A Study of Digital Museum based Digital Heritage

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1. Preface

The revolutionary shifts in the digital platform, brought by the rapid convergence of ubiquitous and smart technologies since 2000, have transformed museum information services and the contents experience environment more dramatically than ever before. Museums have stopped presenting themselves as mere physical space; they have taken the form of digital and ubiquitous space for better user experience. The widening range of museum spaces has raised the urgent need to study museum information architecture designing, contents planning, and user story-telling.

The key focus today in digital museums is developing "time-travel contents," by restoring time information of displayed objects. As previously described by the novel, The Time Machine, human beings have long yearned to time-travel the past, and digital museums are poised to realize such desires.

This paper looks into the process of digital technologies' combining physical, digital, ubiquitous and user experience spaces into a single digital museum. It also assesses the possibility of restoring cultural heritage with time and space convergence, and creating a whole new kind of contents using four different museum spaces.

2. Space convergence in digital museum

Ken Sakamura, a leading researcher in ubiquitous computing and professor at the Tokyo University, has defined a digital museum as the following:

"(A digital museum) is not a virtual museum. It is rather a real museum that uses computer technology very actively. Its purpose, in other words, is to enhance real exhibitions with computers."

According to this definition, the key to a digital museum is convergence and harmony between real and virtual museums, which are achieved by unique characteristics of digital information technology. With the help of hypermedia and its assumption of multi-dimensionality of information, digital information's characteristics such as non-linearity, random access, and interaction have merged with heritage's analog information.

Digital graphic-enabled synesthesia clearly demonstrates how the left brain's recognition of letters turns into a five-sense experience.

And such latest trends of digital technology have led to the creation and convergence of the four below types of contents experience space.

The fourth space will likely have profound impact on the current exhibition designing methods. In x-space, nothing counts more than time and space convergence based on an extensive archive and with effective control of ubiquitous, electronic and physical spaces, as well as the user experience scenario taken into account as thoroughly as possible.

3. Design of digital museum and smart exhibit technology

A digital museum combining the four spaces together requires a novel design concept that integrates hardware, software, contents, and operating system. Ken Sakamura put forward the following four 'open' concepts for his digital museum experiment model.

(1) Open to anyone - Multi-target user system
Unlike traditional museums, a digital museum pursues personalized museum information architecture, a very suitable kind of system to meet the varying needs of visitors, from kids, teenagers, adults, to minorities (e.g. elderly or physically challenged people). This architecture provides customized contents as chosen by the user, on the back of digital story-telling technology and personal device technology.

(2) Open anywhere - Global inter-museum
A museum hub in a certain physical location can be used to link homes to schools, to enterprises, to overseas, and to countless museums worldwide via the global information network. Such a distributed model can be made possible by smart wired/wireless information technologies as well as the global network and virtual reality technology for time and space convergence

(3) Open anytime - Time-travel contents
A management system for lifetime experience encompassing pre, present, and post exhibit experiences and limited exhibitions allowing post-exhibit experience are main features of archive-based digital museum. Another benefit is time-travel experience through the birth and history of key exhibit objects. All these have been possible thanks to the successful application of digital restrology to heritage contents since the 1990s.

(4) Open however - Rich media service

In addition to conventional display methods, exhibits-related know-how, functions, incidents, symbols, and other interesting stories can be provided to change the course of user experience. This takes more than virtual reality technology, which allows users to see, hear and feel contents in virtual space; it requires a new design model based on hard-to-realize multi-sense and multi-dimensional technology and digital story-telling.

The discussion so far suggests the following important points in two different aspects: 1) exteriorly, the USN-based multi-target user system will play a significant role in advancing the ubiquitous digital museum technology; and 2) interiorly, a personalized museum will be the ultimate goal and this will be achieved by the use of digital story-telling (i.e. multi-user story-telling and space story-telling). The next step is devising a digital restoration model and providing tangible and intangible information as well as stories behind heritage.

4. Time and space convergence - Digital restoration of cultural heritage

This chapter analyzes the basic approach of digital restrology to generating time- and space-converged contents for a digital museum. Digital restrology has a three-phased approach: 1) discover and excavate cultural heritage (Find it); 2) restore it digitally (Feel it); and 3) enable time-travel to its past (Visit it).

Given the incomplete and impaired information derived from cultural heritage, its restoration demands much more sophisticated and academical joint work than general cultural contents development requires. The process usually follows these four steps.

Step 1: Digitizing - Rewriting the information from discovered or preserved heritage in a digital form
Step 2 : Archiving - Saving, categorizing, storing, and systematically managing the digitized information
Step 3 : Restoration - Recovering the heritage's archetype using all necessary knowledge from the humanities, social science and art
Step 4 : Experience - Providing the restored time and space information in multi-sense and multi-dimensional ways and sometimes through the mobile network

The restoration step is particularly important as it recovers heritage's archetypes by analyzing, comparing, and matching different pieces of largely accumulated time/space information. Completing an archetype requires a meticulous historical investigation aided by all necessary knowledge from the humanities and art science, among which time, space, and human life-related information would come in handy. Afterwards, an archetype restoration technology, based on digital graphic technology, is employed to recover the impaired parts of cultural heritage. Such an archetype management and restoration technology is a knowledge-based technology for effective and systematic preservation, control, and utilization of cultural archetypes; encompasses the historical investigation technology that supports collaborative research on cultural archetypes based on the knowledge database containing the humanities, social science, history, folklore, aesthetics, and music-related information; and involves deriving, reorganizing, determining and recovering components and characteristics of archetypes.

The final step is about reshaping the heritage in a way that can be experienced by users. The most appealing experience would be time-traveling the past of a given heritage. The latest experience trends are time and space experience, multi-sense and multi-dimensional experience, and customized experience.

Under the impact of these trends, museum exhibits are becoming increasingly experience-focused as opposed to object-focused. Digital technology plays a crucial role here by providing virtual space where people can touch and feel antiquities, which is mostly forbidden at conventional museums. Personalized experience, situation experience, multi-sense and multi-dimensional experience based on time and space convergence are the paths that are being increasingly taken by digitally restored content developers nowadays.

5. Conclusion

Digital technologies have taken user experience at museums to an entirely new level under the concept of digital museum, by merging different types of spaces with one other. Along the way, digital restorology also became essential to discover, save, investigate and digitize heritage information without compromising it. This paper has examined the convergence between digital restoration and digital museum development. This convergence gives us a clear picture of a digital museum that takes a visitor into the past with diverse platforms and restoration technologies.

6. References

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