Mobilizing 3D Virtual Artifacts Exhibition System of National Palace Museum

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Abstract

The online 3D Virtual Artifacts Exhibition System of Taiwan's National Palace Museum(NPM) has received high user recommendation since it launched a few years ago. NPM has curated 5 iconic artifacts which are demonstrated in 3D, interactive form. Researches have shown the system brought about an appealing gateway for those who are not particularly interested in artifacts.

Now with the advent of interactive mobile devices such as iPad, new affordances for storytelling has created innovative approach to design contents that are more engaging and intriguing for all users.

Based on new devices and modes of user experience, we are redesigning the 3D Virtual Artifacts Exhibition System, bringing users utterly new experiences on artifacts.

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Statement of the Purpose

Taiwan's National Palace Museum (NPM) has preserved a vast collection of Chinese heritages. Recognizing the importance of adding value to artifacts via digital preservation, during the past decade, the National Science Council of Taiwan has supported NPM for a series of innovative projects to establish database and curate virtual exhibition systems.

Among these efforts is an innovative virtual exhibition service, The "3D Virtual Artifacts Exhibition System," which is an interactive multi-media online program available for all users, featuring 3D demonstration of 5 famous artifacts while enabling interaction with virtual objects.

According to Hsiao-Kuo Yu et al. (2006), the guidance system with new technology helped significantly to improve visitor's satisfaction. The research also suggest NPM visitors in general expect to see more artifacts be presented with similar approach.

However, Yao-Ting Sung et al.(2006) indicated developers may improve present virtual 3D exhibition system not simply by demonstrating exhibition layouts and artifact informations, but focusing on storytelling and its design, in order to create engaging contents.

As previously suggested, the need for more intriguing virtual content about artifacts is soaring, and the contents need to be redesigned to be more user-centered and engaging. Hence, we propose the use of new mobile devices as a solution. As new media bring about new affordances for storytelling, the original contents needed be redesigned to fit new modes of user experiences.

Having selected 5 iconic artifacts from 3D Virtual Artifacts Exhibition System, we scrutinized the unique features of these treasures, and applied recent tablets to enable a variety of interactions, which is designed to enhance user's comprehension about the features of selected artifacts. As a result, it becomes particularly important to combine the knowledge to the artifacts together with the understanding of iPad's interaction mode and its design.

User-Centered Design Process

The product features in-depth contents including interactive graphics and articles that allows users to read as well as to play with the story within each artifacts.

Typography

The design of user interface have to cope with such needs. In the early process of redesign, we find the necessity to largely improve the layout and typography so as to make the contents more legible and readable for all users. Consequently the redesign process began with tuning typography.

Figure 1. *A stimulation of screen display sample which shows the gothic Chinese typefaces looked clearer on screen than Minchou or kaiti typefeces. From top left to bottom right, these fonts are Adobe Minchou StdL, Xingothic W3, PMingLu, Hiragino Kaku Gothic Pro W3, Apple Gothic – Traditional, MS Minchou, Adobe Kaiti Std R and Apple LiSong Light.*

The original online exhibition system applied kaiti typeface in white characters and black background, whose clarity on screen is not ideal for presenting in recent tablet displays. According to Hakamada et al (2011), the proper CJK typefaces which cope with the principle of universal design is gothic typefaces instead of

Minchou or Kaiti typefaces which generally do not render as clear as the gothic typefaces, as shown in figure 1.

This phenomenon has been amplified by iPad 3rd generation's retina display, for Michou and kaiti typefaces tend to render overtly thin in the portrait mode of the device.

Another concern is the contrast between characters and background. As York (2008) suggested, interfaces presented in pure black background and complete white character induce overtly high contrast ratio which is sharp for human eyes and thus difficult for reading, as stimulated in figure 2.

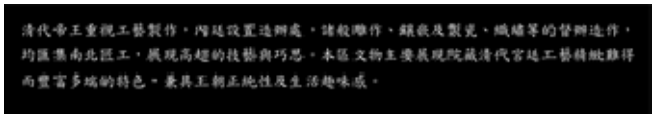

Figure 2. *A stimulation of the original 3D Artifacts Exhibition System. We have improved the contrast design to fit the new mobile version.*

As we looked deeper into the detail of the approach of how NPM exhibit its collections, we find the texture, color and brightness of the gray cardboard background inside the exhibition cases are fairly friendly and make the text read with ease. Moreover, the design is mutual and plain so as not to distract visitors' attention from the artifacts to other objects.

That is the reason why we choose cardboard texture in gray as background, which is able to minimize the brightness of screen display; the mutual appearance of it also help the viewer focus on the text. As for choosing the proper typeface, we used XinGothic, a Chinese gothic typeface which is designed for optimized screen legibility and readability, as displayed in figure 3 and 4.

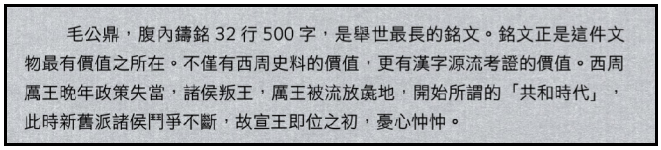

Figure 3. XinGothic typeface is used for optimized screen display.

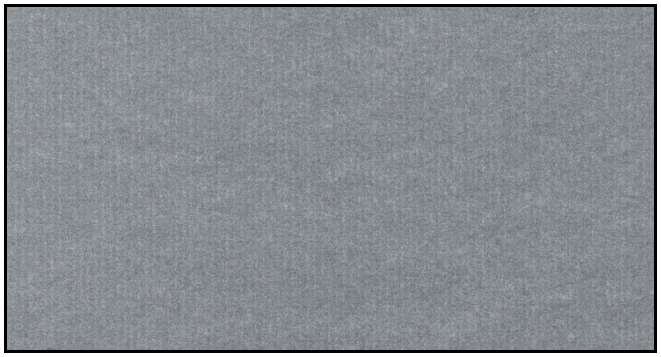

Figure 4. *The gray cardboard texture background creates proper contrast with black character, which is an inspiration from interior design of NPM.*

Navigation and user experience design

The current prototype was built with Adobe Adobe Digital Publishing framework. As the product is presented with adobe content viewer, we have designed a navigation flow which enables users to freely navigate through 5 artifacts.

There are 4 pages within each feature of certain artifact. As users flip downward, they read more contents about the same artifact; when flip to the left side, the users will be navigated to the next artifact. This has matched the mental model of browsing on the web pages and reading through books.

A light tab on screen will lead the users to the complete layout of the product, so that they can navigate freely within different artifacts, as shown in figure 5.

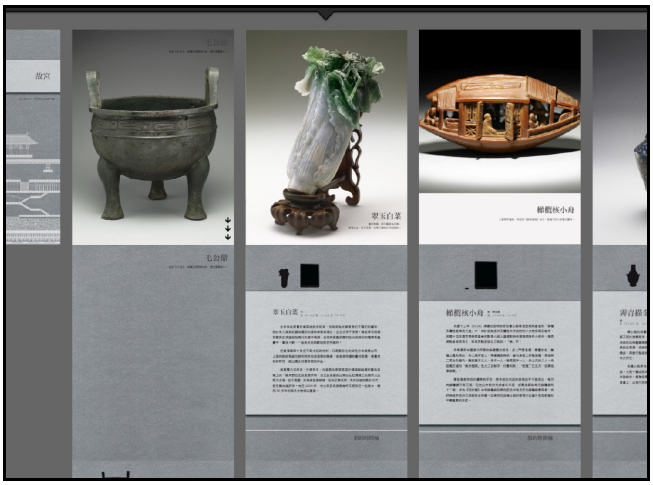

Figure 5. *The general layout of the product on Adobe Content Viewer, which is designed for free navigation to view the contents. Image courtesy of National Palace Museum.*

In general, the user experience design was pursuing the maximum compatibility with user's past experience of using books or websites. This is intended to tune the conceptual model with users' mental motel with minimum the costs of learning.

Exhibition on the iPad

Based on the web-flash version of the 3D Virtual Exhibition System, this product is to be redesigned to cope with the new form of interaction. The problem lies in how to exhibit the artifacts on a mobile device with touch screen. In the following we will introduce how artifacts and its stories were presented.

The Structure of the Content

In this product, there are 4 pages for each artifact. the first pages of all artifacts are panorama demonstration which are played automatically, giving users vivid and dynamic firstimpression about the artifact, as stimulated in figure 6.

The second pages of each artifacts are detailed articles and interactive graphics introducing the features and history of artifacts. There are 2 designs which are intended to bring artifacts closer to users, namely "tablet scale(figure 7)," which applies ipad as a scale to indicate actually how large the artifact is; and the "timeline," which is an interactive chronicle display of other

similar artifacts, giving users picture about just how long ago the artifact is created.

Figure 6. *panorama demonstration will be played automatically as user entering the page. Image courtesy of National Palace Museum.*

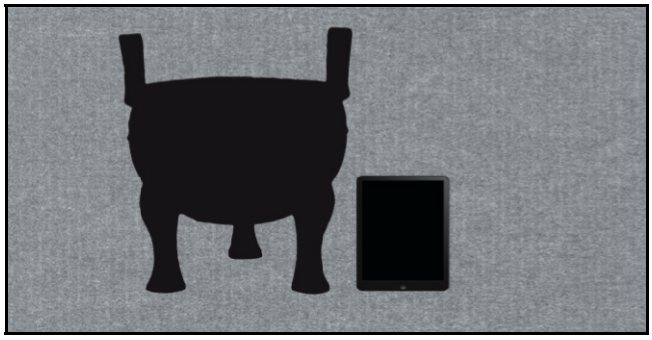

Figure 7. *using recent popular tablet scale to give users the picture of how large the artifact really is. The device contains a 9.7 inches display*

Last but not least, the third and fourth pages are customized contents which mainly introduce exclusive stories about artifacts. For instance, "Maogong Ding" is an invaluable artifact with inscription of 500 ancient Chinese characters, which completed the unknown history of late Zhou Dynasty. Moreover, these ancient characters is remarkably valuable in terms of understanding the etymology of Chinese characters. That is why we designed "the Evolution of Chinese Characters (figure 8)" which allows users to interact with ancient characters and thus acquiring the knowledge of how Chinese characters have been shaped and transformed.

Figure 8. *the Evolution of Chinese Characters, one of two interactive feature content for Maogong Ding.*

Similarly, other artifacts have their own stories to be presented with interactive form. Using the framework provided before, we designed 2 featured interactive content for each artifact.

In conclusion, the structure of how each artifact is presented is as follow:

Page 1: automatic panorama demonstration - page 2: main introductory article with "ipad scale" and "timeline" - page 3 & 4: featured contents of the artifact.

Realizing "Discourses to be Explored" with Interaction Design

As forming interaction design, designers need to comprehend what affordances is provided by the devices, so that they can use the device to its full extent.

As Wei-Hsiang Su et al. (2013) indicated, the use of interactivity of newly emerged devices such as iPad has created "discourses to be explored," which explains how users of digital picture books find meanings within the process of interaction. While using the interactive interface to experience stories, users actively explore the how elements in sight work; and the feedback users received will be used to construct their understanding about the discourse of the story.

Consequently, building a refined interactive storytelling experience relies on a satisfactory combination of narrative art, user experience design and interactive engineering. In the making of the mobile version exhibition system, we tried to build the best practice which performs satisfyingly in terms of user experience and story experience.

So the challenge lies in how to present artifacts and the intriguing stories behind them applying iPad's interaction model. Take the famous "Jadeite Cabbage with Insects" as an example, the artifact was hand-carved from verdant jadeite. There were apparent flaws in this piece of jade and thus limit its value as jewelry. However, the cracks on the surface was carved to become venation of the cabbage, which transformed flaw jadeite into refined artifact.

To illuminate this fact, we designed a "magnifier" for the users, as shown in figure 9. With the magnifier, users can scan through the details of the artifact, such as the venation made from cracks, two insects on the top, and thus understand the feature of the artifact.

Figure 9. *utilizing touch screen, we designed a magnifier to view closely the detail of the jadeite. Image courtesy of National Palace Museum.*

Further improvements

The present prototype is made with Adobe Adobe Digital Publishing Suite. Although this program provides easy-to-use typographical tool and interactive HTML 5 framework that helps quick and efficient scaffolding, advanced interactions using recent tablets' novel functionalities have to be created with native applications. We envision implementing tablet native applications with more dynamic interactive content in the future.

Reference

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Author Biography

Wei-Hsiang Su acquired his BA in Chinese Literature from National Taiwan University. He is currently a graduate student of National Chengchi University's Master program of Digital Contents and Technologies. Wei-Hsiang Su's responsibilities in this project include creating contents and project management. His research topics include content strategies on social media and interactive storytelling.

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Yao-Nan Lien is a professor of the Department of Computer Science at National Chengchi University in Taiwan. He received his B.S. from National Cheng Kung University in 1979, and his M.S. and Ph.D. degrees from Purdue University in 1981 and 1986, all in Electrical Engineering. His research interests include mobile computing, computer and communication networks, database systems, and telecommunication policy.

Yi-Ting Wang, Yi-Ning Huang and Wei-Chen Chu are also currently graduate students of National Chengchi University. They are in charge of user interface design and interactive engineering of this project. Their research interests includes digital publishing and digital preservations.