Multimedia And The First Emperor Of China:

Moving Toward A Digital Knowledge Base

In addition to building the Great Wall and unifying China, Emperor Qin Shi Huang Di is also known for one of the greatest archeological finds of all time: the army of 7,000 terra cotta warriors buried near his tomb.

Unearthed in the 1970s, these warriors, which are meticulously individualistic, provide a fascinating glimpse into an ancient culture that most people will not be able to see firsthand.

PROJECT EMPEROR-I consists of several multimedia programs authored by Dr. Ching-chih Chen, professor and associate dean, Graduate School of Library and Information Science at Boston-based Simmons College. With PROJECT-EMPEROR-I, students, researchers and the general public can see the individual faces of the warriors, their original uniforms and gestures, and get a sense of the magnitude of this archeological find.

"PROJECT EMPEROR-I brings together the ancient and the modern, east and west, humanities and technology," says Chen. "It proves that there are really no boundaries to what you can accomplish with multimedia."

The extensive, CINDY award-winning interactive videodisc product for popular audiences, which has been available through multimedia publisher The Voyager Company since 1991, demonstrates the power of integrating motion video, still pictures, audio, text and data in an interactive multimedia teaching and learning application.
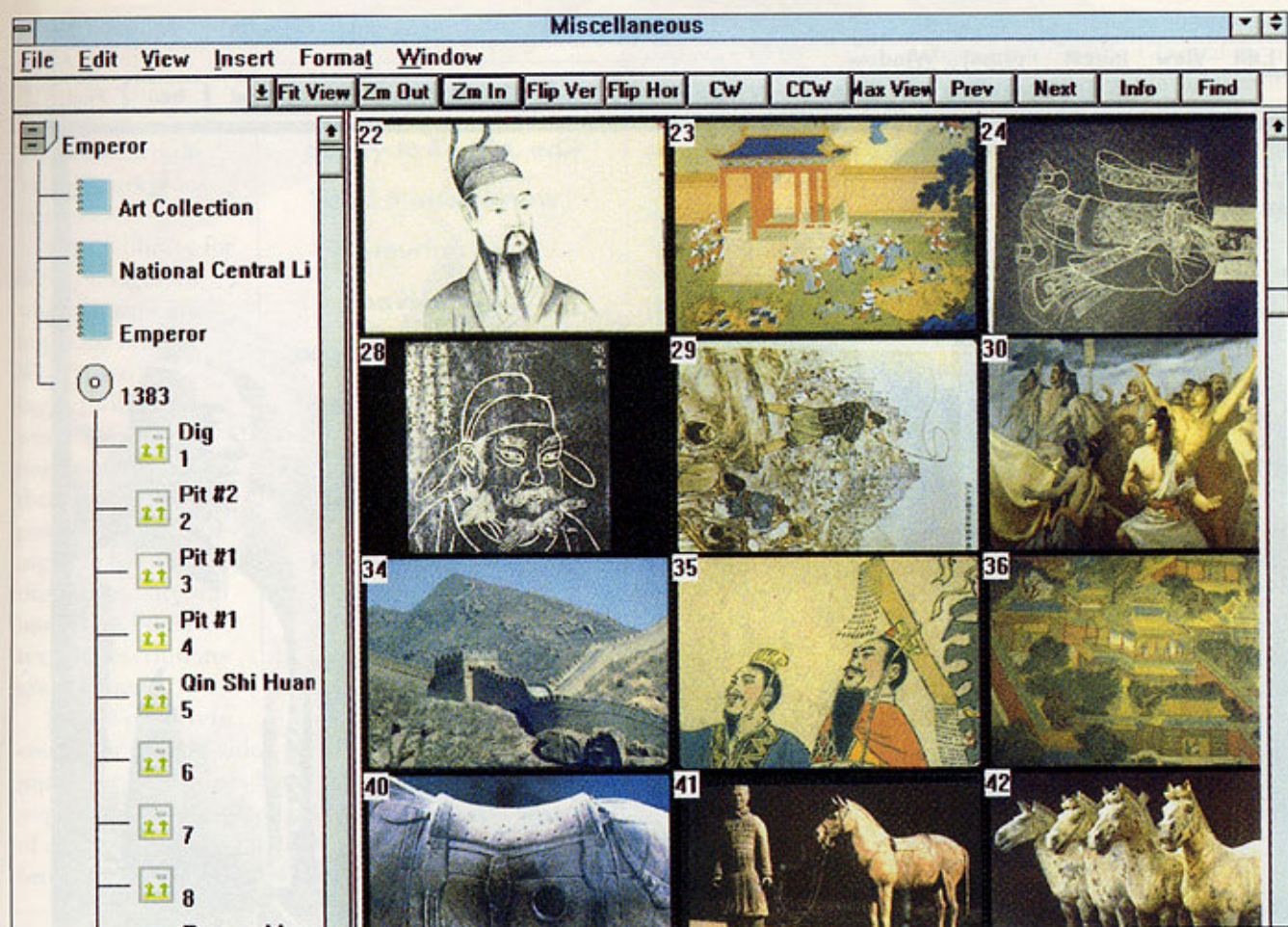
According to Chen, the programs' appeal is in the

Figure 1

seamless integration of different presentation modalities with a knowledge base of factual data and navigational linkages. The end result is a learning environment that is enjoy-

able, easy to use and totally user-directed. Navigation through the information can be either user-driven or directed through pre-established linkages.

A digital multimedia CD-ROM product has also been produced by The Voyager Company for worldwide distribution, and its IBM version is

expected to be ready by Spring 1994. This popular version provides some 20 minutes of digital video, about 400 digital still images and five to six hours of interactive courseware.

Concurrently, further application development is in process with IBM Asia to expand the multimedia courseware.

Over the past year, an effort has been initiated to explore ways in which high-resolution digital images and user-directed image processing can be effectively integrated with

multimedia data to provide even greater flexibility in allowing users to interact with visual data.

"Many of the Emperor images contain significant details that cannot be displayed at video resolution, except in small sections," says Chen. "Integrating high-resolution images that can be processed into a multimedia application opens up new opportunities for the user to specify and perform limited image processing, such as zooming in on details, cropping regions of interest from an image, composing new perspectives, such as side-by-side views taken from different images, or even processing images through different comparison filters."

According to Chen, a scholar or information seeker working with Emperor images may choose to create new pages for views of images in any way they desire, as shown in figure 1. A high-resolution image of

Figure 2

any chosen view can be further retrieved, as shown in figure 2.

"Giving users the ability to create, edit and manage new viewing and navigational organizations from an existing knowledge base changes users from being simply passively interactive to being actively interactive because they are empowered to augment the knowledge base with their own knowledge," says Chen.

A Windows 3.1-based, as well as an OS/2.1-based Visual Workspace suitable for use with a PC have been developed. These systems are being used to test new ways for users to interact with multimedia information in visually-oriented applications.

The Visual Workspace is designed to facilitate working in image-intensive applications by allowing

the user to manage the viewing relationship between different multimedia objects. An object-oriented paradigm is used to allow users not only to view, play back and manage multimedia objects stored on CD archives and/or other magnetic storage, but also to create new objects from views of one or more objects. An object-composition model allows one or more views representing cropped areas of one object to be combined to create a new object. This scheme allows different parts of the same image to be made into parts of several pages of an electronic album or, conversely, allows views of several objects (such as a frame from a video sequence) to be combined into one page. This composition model works even with objects that originate in read-only media and can be used to allow the user to

modify objects stored on CDs.

The Visual Workspace, which now works with images stored on Photo CDs, represents the first step in the development of a full multimedia knowledge base, which can be used to manage different multimedia objects and their viewing and logical relations. Currently, the Visual Workspace is set up to allow the Emperor images to be imported and organized into different pages and sections of an electronic album. Key words associated with each object allows the user to query the Workspace and retrieve a list of matching objects.

The next step is to introduce video sequences into the Workspace and allow their views to be composited into pages. This would, for example, allow a user to use a key frame from a sequence as a reference

and to combine it with other references to build a cross reference.

There are several ways in which the Visual Workspace can be used:

1) as a library for digital images, in which images are imported into the Workspace and tagged with key words or descriptions to facilitate their retrieval and, possibly, their viewing organization. In this mode, only still images and their textual descriptions are required.

2) as a cross reference for motion video, in which images or key frames from video sequences are organized into pages of an album, which facilitates browsing. Selecting the key frame

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allows the associated motion sequence to be displayed.

3) as a knowledge base, in which multimedia objects imported into the system serve as the basis for extending the viewing relationships between them. Still images or frames from video sequences can be grouped into more complex organizations such as all pictures with chariots or horses. Objects and the key words associated with them can be successively combined to create a knowledge base.

PROJECT EMPEROR-I's multimedia developmental work has advanced to provide users with the most system flexibilities and

potential multimedia solutions. The digital multimedia CD enables users to learn and enjoy the subject of The First Emperor of China by selecting, browsing and navigating through an interactive multimedia knowledge base and, from there, specific images at mid-range resolution can be retrieved through thumbnail visuals or hyperlinks from related texts. When users require high-resolution images, they can use the Visual Workspace to access multimedia information, including digital video. Still imagery can serve both as an index to the multimedia knowledge base and as part of the content of the knowledge base.

"With all multimedia information transmittable through high-speed communications channels, these digital developments prepare us for the coming of the information superhighway," says Chen.

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