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# ***THRIVING IN THE DIGITAL COMMUNICATIONS ENVIRONMENT: PROJECT EMPEROR-I'S EXPERIENCE -- FROM PRINT TO MULTIMEDIA, ANALOG TO DIGITAL***

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**Abstract:** This paper explores the potentials of digital environment to knowledge sharing. To illustrate the potential of the "digital future," the author shares her experience with the latest cutting-edge development of a multi-year multimedia project, PROJECT EMPEROR-I -- from full text to multimedia, from print, analog to digital. Specific demonstration will be given by using the newest products of a QuickTime CD-ROM and Photo CDs. Discussions will also be given on the development of a dynamic digital image knowledge base with object oriented approach.

With the coming of the information super-highway, the paper will discuss potential implications of such type of developments for a multimedia global knowledge network. It also explores the concept of "The Global Library" in which all knowledge bases, multimedia or not, can be linked together.

## **1. INTRODUCTION**

In this high-tech world with the dynamic changes taken place on almost daily basis, a decade is a very long time! For PROJECT EMPEROR-I, a multi-facet R&D project related to *The First Emperor of China*' terracotta warriors and horses is celebrating its 10th anniversary at this time. During this 10-year period, there have been many exciting activities and products, which have been rather widely covered in public media, popular as well as scholarly professional journals of over 15

countries, as well as featured in over 40 international and national conferences. These have also been summarized for *NIT* participants in previous years (Chen, 1991; Chen, 1992). Thus, it is a project which should be somewhat familiar to many of you. Yet, each year, there are new products and activities developed in tune with the new technological environment and developments.

At *NIT '93*, I am pleased to be able to bring to the participants this year's new products and developments in the digital domain.

## 2. THE DIGITAL ENVIRONMENT

Unquestionably 1993 is a "digital" year. For example, during the short 30 days alone prior to this *NIT '93* conference, there was not a single day that I failed to hear the mention in the daily news something about "digital communications," "information super-highway," and "multimedia technology." This also include a week in October 1993 full of headlines of heavy-weight mergers and acquisitions, such as:

- "AT&T buys McCaw Celular for \$12.6 billion,"
- "British Telecom buys a 20% equity stake in MCI,"
- "QVC proposes a merger with Home Shopping Network,"
- "U.S. West buys a \$2.5 billion stake in Time Warner," etc...

There is also not a single high-tech and business magazine in this month, which is not discussing the "digital future." For example, one of the latest issue of *Business Week* (October 18, 1993 ) has articles such as "Hewlett-Packard digs deep for a digital future." Unlike earlier years, anything "digital" has become something which is "money-making." This kind of fever for anything "digital" drove the stocks in this financial segment sky-high. Every investment house has come out articles and "advice" on the desirability of such a "great growth industry of the decade." For example, the October 1993 issue of *PaineWebber's Money Notes* has the front cover article entitled "Where are the market drivers of the '90s? Travel the information highway." In that article, it discusses "information highway" as:

*"Reaching into homes and businesses, the electronic road carries data, voice, and video in fast, digital formats, enabling you to access virtually any type of information or entertainment through your personal computer, your television set and, perhaps someday, your wireless video phone. Already, companies involved in the semiconductor, telecommunications, cable TV, software and entertainment industries are joining forces to construct the information highway and make it accessible to consumers and workers worldwide."*

With this kind of all-out efforts in the construction of this information super-highway, information professionals like us can not help to ask some vital questions such as:

- What is the "digital future" for us and for our libraries, media centers, etc...?

- As the knowledge world is going from a paper culture to an electronic culture, how will our organizations be affected?
- How this type of development will change the role of the traditional libraries in the new "digital" and visual information age?
- Are the libraries ready to take advantage of this super-highway?

### **3. TELECOMMUNICATIONS & UNIVERSAL INFORMATION ACCESS**

In the area of communications, in the past we have passed several "information jumps" -- from speech to writing to printing, and now to wire and wireless communications. The last make effective economic and political organization possible on a continental scale, and is taking us toward a global civilization. At this conference, several speakers will address the global communications network, such as Internet, which has greatly expanded in the last couple of years and is fast becoming a medium of mass communication. It is estimated that well over 10 million people in the world have E-mail now.

As to the wireless communications, expected to be one of the most important technologies of the next decade, it will be as commonplace as wired one within three years. With the appropriate hardware platform and proper communications, network and user interface software, packet radio node can serve as part of an "ad hoc" network of other packet radio nodes. Each packet radio system within the network becomes a de facto member of the "ad hoc" network [Mello, 1993]. In most cases, this network is then connected to the larger wired network such as Internet. Wireless communications is driven by two forces -- the trend to untether computers from the desktop, and the desire for universal connectivity. Normally, the forces of portability and connectivity are at odds, but wireless communications permits one to have the best of both worlds -- freedom from the desktop and connectivity.

Thus, as computing and telecommunications develop and merge, what lies ahead is another jump toward what might be called universal information access. This would mean that anyone, anywhere, could talk, write, confer with, or send both textual and visual information to anyone else in any part of the world. This means that the concept of "The Global Library" is not only conceptually sound, but technological feasible now. With this kind of universal library, we would have access to global information resources and/or knowledge bases (Chen, 1993).

### **4. PROJECT EMPEROR-I'S DIGITAL DEVELOPMENT**

During the last ten years, the project has grown from a videodisc, then interactive videodisc project to a truly complex and multimedia one. It has created a number of products which include the popular version of the interactive videodisc, *The First Emperor of China*, published by The Voyager Company, as well as the 80-hour interactive courseware with a comprehensive set of 4-side videodiscs, etc... Since *NIT '92*, in 1993, new R&D work as well as new products developed are all shifted to the digital domain. These include:

- A QuickTime<sup>®</sup> CD, modified version of the popular interactive videodisc, to be ready for worldwide distribution by the end of 1993. The current version is running on Macintosh, but the PC version is being developed as well.
- Several Photo CDs with over several hundreds of digital images at 5 different levels of resolutions.
- A digital image base taking advantage of the newest development in the digital imaging area with the new object oriented approach.

#### **4.1. QuickTime<sup>®</sup> CD and Photo CD Products**

Taking advantage of the current optical, digital video, imaging and compression technologies, a digital CD-ROM product has been created together with The Voyager Company for *The First Emperor of China* by modifying the multimedia materials from the popular version of the videodisc and companion software, also published by The Voyager Company since 1991. The CD includes all 5 chapters of the popular videos in digital QuickTime<sup>®</sup> format. Since digital images and videos are very storage hungry, it is not possible to include all the still images available from the Still Picture Library of the videodisc. Thus, about 320 most important pictures were selected, and 3 photo CDs were created. These Photo CDs are used to provide the digital images for the Voyager CD product, as well as used to experiment the creation of an powerful image base on PC systems. By sacrificing the quantity of images, we gain greatly the quality of these digital still images.

The newly created digital videos and digital images, after compression, have been integrated to the interactive application development of the final digital CD-ROM. With this product, users can now, in an intimate way, retrieve whatever they wish to have by using only the double-speed CD-ROM drive attached to their own Macintosh. Thus, the hardware setup is considerably simpler than that of an interactive videodisc system. This new product will also facilitate the use of this interest-ing application by those users situated in countries with different broadcasting standard, such as PAL, since they don't need to concern themselves with these considerations.

Differing from our interactive videodisc product, instead of seeing interactive multimedia materials on two screens -- computer monitor and the TV or monitor for the videos coming from the videodisc, now all multimedia presentations can be shown on the same microcomputer screen. Figure 1 shows the opening and main menu screens of *The First Emperor of China* CD, which are quite similar to those of the interactive videodisc. Yet, the rest of the application presentations are quite different. Once a user selects a topic, say "Introduction to Qin Shi Huang Di," Figure 2 shows that the system immediately comes out a screen with a QuickTime video window for digital video as well as the supporting text. Figure 3 shows that digital video for different locations of The Great Wall can also be accessed by clicking on the desired location on the map.\*

The CD version includes all the system features of the interactive videodisc. However, for the "Image Library" portion, the CD version provides additional advantages including:

- Instant access to full-screen images of much higher resolutions on the same screen.
- Thumb nail access to images of the same subject grouping.

As common to all Emperor's applications, hyperlinks are provided from texts to images, from texts to glossaries, etc... The user has the ability to experience total freedom in their selection of multimedia information. The entire subject is being presented from a "knowledge base" point of view.

Currently the CD-ROM version is available on Macintosh only. The product will be ready for world-wide distribution by *MacWorld* in San Francisco in early January 1994. The PC version is being developed, and hopefully will be available sometime in 1994.

## 4.2. Dynamic Image Base

A dynamic image base has been developed using **Picture View**; (tentative name).\*\* Picture View; provides an object oriented approach to handling and working with large collections of images by allowing users to manipulate and process "*instances*" of original images stored on Read-Only media. A workspace managed by the Picture View; software provides the user with the ability to view, organize, transform and compose images into new images and/or collections and to store them efficiently onto magnetic storage as transformation mappings that can be recalled at a later time. This capability effectively integrates the archival ability of CD-ROMs and Photo CDs with the desire by users to modify and create new images without having to store all the transforms as images.

A hierarchical document model is used within the workspace to allow users to create *pictures, pages, sections, albums and drawers* (Figure 4). Pictures serve as the fundamental building block and can contain either textual data images or graphics or other pictures. Pages can contain one or more pictures as well as other pages (e.g. as a miniature). Composition of objects are done using a camera metaphor where a cropped portion of the source object (e.g. a picture) is mapped or projected into a destination object (e.g. another picture). This allows the user, for example, to map portions of several images into a composite picture and then the picture into another page and so on. In all mapping projections, the identity of the original source objects is not lost so it can be selected and modified even in its derived form. This capability differentiates Picture View from the more traditional bitmap image processing systems in which the identity of the source is lost once they are composited together. Captions and user added notes can also be affixed on any of the objects. Each object in the workplace maintains a set of user viewable and modifiable properties list on which searches can be performed. In the case of the **Emperor** images, for example, each object maintains a list of key words and textual descriptions regarding place of find, current location, estimates data, etc. (Figure 5). The user can search the workplace using keywords and the textual description to generate a review list which can then be refined by successive searches. Keywords and textual descriptions can also be associated with user added notes or captions.

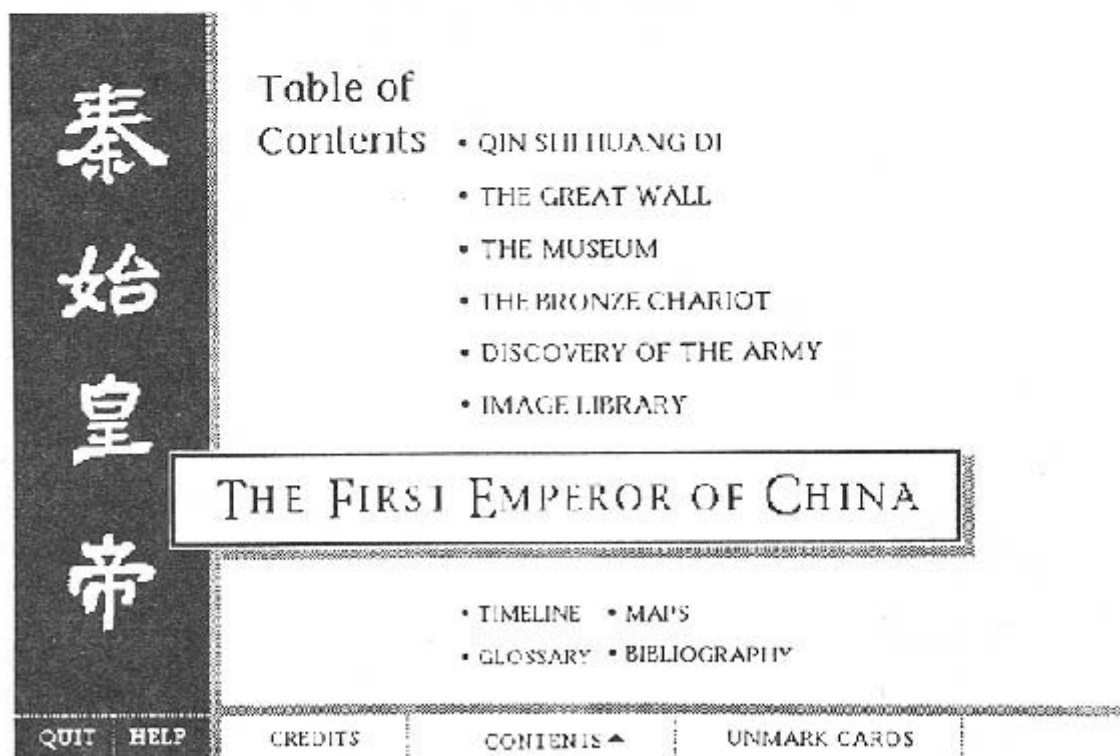
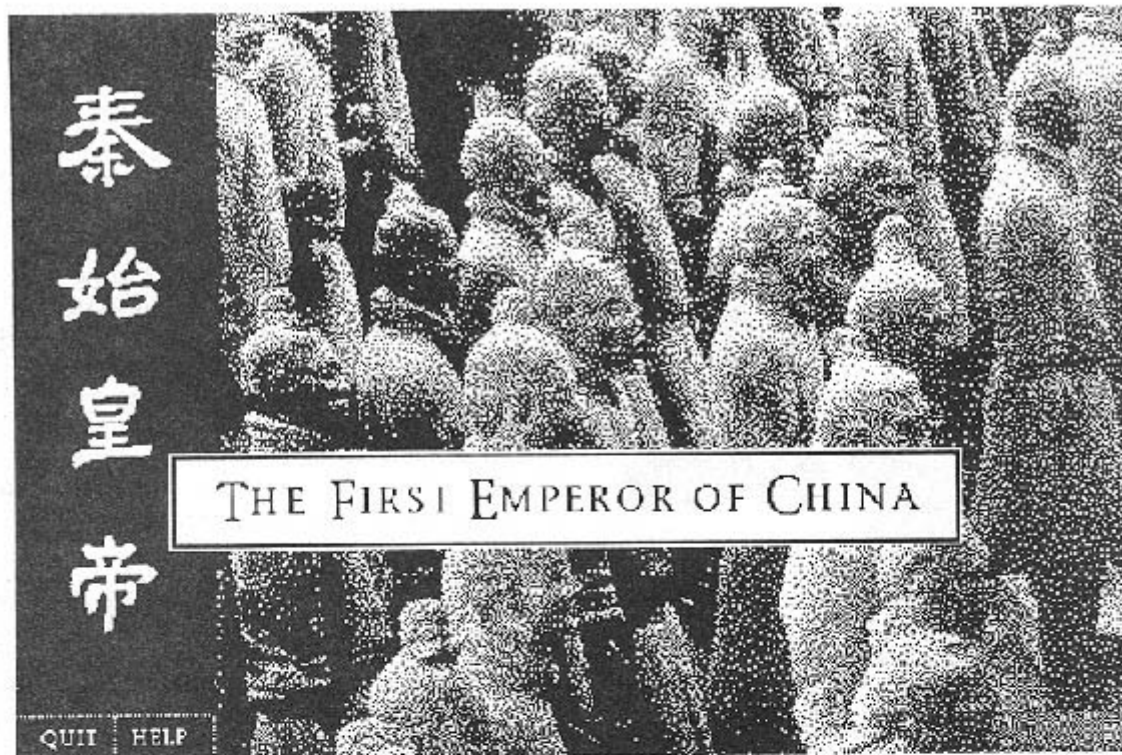


Figure 1. The Opening Screen and Main Menu of *The First Emperor of China* CD

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## Qin Shi Huang Di

In March 1974, peasants digging a well to the east of the tomb mound of Qin Shi Huang Di (the First Emperor of China), outside Xi'an in the northwest, suddenly struck fragments of pottery warriors buried in the ground. Archaeologists rushed to the site to investigate this new discovery.

Within a few weeks, it became clear that the find was going to be among the most spectacular in this century and the news spread rapidly

START  
PLAY

Select Audio:

ENGLISH

CHINESE

HIDE TEXT    ASK THE EXPERTS    BIBLIOGRAPHY

QUIT    HELP    ✓ GO ✓ G    PRINT TEXT    CONTENTS ▲    ◀ MARKED ▶    >

< 1 of 16 >

Figure 2. The QuickTime video and the accompanying text introducing The First Emperor of China

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## The Great Wall

Click on a place name to see a motion sequence of that portion of the Great Wall.

-----GREAT WALL

JUYONGGUAN    SHANHAIGUAN  
BADALING  
CLOUD TERRACE  
HAYUGUAN    Gobi Desert    Loess Plateau    Beijing    SOLE DRAGON HEAD  
Hebei Corridor    Bohai Sea  
Yellow River  
Xian

QUIT    HELP    ✓ GO ✓ G    MAP INDEX ▲    CONTENTS ▲    ◀ MARKED ▶    <

Figure 3. Accessing the QuickTime videos on The Great Wall via the use of map



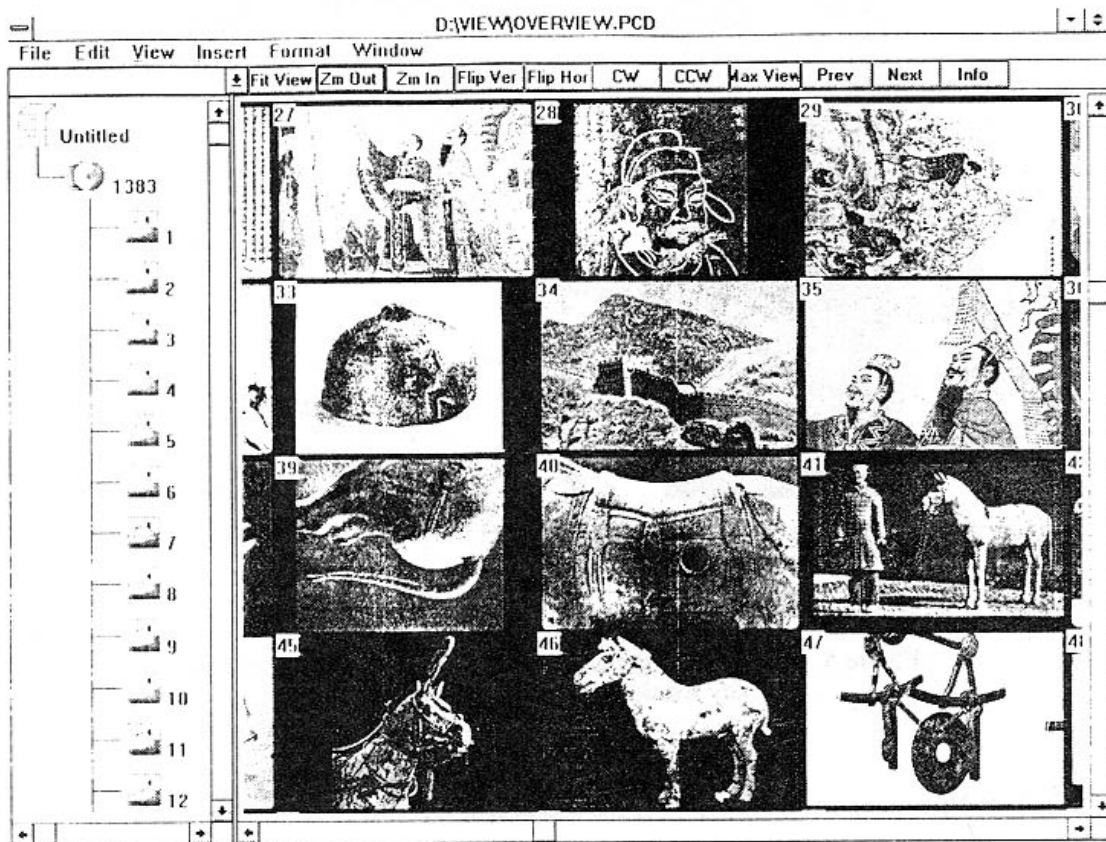


Figure 4. A page of pictures composed in Picture View from the digital images

Picture View supports three views of the subjects in the workspace:

- The first is the logical view which shows the relationship between each of the objects. This view resembles a file manager in depicting the tree like relation between parent object and subordinate object.
- The second view is the object view that shows the rendered form of any object such as a page or a CD (Figure 4).
- The third is the archive view which shows the contents of an archive such as a photo CD as a miniature thumb nails. The user can navigate through the document structure in any of the three views. Additional viewing controls in the object view also allow the user to zoom in, zoom our, flip, rotate, crop the displayed object. All viewing information is maintained by the work-space between sessions so the user can resume working on the images at a later time.

Picture View is designed to run in an Window 3.1 environment with a 4-8 MB of RAM and reasonable amounts of fixed disk support got intermediate caching. Since the workspace does not need to store the processes results, the actual amount of information maintained between sessions is very small. It can, however, be set to keep intermediate results from one session to another to eliminate the need to regenerate the processed images.

Connections to digital videos and any other related materials are possible. Furthermore, connections to any communications network for digital data sharing can be made easily as well. Given the huge amount of images currently available in all types of libraries, archives, and information centers, this development seems to suggest great potential for numerous kind of future applications which can take full advantage of forthcoming digital networks and communications.

## **5. SHIFT TOWARD A LEARNING-ORIENTED SOCIETY: THE NEW EMPHASIS**

In the current dynamic and competitive society, information has become the key to productivity, and there is a clear shift toward a knowledge-based learning-oriented "creative society." We are witnessing the following change in emphasis:

- Societal values change from "acquiring" to "learning"
- Growing motivation of individuals for knowledge
- More people learn to use information creatively
- More demand for multimedia information
- More demand for global information.

It is clear then that a changing society characterized by continuing technological progress, societal and economic changes will definitely pose new challenges to libraries, information centers, and archival organizations. It demands information professionals like us to transcend traditional methods of providing information access within the confines of any physical structures, such as libraries, to providing access to services and global knowledge to people at home, in school, at work, or any place so desired by them (Chen, 1993).

Technologies are ready for us to experiment many exciting things, and the political environment is also ready to push the digital information super-highway which will soon be ready to enable us to transmit large quantity of multimedia information and data within the global electronic and digital network. To be ready for this excitement, some libraries are beginning or have started to shift from books to computers. For example, as reported in the *Wall Street Journal*, the Chicago-Kent School of Law at Illinois Institute of Technology has started, in big scale, to convert existing books into electronic files. They have, for months, broken the book bindings, tore the pages for scanning, and stored the digital information in their computers. Columbia University's law library has also announced plan to scan and store on a \$1.5 million supercomputer 10,000 deteriorating old books yearly by 1996 (Bulkeley, 1993). Such early efforts at electronic libraries foretell vast changes in academic research. These are early attempts to get ready for the coming of the information super-highway.

## 6. CONCLUSION

As a R&D project, PROJECT EMPEROR-I shows how one can develop innovative applications in this visual and digital information age, in order to aim at the construction of a kind of multimedia knowledge base which can be shared globally. Currently the electronic by-products, distributed through rather traditional means, have already enhanced learning and global information access. Having made great efforts in creating electronic content base in the digital domain has begun to prepare us for the coming of the information super-highway. We are ready to experiment, share and transmit our digital videos and images through whatever sophisticated digital communications networks which are expected to be ready by 1995 or 1996.

One should always remember that when the information super-highway is built, it needs the right kind of vehicles to be on it. Digital contents will be the key for any successful use of this kind of highway. Without, the information super-highway will go to waste. So, prepare ourselves for it!

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