Exploring Your Amazing World Heritage at A Simple Click of the Mouse[*]

Ching-chih Chen

This article is to appear as a chapter in *Technology and Libraries in the Twenty First Century: An International Perspective*. Edited by R. N. Sharma. Scarecrow Press, 2010. This article is based on the keynote speech delivered at the *ACRL/IRC Meeting* at *the American Library Association Meeting* in Washington DC, June 26, 2010.

Abstract

In this paper, the author will share her cutting-edge technology application in presenting the 890 World Heritage Sites of 148 countries inscribed by the UNESCO World Heritage Center (WHC) to the world (it is expected that another 30 some new sites will be added on July l, 2010). With the simple click of the mouse, one is able to visualize the global situation related to world heritage, to explore and experience this fascinating world by a quick viewing of the introductory videos, to find the site(s) from associated geographical information (map) or timeline, to instantly access multimedia and multilingual information on any selected site from a chosen country or region, or to choose desirable image(s) from all available photographic resources of the whole world for comparative and evaluative studies, thus gaining instant knowledge. Printed and web-based resources, such as all the published books, journals of general and scholarly nature, documents, etc., are also instantly obtainable. Traditional methods in retrieving desired information using database fields like title, location, keyword, etc. are mostly not used immediately since users generally do not know this information when beginning. Thus numerous featured retrieval methods including geographical, country, temporal, as well as content-based image retrieval (CBIR) are introduced for easy access. Visualization development is in progress, which will bring World Heritage treasures hidden in the web-like structures to the surface for the users.

.

1. Introduction

From 2002-2006, the NSF/International Digital Library Program (IDLP) supported a major global digital library of cultural, historical, and heritage image collections, called *Global Memory Net* (*GMNet*), directed by Dr. Ching-chih Chen. It was launched for universal access in late 2006 under the URL, http://memorynet.org. This gateway to the world culture and heritage was and continues to be very well received, and general public and scholars from over 4,000 cities in over 150 countries have used the site.

The success of *GMNet* with its flexible and powerful Linus-PHP-MySQL i-M-C-S (integrated Multimedia Content-based System) has prompted a partnership with the UNESCO's World Heritage Center (WHC). In November 2006, the WHC signed a multi-year Memorandum of Understanding (MoU) with Simmons College, Boston, Massachusetts, USA, to establish the first virtual World Heritage Digital Center (WHDC) under the leadership of Dr. Chen. "The World

[*] The World Heritage Memory Net is a mega-project in partnership with the UNESCO's World Heritage Center since 2007. It has been a topic of numerous keynote and invited speeches given by the Author in various parts of the world. This article, while updating the development in progress of the project to June 2010, also covers much of the basic background information from these talks given by the author in the last year alone. A few most recent ones are listed in References [1]-[5].

Heritage Center considers this an important project with great potential to enhance the humanities for universal access and enrichment through the use of emerging technologies," commented Francesco Bandarin, Director of the WHC.

This MoU has led to the development of *World Heritage Memory Net (WHMNet)* since 2007. With intensive R&D effort extending capabilities far beyond those of the *GMNet* (http://www.memorynet.org), *WHMNet* has begun to emerge as a launchable site for universal access, which will greatly promote a better knowledge of World Heritage properties and increase awareness of everyone's duty to protect them.

This mega *WHMNet* project is expected to be launched for public use before the end of 2010, so this "development in progress" is facing considerable challenges even at the final stretch of this major R&D work. This paper will provide a preliminary bird's eye view of what promises to be an invaluable web-based knowledge base on World Heritage with immeasurable potential, and which hopes to motivate more dynamic and digital activities of a similar nature among libraries, archives and museums.

2. How Does *WHMNet* Work?

With limited amounts of time and space, it is difficult to provide an adequate overview of such a huge project. Thus, only the bird's eye view can be provided in the following with the help of abundant graphics. "A picture's worth a thousand words," thus the graphics will help us to decrease substantially the detailed narratives, and to enhance readers' conceptual appreciation of the kind of information access this flexible system is able to provide and which is not possible elsewhere.

At the present, initial multimedia and multilingual data of all 890 sites as of June 2010 have been processed and uploaded to our Server. While more are to be added, the current MySQL database already consists of about 14,500 records in about 80 languages on over 40,000 images of these 890 sites. In addition, there are many videos, some sound tapes, and many unique document files. A major challenge of this final phase has to be the user interface design. Thus, all graphic presentations included here are still preliminary and subject to major changes.

Figure 1 shows the current Home Page which the author has been using on the existing internal Web Site. This graphic can serve as a good PowerPoint slide showing most of the multimedia and multilingual resources which are available for access at a simple click of the mouse.

At this intensive stage of interface design, although the final Home Page is far from complete, several project design principles can be shared with the readers. Our web-based knowledge base will aim at providing users with an incredible general experience first. As already stated, while we have enormously rich multimedia resources, we don't want our users to access them only through a stiff and inflexible traditional database approach. *Thus, for exploring our amazing world on this World Heritage Memory Net site, we want to engage our users from the very start, making them look first at what we have and what we can provide them. We want their first experience to be immersive and exciting, leading them to explore further, and gain more knowledge of this amazing world on their own.*

Figure l. Preliminary Home Page of *WHMNet*

To achieve this, the final Home Page will likely be much simpler than what is shown in Figure 1, and is more like Figure 2 where a user is invited to enter their world heritage by looking at them first through at least 4 different very visually oriented approaches:

1. Visualization – the results of using advanced visualization techniques to explore the weblike structures with nodes of sites by country, location, name of site and links of relationship and the like in terms of popularity, occurrence, frequencies etc. These results can be found instantly at a simple click of the mouse.
2. Videos – We have created about 30 introductory videos with sampling images by region or country from our sites so that the users can instantly be attracted to whatever they choose to see and enjoy first.
3. Maps – Our users can pan over the entire world and visualize the density of world heritage sites in different parts of the world, as well as select any particular one for quick viewing.
4. Timeline – The 890 world heritage sites of the 148 countries are locatable by a timeline extending from the late centuries B.C. to the very present, except for those natural sites which have existed for millions of years. Again, one can select any particular one for quick information.

This is very much in line with what was expressed at a keynote speech of Ben Shneiderman delivered at a recent *humanities+digital: visual interpretations conference, May 20-22, 2010* and organized by *hyperstudio* at MIT. Shneiderman said that "the Visual Information Seeking mantra – overview first, zoom and filter, then details-on-demand – was a compact way of

conveying the lessons from designing interactive exploration tools for statistical data. But this principle turns out to be broadly applicable to a range of information searching situations.

Figure 2. A potential and simpler Home Page of *WHMNet*

Navigable Information after Home Page

One can see from the left panel in blue (see the tentative Figure 3) that all 890 sites can be accessed collectively or by Region/Continent. Figure 2 shows that this navigational panel will most likely be moved to the top navigational bar of Figure 2, and thus there will be more space for the actual multimedia and multilingual contents related to each site. We shall discuss further content-related information in the following section once a region is selected.

Figure 4 is the tentative Right Panel of Figure 1, which shows the sample relevant textual resources where the user can further obtain additional needed books, articles, images, videos, web-based materials relevant to a chosen site. This "one-stop" approach will enable a user to find literally anything, in print or online, which they are looking for. For example, the instant link to the OCLC World Cat will provide users access to library resources from over 170 countries. One can also link to social networking using Twitter, etc. as well as go to sites like Flickr etc. In the bottom of Figure 4 is the Tag Cloud which is linked in real-time to the terms most frequently linked to the searches performed by the users at that time. Since the site is not yet available for

universal access, the words shown there are related to our own internal searches. For example, in the process of preparing a keynote speech to the 10th CONSAL Meeting in Hanoi, Vietnam, *WHMNet* was used to find sites in Vietnam, thus it is understandable that "Vietnam" is shown as one of the more frequently searched terms [5].

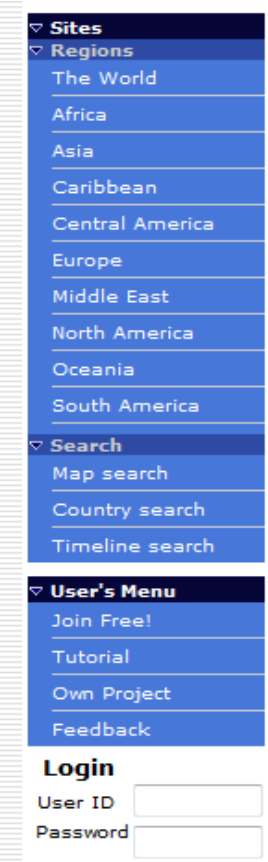

Figure 3. Left Panel of the Current Home Page (Preliminary). This may be the horizontal navigational bar at the top of Figure 2.

Figure 4. Right Panel of the Current Home Page (Preliminary). Upper: Sample global information resources Lower: Tag Cloud on real-time searchers.

From Figure 3, one can further move from a chosen Region/Continent to Countries and Sites as shown in Figure 5. When one looks at the Left Panel (Figure 3), one can choose the WORLD or any of the Regions/ Continents listed. For example, when the WORLD is chosen, the 148 countries with available world heritage sites are alphabetically listed on the left center column as shown in the current Figure 5, and all 890 sites which the World Heritage Committee considers as having outstanding universal value are arranged alphabetically on the right center column of Figure 5. These 890 sites, based on UNESCO/WHC's classification, are classified as:

- Cultural – 689 sites,
- Natural – 176 sites,
- Mixed (both cultural and natural) – 25 sites, and
- Heritage In Danger – A few of the above (marked in “red” dots are sites in danger.)

Thus, the world heritage sites are appropriately indicated with symbols of the types of sites on the Map as shown on the right column of Figure 5. On the map, one can move the pane horizontally left and/or right to view all the sites in the world, or select any one of them for further exploration.

It is worth mentioning that the World Heritage Committee meets each year in late June to decide on new sites to be inscribed by WHC. Thus, it is expected that in early July 2010, there will be possibly 30 some new sites to be added, and we shall make every effort to include them as soon as possible.

Figure 5. 890 World Heritage sites of 148 countries are shown by country, name of site and geographical map.

A Quick Glimpse of the World Heritage Sites

If one has no idea what information he/she can expect to find on the 890 sites in the world, then the two buttons – "Image Gallery" and "Random Images" under the Map of Figure 5 can be of great help to the user. "Image Gallery" will bring out all the 40,000 images of these 890 sites currently available on the server in the order of image acquisition or organization. Browsing these many images from one page to the other with each page (or screen) displaying 20 images at a time can be a very tedious, time-consuming and inefficient process. In this case, the "Random Images" feature will serve the users well! It will randomly provide images of these 40,000 images, so that one's knowledge on the World Heritage Sites will increase dramatically from a few simple clicks of the button because each image will also be shown with the title of the Site. Once an image of interest is spotted, one can find images of similar color and shape in all World Heritage Sites by choosing "Similar", as shown in Figure 6. For example, if a Roman Column in Italy was chosen, then similar columns in various parts of Europe, Africa can be shown quickly. One's knowledge on this Roman Column can then be expanded quickly. A click on "Larger" will enlarge the chosen image and the zooming can be performed easily but the amount of enlargement depends largely on the resolution of that image.

Figure 6. Random images of the current 40,000-image collection are shown with titles of the sites, and one is given the choice of finding similar images, enlarging the image icons, or getting the site information for any chosen image

Selecting A Specific Site and What Can One Find?

To enhance the readers' appreciation of the diversity and richness of the resources, instead of selecting one specific site and going through the entire process, we shall show three selected sites and describe the featured multimedia information which the user is able to obtain. These sites are:

1. China's Great Wall,
2. India's Taj Mahal, and
3. Jordan's Petra.

For these sites, the user selects **Asia -> China** or **Asia -> India** or **Middle East -> Jordan.** As shown in Figure 7, the user can instantly see the 38 World Heritage Sites in China displayed with the map locations and types of sites indicated when China is selected. Similarly when India is chosen, the 27 World Heritage Sites in India are displayed instantly, so Jordan's 3 sites are shown when **Middle East -> Jordan** is clicked.

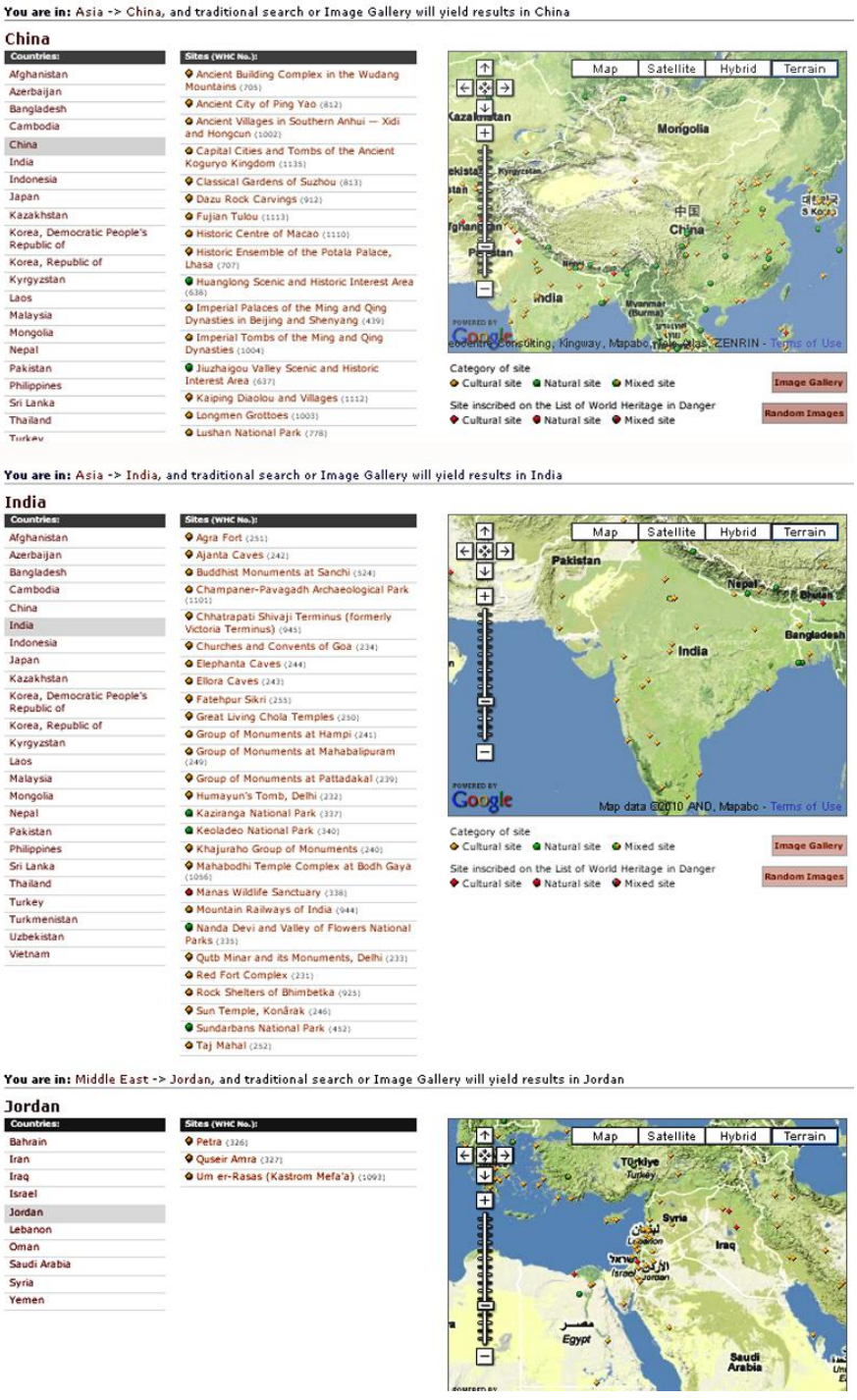

Figure 7. Sites of China, India and Jordan

When China's Great Wall or India's Taj Mahal or Jordan's Petro Is Chosen

As shown in Figure 8, when one clicks on the Site name of "The Great Wall," or "Taj Mahal," or "Petra," one is instantly offered the basic metadata, descriptive information in multiple languages. In addition, for each site, links are made also to available video, sound, documents (in PDF files), 3-dimensional tour, and WHC's official site for other additional information. "Image Gallery" can be linked to all the relevant images of the site.

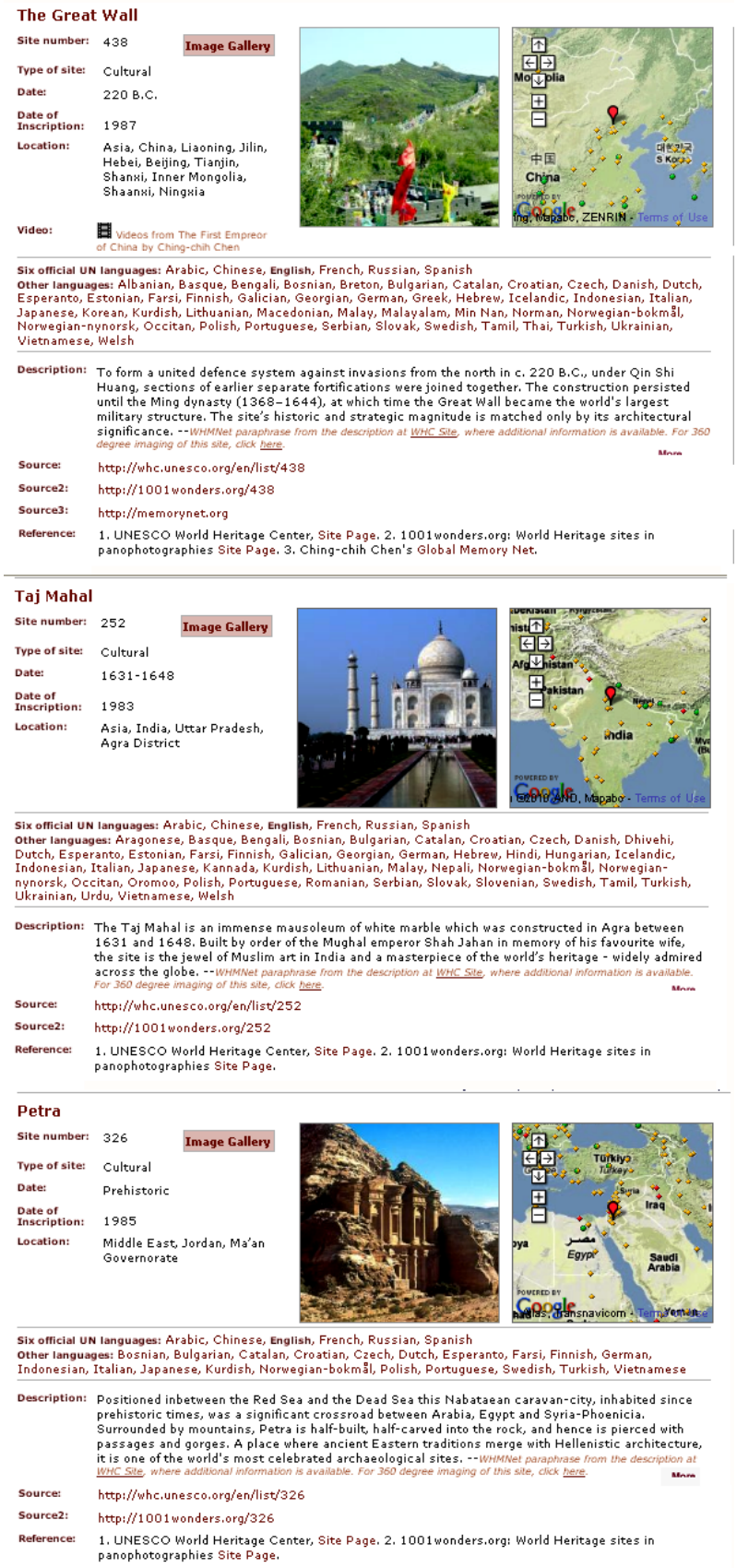

Figure 8. Instant showing of descriptive information on the chosen site in multiple languages as well as site links to videos and 3-dimensional tour, as well as Image Gallery

- *Instant Multilingual Access*

For all Sites, the six UN official languages – Arabic, Chinese, English, French, Russian, and Spanish – are available, as to other languages, the number differs from a few to the maximum of over 50 languages as in the case of "The Great Wall" as shown in the upper portion of Figure 8. One can obtain the multilingual information instantly by clicking on the language indicated as shown in Figure 9 of the Chinese for "The Greal Wall," Figure 10 of the Tamil for "The Taj Mahal," and Figure 11 of the Arabic for "Petra."

Figure 9. Switching metadata from English to Chinese for "The Great Wall"

Figure 10. Switching metadata from English to Tamil for "Taj Mahal"

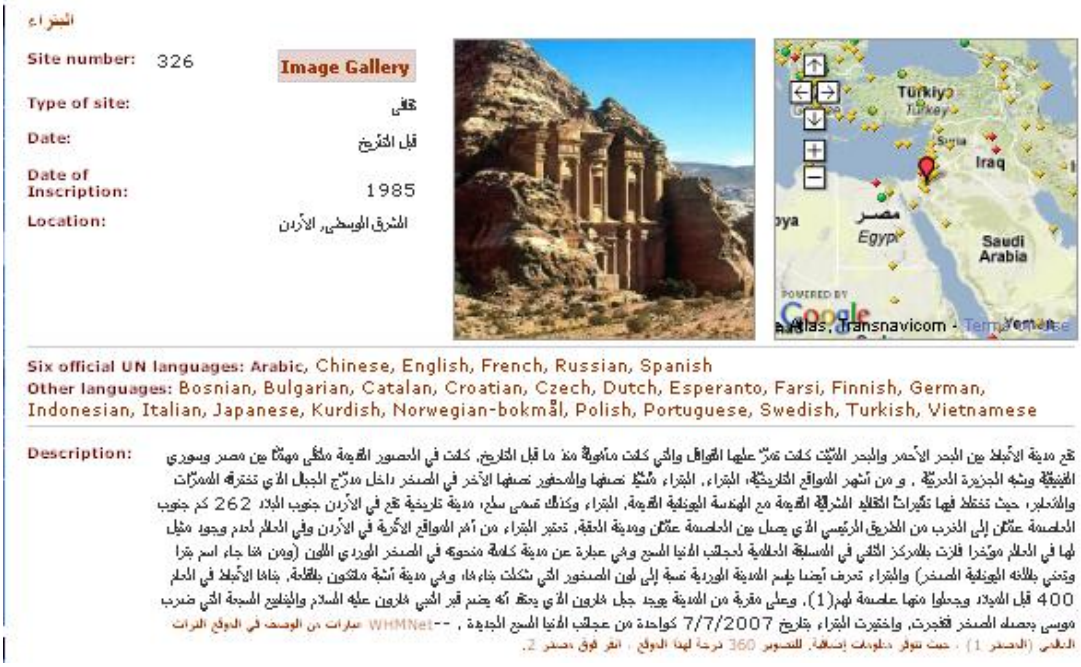

Figure 11. Switching metadata from English to Arabic for "Petra"

- *Instant Multimedia Access*

Figures 8 and 9 also show that in addition to the multilingual descriptive information on "The Great Wall" Site, for example, various associated multimedia information can also be instantly retrieved and displayed.

- Currently, the Site content screen is also being redesigned, and the end result is likely to replace the center picture of the site as shown in Figures 8-11 in such a way that all images of the site can be quickly browsed and explored by flowing freely either left or right, and then a specific image can be selected for enlargement, as shown in Figure 12.

- By clicking on "Image Gallery," an image collection on the chosen Site can be viewed either in the order of images pre-organized or randomly. A user can also select an interesting image and ask for similar images of the same color or shape by clicking "similar," or enlarging the image by clicking "larger," as shown in Figure 13 on the images of Petra.

- Relevant video, sound clips, etc. can also be instantly retrieved when available and clearly indicated, as shown in Figure 9 for the video from *The First Emperor of China* produced by Ching-chih Chen on The Great Wall.

- In collaboration with 1001wonders.org, when the URL link is indicated, the user can take a 3-dimensional tour of the site by clicking the URL as shown in Source 2 for all three sites on Figure 8. This provides the user an incredible experience as if he/she is standing on the top of The Great Wall, the only fascinating man-made military structure visible

from the moon, or standing in front of the magnificent Taj Mahal, the universally admired immense mausoleum of white marble, or touring the unforgettable Petra with its elaborate built and monumental rock-cut tombs and temples.

Figure 12. Image Flows of The Great Wall, Taj Mahal and Petra

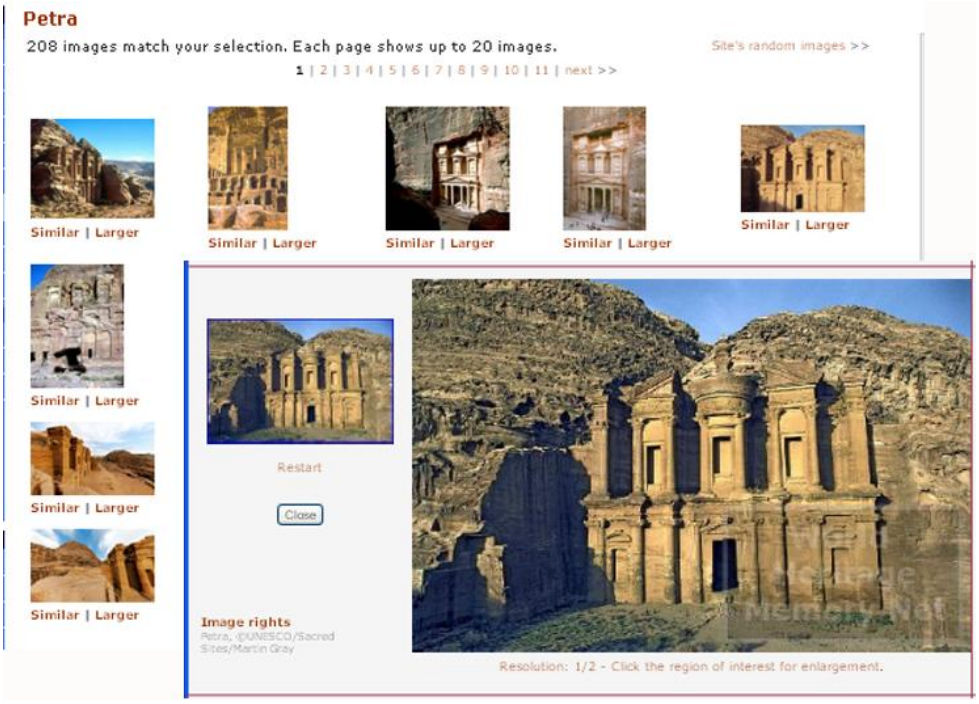

Figure 13. Image Gallery provides 208 images on Petra

- *Geo- and Temporal-Retrieval Capabilities*

In addition to the whole array of features described above, more geo- and temporal-retrieval capabilities are available as already mentioned earlier in this paper. In fact, users are directed to look and explore first these features immediately at the overview level at the Home Page of WHMNet as shown in Figure 2. We shall elaborate only slightly more on these features in this section. Figure 14 shows how one can go to browse the world map and click on any site of interest for further information on the upper Map Search, or select the country of interest from the countries listed in the lower screen of the Country Search. The 890 Sites from 148 countries are all there!

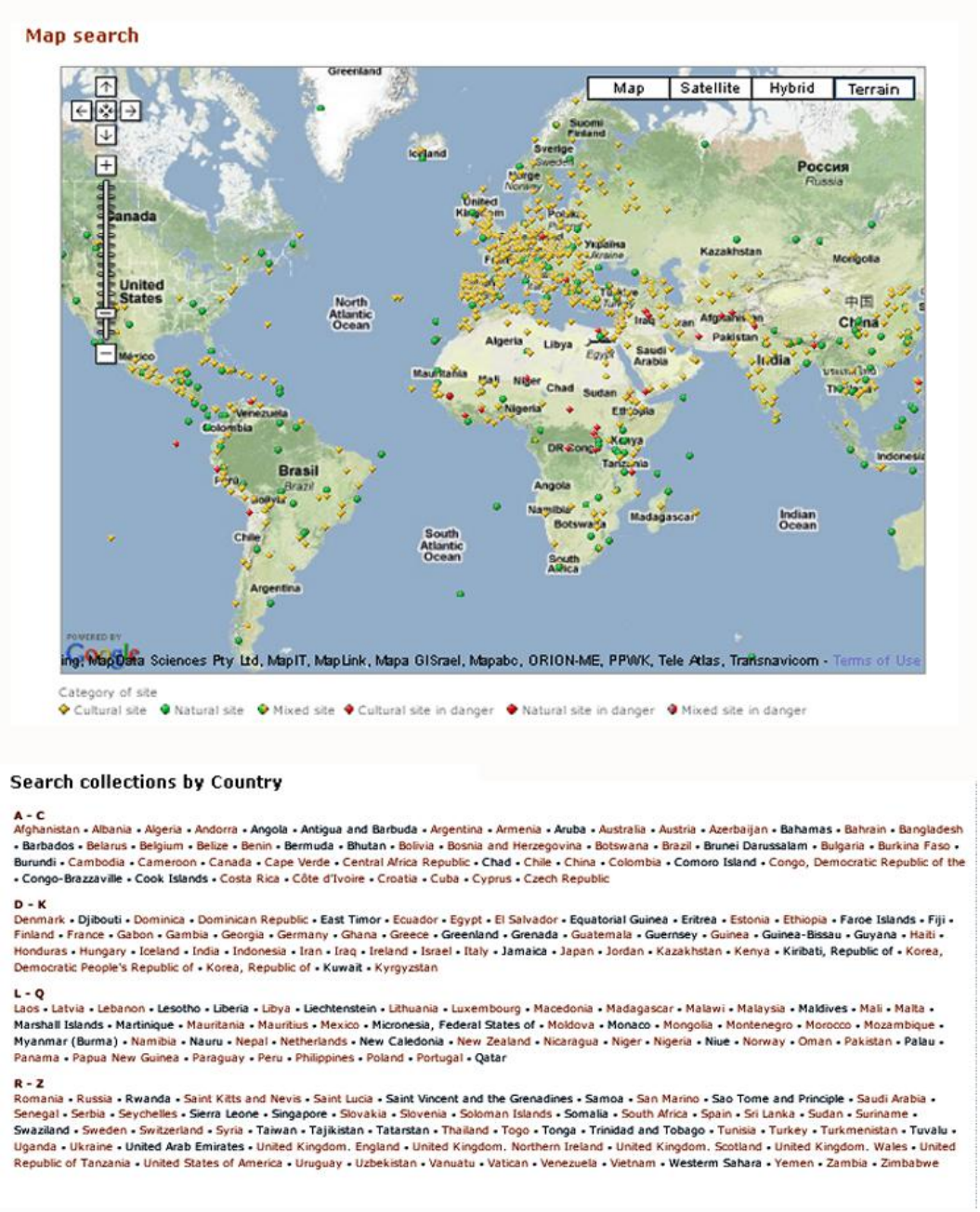

Figure 14. Accessing World Heritage sites geographically.
Upper: World Heritage sites are geographically marked with appropriate "type" symbols
Lower: Countries are alphabetically arranged. Those in "brown" have World Heritage sites

In addition to geographical access to the World Heritage Sites, temporal access is also available. This is an important feature because the 890 sites range from those prehistoric ones with age of millions of years, to Sites of the 20th or even 21st century, such as the Sydney Opera House in Australia. On *WHMNet*, one is able to horizontally browse through time, and select the sites of interest, and then obtain quick descriptive information instantly. Figure 15 shows that the "Complex of Hué Monuments" Site starts around Year 1800. Note that the basic UNESCO WHC's descriptive information is paraphrased here. In general, we have placed emphasis on those sites no older than 300 B.C. Thus, "natural" sites are not included for the obvious reason that they are much older than 300 B.C.

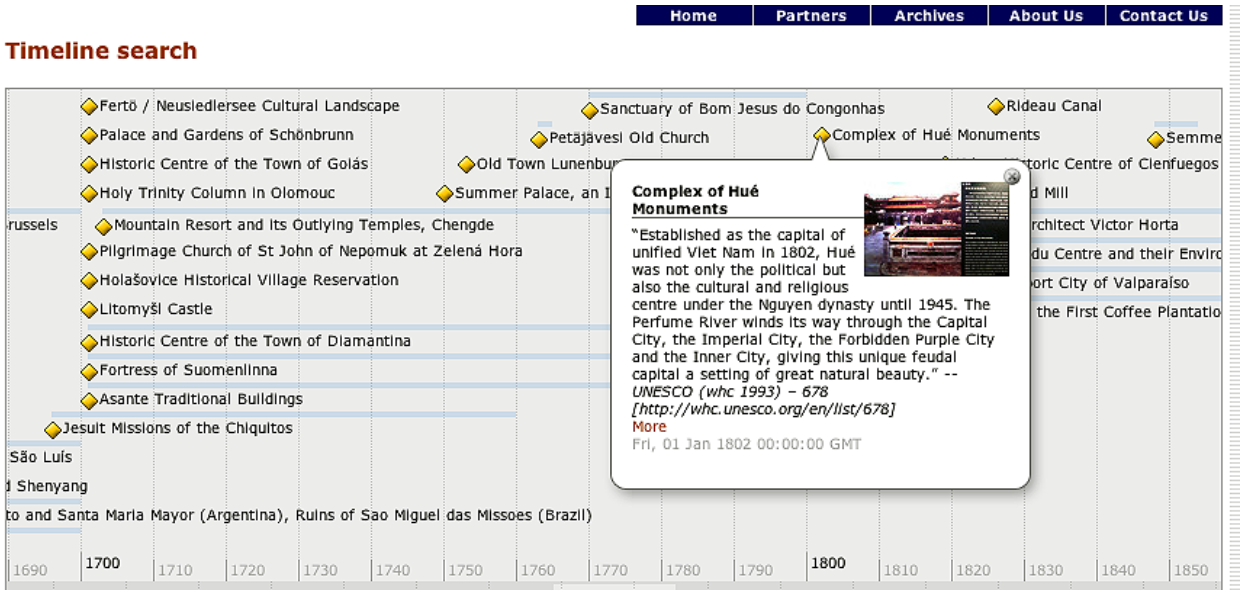

Figure 15. Timeline retrieval of the "Complex of Hué Monuments" Site

- *Visualization*

Digital humanity has come of age. Visualization technology can be most effective in platforming humanistic inquiry. At the recent *humanities+digital: visual interpretations conference, held at MIT on May 20-22, 2010* and organized by *hyperstudio* at MIT, all keynote speakers like Johanna Drucker of UCLA, Ben Shneiderman of University of Maryland, Martin Wattenberg of Flowing Media, and Lev Manovich of UCSC, articulated in her/his own way that despite the challenges, visual knowledge representation can immerse users in a seamless beautiful environment while exploring and experiencing the subject from many different angles [7]. For *WHMNet,* although we have been thinking about visualization for some time, and we already have our 890 World Heritage sites well presented in a global map with sites properly identified and with very useful historical timelines, there are a lot more things we can do since we have not fully leverage our enormously rich multimedia data and resources.

Now, we have already completed the extensive and very labor-intensive work in the creation, gathering, and organization of the large multimedia and multilingual data and incorporated them into our powerful but flexible system. It is time to explore some real uses of what Shneiderman calls a "visual information seeking mantra." There are many definitions for the word "mantra,"

but simply it is a "powerful tool" or "a tool for power." For the former definition, how can we use visual methods to think, discover, and explore, as well as to bring our World Heritage treasures and those connections hidden under the weblike structures to the surface? For the latter definition, how can we use visualization to empower our users?

In Gudrais' most recent article [8], she narrows down any complex networks to two basic elements of nodes and links (also called ties). She said:

> *"But as the numbers of nodes and links increase, the number of possible configurations grows exponentially. Likewise, there are innumerable possibilities for what a node and a link can represent… Structurally simple, yet analytically incredibly complex, networks hold the answers to so many questions…[are studying]."*

More succinct introduction to complex networks can be found in Newman's recent book [9]. Newman also defines a network, "in its simplest form, a collection of points joined together in pairs by lines." The points are nodes and the lines are links or edges. He further said that "many objects of interest in the physical, biological, and social sciences can be thought of as networks" and his book shows that "thinking of them in this way can often lead to new and useful insights."

Thus, *WHMNet* is in the process of collaborating with expert(s) in this important area to look for these new and useful insights. While the results are very preliminary, we can already share with the readers our latest computer-generated global image of the 890 World Heritage sites as shown in Figure 16 where our amazing 890 World Heritage sites are displayed with their links or connections or relations in a very complex network system with ability for us to zoom in any aspect of it.[**]

On this image, the "brown" nodes are the World Heritage sites, and the "blue" nodes are "keywords", taken from the *WHMNet*'s image list. Links denote that a site has an image that is tagged with the connected keyword. The node size is dependent on degree: the more links, the larger the node. Link color depth depends on link frequency: The darker, the more images per site bear the keyword. Thus, from Figure 16, we can see that the network is very dense, which means that the keywords used to describe the images are very broad ones (which we are aware of), or our World Heritage sites are quite aggregated with a lot of data gathered together.

3. Conclusion

The bird's eye view of *WHMNet* presented in this paper covers only the tip of the iceberg of the functionalities of this important mega-scale global digital project. It is clear that with the help of cutting-edge technologies, for the first time, multimedia and multilingual information on the world's invaluable heritage sites is able to be accessed, explored, experienced and learned instantly with a simple click of the mouse. This is truly bridging the cultures of the world, and thus in this post-9/11 era, it has tremendous effect on "enhancing understanding among people in

[**]I want to thank Maximilian Schich, the DFG Visiting Research Scientist at the CCNR - BarabásiLab of Northeastern University for this initial collaborative work with our project and look forward for more in-depth R&D possibilities.

this troubled time," as an award was given by the Cultural Convention in 2006 recognizing Chen and her *GMNet*'s contribution in this aspect. As this chapter is in a book mainly prepared for librarians and archivists, this dynamic approach should have great potential for them and for museum professionals as well. They can contemplate using similar approaches for bringing their own institutional treasures to the surface for universal access and exploration beyond the traditional database approach, which is important, but it is just the beginning.

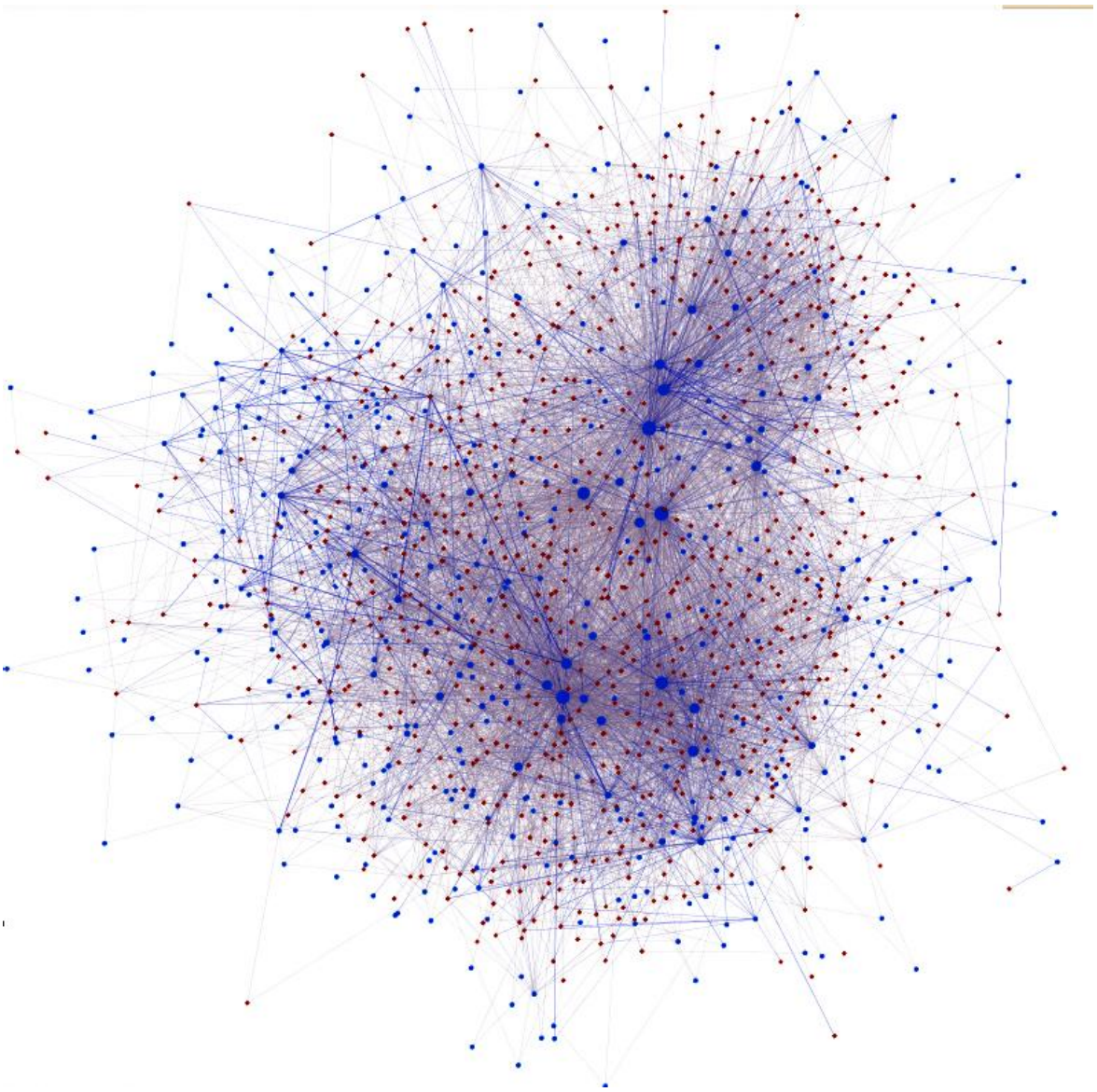

Figure 16. The global image of the 890 World Heritage sites based on *WHMNet*'s sets of description data. Image: Maximilian Schich, www.schich.info

The MoU signed by UNESCO World Heritage Center with Simmons College is a fitting display of both WHC's interest and enthusiasm in the research and development activities of *WHMNet* because of this project's ability to provide universal access to the World Heritage Sites in a way not possible before. The *WHMNet* leverages the results of previous highly successful multi-year R&D projects supported by the US National Endowment of Humanities on the development of interactive videodisc in presenting an incredible period of Chinese history (the period of The First Emperor of China) in the mid-1980s to early 1990s and by the US National Science Foundation from 2002 in using innovative multimedia technology developed for *Global Memory Net* (*GMNet*). Without much marketing effort and banking on the power of Internet technology, *GMNet* has already reached general public and scholars from over 4,000 cities of 150 countries in the last two years. We expect that *WHMNet* will reach a much greater global audience with its much enhanced multimedia and multilingual capabilities, as well as its new approaches in engaging users. *WHMNet* hopes to enhance the humanities for universal access and enrichment through World Heritage Sites by using cutting-edge information technologies, and thus contribute to the promotion and awareness-raising of the UNESCO's 1972 Convention.

4. Acknowledgment

The *WHMNet* gratefully acknowledge the essential support from the US National Science Foundation (NSF)'s International Digital Library Project under Grant No. CISE/IIS/0333036 (a part of *Global Memory Net)* and its several supplemental grants. Much of the data collection, creation, and organization work as well as the multilingual paraphrasing work are supported by two US NSF's Research for Excellence for Undergraduate (REU) grants in 2007-2008 and 2008-2009. Without these NSF supports, it would not be possible to contemplate a mega-project like *WHMNet*.

I also wish to acknowledge The Emily Hollowell Fund for Research of the Graduate School of Library and Information Science of Simmons College which provided partial support for work-study assistants and a few graduate assistants.

5. References

[1] Chen, Ching-chih, *World Cultural Heritage Is One Click Away: Lecture Series*.

- "World Cultural Heritage Is One Click Away: So Can World Agricultural Heritage," Talk given at the National Agricultural Library, Silver Spring, MD, March 26, 2010.
- "Technology Enabling and Universal Access to World Heritage: Challenges and Potentials: The Cases of Global Memory Net (全球記憶網) and World Heritage Memory Net (世界遺產記憶網)". An invited speech given at National Tsinghua University, Hsinchu, Taiwan, March 12, 2010.
- "Culture and Technology Integration (文化與科技整合的新形象): *The Cases of Global Memory Net (全球記憶網) and World Heritage Memory Net (世界遺產記憶網)*. An invited speech given at National Normal University, Taipei, Taiwan, March 11, 2010.
- "A New Look of Culture and Technology Integration (文化與科技整合的新形象): *The Cases of Global Memory Net (全球記憶網) and World Heritage Memory Net (世界遺產記憶網)* . A special event speech given at National Center for Traditional Arts, Yilan, Taiwan, March 9, 2010.

[2] Chen, Ching-chih. “Cultural Heritage and Digital Libraries: The World and Universal Access.” A keynote speech at the *International Conference on Arts Venue Planning and Management*, Kaohsiung, Taiwan, November 9, 2009.

[3] Chen, Ching-chih. “Broad-based Societal Implications of IT Development: A case-presentation on the convergence of IT and large-scale digital content on world culture and heritage.” A keynote speech at the *EITC Conference*, MIT, August 6, 2009.

[4] Chen, Ching-chih. “*World Heritage Memory Net*: Instant access to 145 countries’ 878 World Heritage sites with cutting-edge technologies,” an Invited speech at Sichuan University, Chengdu, China, July 6, 2009.

[5] Chen, Ching-chih. “*World Heritage Memory Net*: Instant access to 145 countries’ 878 World Heritage sites with cutting-edge technologies,” an keynote speech as well as Opening Keynote at the 14th Congress of Southeast Asian Librarians, Hanoi, Vietnam, April 21-22, 2009.

[6] Shneiderman, Ben, “Visual Overviews for Cultural Heritage: Interactive Exploration for Scholars in the Humanities, Arts, and Beyond,” a keynote speech given at the *humanities+digital: visual interpretations conference, May 20-22, 2010,* organized by *hyperstudio* at MIT. p. 15 of the *Meeting Program*.

[7] *humanities+digital: visual interpretations conference, May 20-22, 2010,* organized by *hyperstudio* at MIT. *Meeting Program*. pp. 14-15.

[8] Gudrais, Elizabeth, “Networked: Exploring the weblike structures that underlie everything from friendship to cellular behavior,” *Harvard Magazine*, May-June 2010. pp. 44-50.

[9] Newman, Mark E. J. *Networks: An Introduction*. Oxford: Oxford University Press, 2010.