Global Memory Net Offers Users the World Instantly

By Ching-chih Chen

In technological terms, it has been a long time since my *PROJECT EMPEROR-I* — a multimedia interactive videodisc project on the First Emperor of China's famous terracotta warriors and horses — supported by the US National Endowment for the Humanities was reported with great enthusiasm in *Library Times International* in 1986 [1]. At that time, *PROJECT EMPEROR-I* demonstrated that multimedia technology could change the way we seek, demand, and use information. Almost two decade later, fueled by enormous progress in science and technology, we have come a very long way from the use of interactive multimedia technology in the workstation environment to the global networked environment. We have moved from the use of hardcopy and analog resources to digital content, which users can search, retrieve and use instantly to meet their needs over the global network with no national boundaries. We have also moved from the offering of multimedia content of one specific subject topic to the digital content of all media formats on all related subject topics to the world instantly. We are truly living in a new period of unprecedented opportunities and challenges! So, in this digital era, we have witnessed the exciting convergence of content, technology, and global collaboration in the development of digital libraries [2] with great potential for providing universal information access.

Thus, today's information seekers, regardless whether they are general public, school children, or those from research and higher education communities seek information for education, research, entertainment, or enrichment in very different ways from before. From the information resources point of views, the old model of "owning" a collection has given way to "sharing," and the new emphases have shifted from possessing large "physical libraries" to "virtual libraries" digitally distributed all over the world.

In the last two decades, I have experienced much of these transformations up-close and personal through my own R&D activities – from the creation of interactive videodisc and multimedia CD in the 80s and 90s to leading a current international digital library project, *Global Memory Net,* supported by the International Digital Library Program of the US National Science Foundation [2].

WHAT IS GLOBAL MEMORY NET?
From PROJECT EMPEROR-I to *Chinese Memory Net*

In the early 80s, the by-product of *PROJECT EMPEROR-I's* is a set of interactive videodisc, called *The First Emperor of China*, content of which later was converted to a popular multimedia CD product of the same title in 1991 and published by the Voyager Company. As my institution was not big enough to be involved in any digital library R&D activities of both the first and second phases of the Digital Libraries Initiative (DL-I and DL-II) of the US National Science Foundation (NSF), I was busy in building up contents, and develop more complete descriptive information (later known as metadata) of these resources. In 1999, when NSF first introduced its International Digital Library Program (NSF/IDLP), I proposed the– *Chinese Memory Net (CMNet)*, which became one of the first NSF/IDLP Projects.

The NSF's supported *CMNet* since 2000 is intended to develop a model for international collaboration with various R&D activities in digital libraries. It hopes to accomplish "more" with "less," avoid duplication efforts, and capitalize R&D results from other major funded digital library R&D projects. In the short three years, it has made a great effort in developing collaborative infrastructure for digital library development and actual multimedia digital content development. *CMNet's* core content builds upon the large quantity of visual materials of my earlier interactive videodisc (1986) and multimedia CD (1991) products, *The First Emperor of China*. To each image included, extensive research efforts were made to provide relevant descriptive data (metadata) with annotations, as well as links to relevant references and texts whenever possible.

This labor-intensive R&D activity in content and metadata building has paid off because these data have formed attractive basis for a number of exciting and productive technology-oriented collaborative works with computer scientists, such as a few listed in the following with more complete reference provided in [3, 4]:

- Open Archive Initiative (OAI) research,
- Intelligent agent and text-based image retrieval,
- Semantic sensitive content-based image retrieval,
- Digital video using the Informedia technologies, and
- Machine learning for annotation.

From *Chinese Memory Net* to *Global Memory Net* (GMNet)

Once it is possible to develop a multimedia digital library in one subject disciplinary or for one geographical area, it is upward scalable to include more subject topics and bigger geographical areas. This was the case with the expansion of the scope of

CMNet to GMNet since 2002. GMNet developed out of the CMNet project which concentrates on images and video related to China's ancient culture. In recent years, CMNet has collaborated with several major institutions in different countries and thus has become a Global Memory Net. The current effort in CMNet has gone far beyond the Chinese area. It is being expanded to cover the 'memory' of other parts of the globe.

As shown in Figure 1, the tentative GMNet homepage, GMNet literally has space holder for all countries in the world although this tentative homepage has listed tentatively only a few continents and countries under each.

WHAT GLOBAL MEMORY NET COVERS?

The name of Global Memory Net clearly articulates both the potential coverage and scope of this project:

1. **Global** – It means global coverage.
2. **Memory** – "Memory" refers to all the treasured, thus GMNet has the structure to cover all kinds of invaluable memories related to culture, heritage, history, art, music, science, technology, medicine, etc. However, at this initial stage, and with initial entry of the extensive visual memory related the First Emperor of China's terracotta warriors and horses, GMNet is focused on the world significant cultural, historical, and heritage materials. Once this focus is well underway, GMNet will expand to cover other kinds of "memories."
3. **Net** – This means that GMNet hopes to network all significant world resources together. Instead of encouraging the development of small and fragmented digital libraries, it hopes to be a networked portal to offer needed resources instantly with the simple click of the mouse.

HOW GLOBAL MEMORY NET OFFERS THE WORLD!

It is impossible to present the features and ease of use of GMNet in such a short introduction. Although we are exploring the sophisticated digital video retrieval capabilities using the world renown Informedia Technologies [2], it is not available for public use at this time. Thus, I shall limit the offering of some examples related only to the cutting-edge capabilities of image retrieval due to the page space limitation.

Figure 1

In the simplest way, just imagine taking a visual tour of a country's culture, heritage, history, and world contributions, all while sitting at your computer. This soon to be available GMNet will provide image retrieval capabilities with considerable textual supports in a way not possible before. For example, from the page like that shown in Figure 1, one can go to China and then Emperor Image Base quickly. Then one will be able to retrieve invaluable images related to the First Emperor of China, for example, by conducting the traditional search using Google protocol if predefined specifics of the images are known. In this case, one can search literally every field of the metadata, such as creator, title, location, time period, description, keyword, reference source, etc. In this approach, keyword search is likely to be the most popular one.

However, in most cases, one does not have any idea on what kind of images are available in GMNet. In this case, one can use the cutting edge content-based image retrieval technique, SIMPLIcity, which allows users to browse, retrieve, enjoy, and learn in just seconds through multiple thousands of digital images accurately and effectively.

Until recently, most archival images were not available in digital form. Now we have a large quantity of invaluable digital materials from multiple countries, together in one place. One can ask the system to bring out image icons randomly, or to browse the images by displayed icons page to page until one locates the image of interest. For example, when the icons of the mages of the Emperor collection are displayed randomly in Figure 2, one spots the image related to a map of interest. In this case, one can ask the system to provide "SIMILAR" images by clicking "Similar" without typing any word, GMNet will display in seconds all the maps in the collection similar to the one selected. This opens up all possibilities for all related maps

Figure 2

which are totally unknown to the user (see Figure 3). Once these massive numbers of images are displayed, one will be able to find more textual descriptive information as well as reference sources and in some case, full-text pages on a chosen map instantly by clicking "Info". If the chosen image needs to be enlarged, then click on "larger", and multiple levels of zooming will be possible and dynamic digital water mark will be instantly generated to offer the "ownership" information of the image.

Currently we are engaging in several exciting collaborative projects including the University of Florence on Project Restore. Pre- and postrestoration images and descriptive information of restored Italian artifacts are being posted on the Web, including wall paintings damaged from the 1966 Florence flood.

For more information on the project before the website is available for public use, visit www.memorynet.org.

Figure 3

Global Memory
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CONCLUSION

During 1998-2002, I was privileged to serve on the US President's Information Technology Advisory Committee's (PITAC). Our PITAC's Digital Library Panel's Report, *Digital Libraries: Universal Access to Human Knowledge,* has a vision for digital libraries:

"All citizens anywhere anytime can use any Internet-connected digital device to search all of human knowledge.... In this vision, no classroom, group, or person is ever isolated from the world's greatest knowledge resources." [5]

This is a vision more easily said than done! There are many obstacles on the road, thus we are a long way from approaching this "elusive" vision.

From "sharing" and "accessing" points of view, we must first have much more "quality" digital contents, we must collaborate internationally in content building because no one can have everything, then we must have the technology to cope with these contents, and the infrastructure to deliver, access and retrieve them [2]. This is what *Global Memory Net* is inspired to do specifically in content building and method development areas.

ACKNOWLEDGMENTS

REFERENCES

1. "PROJECT EMPEROR-I premiered in Boston," *Library Times International* 2 (5): 88 (March 1986).

2. Chen, Ching-chih, "The promise of international digital library collaboration for innovative use of invaluable resources," in *Human Information Behaviour & Competences for Digital Libraries* (Keynote in *Proceedings of the Libraries in the Digital Age*, May 25-29, 2004, Dubrovnik and Mljet, Croatia. pp. 7-15.

3. Chen, Ching-chih, "Global Memory Net: Potential and challenges for archiving and sharing cultural and heritage resources," *Proceedings of the ICDL (International Conference on Digital Libraries) 2004*, Delhi, India, February 25-27, 2004. Delhi, India: TERI, 2004. pp. 3-10.

4. Chen, Ching-chih, "Past forward - Digital media for cultural heritage: The case of the Global Memory Net," Invited lecture given at the *10th Annual Lecture of Informatics*, sponsored by Informatics, Bangalore, India, February 29, 2004.

5. US. President's Information Technology Advisory Committee (PITAC). Digital Library Panel. *Digital Libraries: Universal Access to Human Knowledge.* February 2001.
   www.hpcc.gov/pubs/pitac/pitac-dk-9feb01.pdf

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Dr. Ching-chih Chen is Professor of the Graduate School of Library and Information Science, Simmons College, Boston, USA. A sought-after international consultant and speaker in over 40 countries, she is an author and editor of over 35 books and more than 150 scholarly journal articles. She was the Chief Conference Organizer of a series of 12 International conferences on New Information Technology (NIT) from 1986-2001 in different parts of the world.

A Fellow of the American Association for the Advancement of Science, she has received many awards and honors, including the Best Information Science Teacher Award of the American Society for Information Science, the Library and Information Technology Association's LITA/Library Hi Tech Award, the LITA/Gaylord Award for the Advancement in Library and Information Technology, and many others. During 1998-2002, she served as a member of the US President's Information Technology Advisory Committee.

Editor's Note:
Prof. Chen will present her *Global Memory Net* at the *Annual Meeting of the Asia, Africa, and The Middle East Section (AAMES) of ACRL/ALA* in Orlando, FL on June 26, 2004 at 2:00-4:00pm. She will receive the Distinguished Service Award from AAMES at the end of the meeting. She will also present a talk at *the Chinese American Librarians' Association (CALA) Annual Meeting* in Orland on June 27, 2004 at 2:00-4:00pm. At *IFLA* in Buenos Aires, Argentina in August,