal for developing an audio

and/or visual database. This is because of their ability to store video images, as well as photographs, drawings, maps, charts, plans, formulas, narration, recordings, videotapings, and more. It is a perfect storage solution for compact safekeeping of large amounts of multi-media and multi-formatted information. With this useful quality, optical videodiscs can be the answer to spatial preservation and conservation problems. High color resolution graphics make the discs perfect for visual presentation and preservation.

Thus, it is clear that the versatility and characteristics of the videodisc, as described above, can be summarized as follows:

- 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.

It is therefore the ideal medium for coupling scholarship with technology; research and demonstration with education and training; and high technology with subject specialities. It should have great potential for library development and cooperation, and information transfer and dissemination.

Interactive Videodisc

The videodisc receives much praise for the characteristics which are described above. Yet, the ultimate power of the videodisc can only be fully revealed in an interactive mode. In order to gain a good understanding of this, one must first understand what an interactive videodisc is.

Human conversation is a good example of an interactive system, because it depicts the key to such a system, which is that both the user and the system enter into a simultaneous and

reciprocal interchange. The key characteristics are its simultaneity and interruptability. Similarly, interactive optical videodisc systems permit the viewer to become an integral part of the system. This is feasible via the easily and randomly-accessed analog disc which is retrieved with a connected computer system, most commonly a micro-based one. In other words, computer programs will be written which will enable the system user to retrieve any of the 54,000 frames of the analog disc containing numeric, textual or video information. As well, the desired information on a digitized disc, in the user's specified format and their own pace, is easily retrieved. In this way, the viewer does not take an observation role. Rather, the viewer is extremely active in the viewing/learning process.

An interactive videodisc system promotes the successful marriage of the computer with the videodisc, and its audio, textual and visual information. An assortment of coursewares and programs may be developed and/or composed because of the disc's trait of easy information accessibility. Today's sophisticated software options are also contributing factors in this. This offers the user a range of information available both on the disc and in the computer. An interactive videodisc system can be easily made user-friendly. It can become individualized by merely introducing such technology as a touch screen, light pen, and barcoding.

Interactive videodiscs can play a valuable role in contributing to the quality of life in the 20th century by providing speedy and needed information access to users as deemed necessary and desired. Furthermore, their unique characteristics and usefulness, which promote easy information access can significantly enhance our appreciation of difficult subject matters, such as the humanities which are not as clear-cut and straight forward as those matters in science and technology. It is my intent to illustrate these potentialities with actual demonstrations. Since "a picture's worth a thousand words," it is my hope that the demonstration

will permit us to have a greater appreciation of the role which new technologies, such as the interactive videodisc, can have as useful tools for library and information development and cooperation. Furthermore, I aim as well to show that an interactive videodisc does not require a "star wars" environment, with confusing sounds and flashing lights, to become a reality.

Since I am speaking on Chinese turf, there is nothing more fitting to illustrate my points than something truly Chinese. The Chinese people are proud of its 5000-year cultural heritage and magnificent civilization. There are many things throughout the centuries which they can and should share with other people on this earth. For this reason and the respect of my own Chinese heritage, the incredible archaeological find near the grave site of the well-known First Emperor of China has been chosen as the theme of this videodisc project. It will illustrate the great potential, value and versatility that interactive videodisc technology can play, not only in information management and the promotion of humanities, but in international cooperation and understanding. This project is known as PROJECT EMPEROR-I, and I am the Principal Investigator and Project Director.

PROJECT EMPEROR-I

"PROJECT EMPEROR-I: China's Treasure Revealed via Videodisc Technology" is supported by the Humanities Project in Libraries, via the US National Endowment for the Humanities. This project applies the latest in videodisc technology in order to present and interpret a major historical/archaeological period of China's past. The site and artifacts to be recorded and presented are from the period of the First Emperor of China (Qin Dynasty). During the Emperor's brief fifteen-year reign, his accomplishments included the institution of unified written scripts; the completion

of the Great Wall; the unification of warring states; and the building of his magnificent tomb near Xian. Near his tomb the discovery was made of 7,000 life-size terracotta figures of warriors and horses (see Figure 2). This most spectacular and significant archaeological discovery has captivated people throughout the world. PROJECT EMPEROR-I, employing an interactive videodisc, presents and interprets these intricate and amazing subjects.

Objectives

PROJECT EMPEROR-I demonstrates how the videodisc can be employed as a serious medium for information storage, processing and retrieval. Yet, it also goes a step beyond this, for PROJECT EMPEROR-I also aims at eliminating the barrier between humanistic applications and new communication technologies. PROJECT EMPEROR-I is unique in its promotion of a harmony of East with West, past with present, humanities with high technology, and scholarship with application. One of the Project goals is to demonstrate new technologies' capability in supplying users with improved and more efficient large-scale information processing, storage, access and delivery. The outcome, which is revealed via this Project, is the presentation of multimedia, multi-formatted, and multi-dimensional information by means of a revolutionary technique. A significant ramification is also the promotion of an increased understanding and appreciation for the humanities. A further exciting outcome is the introduction of a novel, interactive educational and learning tool which provides visual, audio, and textual information by means of videodisc combined with developed courseware and employed with a micro-based system.



Figure 2. Qin Terra-Cotta Figures of Warriors and Horses (Courtesy of PROJECT EMPEROR-I)

PROJECT EMPEROR-I Products

1. Disc (entitled "The First Emperor of China")

The main products of PROJECT EMPEROR-I are two double-sided "12" NTSC CAV videodiscs. These are entitled "The First Emperor of China: Qin Shi Huang Di, 秦始皇帝" Each disc is composed of 108,000 frames of visual images together with musical interludes. In addition is a full-hour of narration and/or interviews, which have been recorded in both Chinese and English.

The first double-sided disc is composed of over 200 segments of motion video and 4,000 plus still frame pictures. The motion video was created from edited films and videotapes. The visual information is grouped on the disc in a format very similar to that of an electronic book. In other words, the visual information is matched with appropriate bilingual narrations, which are then classified into "chapters". Each chapter focuses on a specific theme; for instance, "Introduction on the First Emperor of China," "The Great Wall," and "Collection of the Qin Terra-Cotta Museum of Warriors and Horses." This format allows for very speedy retrieval of both the audio and visual information on a thematic topic even though any one of the 108,000 frames of visual images can be retrieved randomly and easily in less than three seconds.

The second double-sided disc possesses very valuable oral history on this subject. This historical perspective is presented via videotaped interviews. Ten of the field's top experts were interviewed and their insights recorded on over 60 hours of videotapes. These tapes were critically selected for inclusion on the second disc in the format of questions asked of and responded to by each expert. The answers provided to each question by the experts are again arranged in chapters, and each can 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 relational database management software specifically designed for the retrieval of visual information. Each record will 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, visual and audio data by means of a micro-based interactive videodisc system. The Interactive Video Information System (IVIS) designed by Digital Equipment Corporation is an excellent example of such a system.

3. Coursewares

With a most appreciated hardware grant from the Digital Equipment Corporation, the DEC IVIS has been used to develop a variety of computer-assisted instructional coursewares, which rely on this videodisc being used along with DEC's IVIS system. The hope in developing these coursewares is to be able 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 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 DIRECTOR software.

Each lesson will enable the system user to interactively choose the options given as menus and sub-menus on the monitor screen in order to make selections. 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 choices, the main menu also includes various other options which include the following:

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

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 benefitted from such a technology-related product. Videodisc technology, with its capacity for instantaneous, easily retrieved multi-media data and information, and simultaneous spectacular visual images, enables many 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. To this end, I hope that someday the magnificent collection of priceless artifacts here in the National Palace Museum, and the rare book treasures of the NCL can be captured and stored on videodisc as well, so that billions of people in other parts of the world will have the added opportunity to be exposed to the glorious Chinese Culture and civilization beyond what can be disseminated via printed sources.

While PROJECT EMPEROR-I has demonstrated this possibility vividly, the Project has also emerged 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 a 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 aggressive library services and information provision which we as informational professionals in this information age should develop and strive for.

Library literature has brought home the vital element in libraries that is provided by those people who commit their lives to the programs and networks in building coalitions for library development and cooperation. PROJECT EMPEROR-I is one attempt to develop new frontiers in utilizing new information technology, and in working with other professions for information development and cooperation. While the process and tasks in-

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) (December 1986): 217-239.