Issues and Expectations for Digital Archives in Museums of History: A View from a Japanese Museum

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Abstract

Digital archiving systems promise to advance the ability of museums to preserve and utilize information about historical and cultural materials. Museums have a large number of materials that require preservation from future degradations for a long period as long as possible. On the other hand, it is common, and important to use these materials for a variety of purposes, i.e., exhibitions, investigations, researches, education, and so on. In this article, several issues and expectations for digital archiving systems used in museums of history are discussed.

In museums of history, digital archives enable more flexible exhibitions that satisfy visitors' needs, more deeper investigation and research, and a more convenient means of managing materials in comparison with conventional archiving systems. They also promise to increase accessibility to materials at lower cost. At the same time, digital archiving systems must work alongside and with conventional ones. The author hopes that this article will help with the effort to build better digital archiving systems.

Introduction

Museums have large numbers of artistic, historical and cultural materials. Indeed, museums exist to collect, store, preserve, investigate, exhibit, manage, and utilize such materials. To avoid the degradation of materials, museums could, should, and often do prevent their handling. But in such cases this means that no new information about materials will ever become available. By using digital archiving systems, many users can access information about the materials. Furthermore, digital archiving systems should advance museum activities significantly, by enabling them to achieve a suitable balance between long-term storage and effective use of materials.

The author of this article works for a national museum in Japan but is not a historian, an archivist, or a curator. The author's expertise is in digital image processing and its application to museum activities; the article reflects this particular perspective. The museum is a museum of history, and houses a graduate program and research institute on Japanese history. Its principal activities include exhibition, historical research, and management of materials. It is in this context and from this perspective that the author will address several issues and expectations for digital archiving systems in the following sections.

Museums of History

In this section, some features about museums of history will be described prior to discussing digital archiving systems. Museums of history store not only numerous original historical materials but also photographs and replicas of original materials, as well as research findings and other related information. They not only hold a wide variety of materials, but any given artifact provides multiple perspectives on history and is open to many research interests. Moreover, new research findings continue to grow. These research findings are themselves items to be preserved as evidence of history and used in exhibitions or further researches.

Historical and Cultural Materials

Example of historical and cultural materials stored in museums of history are archeological objects such as stone tools, earthenware, bronzeware, and ironware, historical materials such as written records, other documentary materials, clothes, and craft arts, and folksy materials such as spiritual objects, materials relating to daily life or special events in life, movies recording the folk customs and lore that are still a part of people's lives today.

Users at Museums of History

There are many kinds of users in museums of history, e,g., visitors, historical and scientific researchers, students, teachers. In addition, people who access museum websites through the Internet are also users of museums. It should be also remembered that some users will have little prior knowledge of the history addressed by an exhibition.

Researches in Museums of History

Materials in museums of history are not only items for exhibitions but also research materials in historical, cultural and scientific researches.

The places to do these researches are not limited to inside museums. Archaeological sites, libraries, private houses, and research fields for folklore are also places of research. In addition, these researches are carried out under collaborations between many distant researchers who have a need to share relating to materials.

Issues on Digital Archiving Systems

As mentioned previously, there are large numbers and many kinds of materials, users, and purposes in museums of history. In this section, some basic issues about digital archiving systems used in museums of history are mentioned.

General and Practical Issues

In museums, reliability for long-term storage of materials is a common issue. In storehouses for materials or photographs, storage condition is controlled for preserving them so that future degradation will be minimized. On the other hand, digital data can be copied with no information loss, but it requires the use of digital devices such as computer displays. Moreover, there is as yet no history of actual long-term storage using today's digital devices and data formats. In addition, maintenance of digital archiving systems is not easy because rapid updates of software and developments of new hardware occur very fast.

Technical Issues

There are three steps to build and use digital archiving systems. The first step is acquisition of digital data. In this step, how to take photographs easily and how to digitize the photographs by a scanner or using digital camera are issues because the number of materials is huge and there are a wide variety of materials in size and type. In addition, input of text data to the systems is also a major issue in the acquisition step.

Because recently many researchers use digital cameras as a research tool, a lot of digital images have been stored on their PCs. Although these images are materials for digital archiving systems, these are not used due to lack of unified image format and different methods to add related information.

The second step is processing of the digital data: how to gather the image and text data, resize of image data, keyword setting for retrieval, and installation of the data into a database software.

Some image processing techniques can be applied in this step. The latest digital imaging technologies have possibility to find new historical information from materials by using multi-band imaging,[1] measurement of spectral reflectance,[2] estimation of 3D shape information,[3] and gonio property of the surface of materials.[4] However, how to store and use this higher order information remains as unsolved issue in digital archiving systems.

The third step is usage of the digital data as an archive in exhibitions, researches, and museum management. There are several methods to share the digital data, however there is no common method in the field of historical research. Furthermore, how to guard the archives from illegal access, how to achieve cross-search among different databases or different archives, how to manage backup schemes, version control of archived data, and care of end of life of hardware and software are the issues in this step.

Administrative Issues

Securing of human resource and budget are firstly required to create and maintain the systems. Recently, copyright control is a serious issue when the materials are rented outside of museums or exhibited through the Internet. Because the rights attached to materials are not simple, control of the rights is complicated. Setup of administrative policy and compliance with the policy are also administrative issues.

Expectations for Digital Archiving Systems

Stable Long-term Storage

Photographic film is widely used to record materials, and photographs do provide reliability of long-term storage for a certain period and can serve as a reference in color reproduction and image quality. However, exactly speaking, these are not without degradation problems such as color fading. On the other hand, digital data are without degradations when the data are copied. This ability of lossless copy has clear potential in long-term storage.

Better Access

Preservation of historical materials is a top priority issue because they are evidence of history, and are forever gone if lost. Achieving a balance between preservation and accessibility to materials itself or information about the materials is another issue confronting museums. Digital archiving systems will help to balance the demands of conservation and accessibility.

Better access to material information enables the creation of an adaptive exhibition that can better meet a visitor's needs. Accessibility is not only an exhibition-related issue. Researchers are also helped if they have access to material information when conducting research outside the museum.

During historical research, research results have been updated frequently. Conventional archiving systems are not suitable for rapid update and sharing the updated investigation results between research collaborators. If digital archiving systems can offer benefits to historical researchers, research collaboration between distant researchers will be advanced.

Ease of Use

Ease of use is very important for all users such as visitors, researchers, network users, and even staff in museums. As there are many visitors who are not familiar

with use of digital devices, it is critical to design user interface for many kinds of users.

Adaptable and Flexible Archiving

Most exhibit explanations placed in galleries are fixed. By using computer displays connected to digital archiving systems, more adaptive and flexible explanations could be made available, i.e., multilingual captions, switch of brief or detailed explanations, and so on. Because the original historical materials are very fragile, exhibitions are not rearranged so often. The switch of explanations could help users to fashion their own image of history in exhibitions.

Support Through Digital Imaging Techniques

In historical researches based on historical documents, a huge number of documents have already been taken by micro-films and so on so far. But images can be taken more conveniently by digital imaging systems. Accumulation of digital images contributes to building archiving systems, and will enable new historical finds through the use of data mining.

In addition, several functions that can not be obtained from conventional photographic systems can be available: instant image checking after it is shot, low cost because there is no development of films, simple set-up of imaging systems at investigation sites, and image processing techniques to increase image quality. Furthermore, to take images by digital camera enables non-destructive inspection of historical materials. For example, a text hidden under a layer of old lacquer layer can be read by using an infra-red imaging technique.

Examples in the Museum

Original Materials in the Museum

The National Museum of Japanese History, where the author works, is a national museum for scholars and the public that offers, exhibitions of completed researches and materials collected in the course of research. The museum is also a part of the Graduate University for Advanced Studies. In the museum, over 160,000 historical and cultural materials are stored. These reflect a wide variety of size and types, and not only real objects but also replica and diorama are included. The number of materials displayed in the galleries is very few compared with the total number of materials. Most materials are stored in the storage house of the museum where room temperature and humidity are kept stable. Databases about materials and research findings are served on the website of the museum.

Archives by Silver Halide and Digital Systems

Photographic film is used to take images for collection catalogue, printing, and attachment for index of materials. Several types of film such as negative, reversal, color, and monochromatic are used for different purposes, and at least two shots are taken as a work film and master one. The work films are used for rental, digitization, and so on. The work and master films are stored separately for safety reason.

Digital images are obtained by digitizing of the films. The ProPhotoCD format is used commonly. JPEG image format for websites or databases are converted from these formats. Meta information about image data or historical information is added by researchers manually.

Related Applications

In the museum, some applications related to digital archiving systems were developed. The first one is high resolution image viewing system with touch panel interface.[5] For historical materials, especially old maps or textiles that are viewed by a variety of users, high resolution digital images are required to read fine information on the materials. An image displayed on the viewing system can be scaled so that any part of it can be viewed at an appropriate magnification level. The contents equipped in the system include “Edozu-Byobu”, which is a folding screen showing panorama of old Tokyo in the 17th century; “Kimono”, which is a collection of antique Japanese clothing; scroll paintings, and historical documents. This system is suitable to show very large scale materials, the finely drawn details of which are often hidden to the naked eye even on the original. This system has been used widely in exhibitions, historical researches, and educations in the museum.

Another example is a system for image acquisition and improvement of legibility of historical documents.[6] As the first step in historical research, it is very important to read historical documents. Historians like to peruse original documents directly, but as in practice this may be difficult, conventional photographic systems are often used. Historical documents vary greatly in type and size, therefore the application of digital imaging systems promises to contribute to the development of historical research. According to this requirement, an image processing technique to improve the legibility of historical documents by spatial frequency filters was investigated. Since the paper used in some historical documents is very thin, letters written on the reverse side of the paper can be observed from the front side. As a result, letters on both sides of the paper become mixed up when the documents are read. This is one reason for the legibility of the documents to be degraded. These letters were separated into two kinds of letters having different frequency components by two kinds of spatial frequency filters, a process which is fundamentally analogous to the un-sharp mask filter technique. These filters have different responsibilities in the frequency component to determine whether the letters are on the front side or not. The results of these experiments are relevant not only to digital imaging but to digital archiving as well.

Conclusion

Several issues and expectations about digital archiving systems in museums of history have been discussed. Generally, museums have a large number of materials, but most of them are preserved in storage houses. Photographs of these materials are also important to preserve as evidence of the material. Because museums want to use these

materials in exhibitions or research purposes, digital archiving systems should help to increase accessibility to the information about materials for a variety of purposes.

In exhibitions at museums, exhibitions often seek to construct a particular image of history, even as they realize that multiple images are possible. It is important to provide support for visitors who seek to build alternative images from exhibited materials and accompanying information. This is a hard challenge that museums of history face.

There is a pressing need for digital archiving systems that can be used not only to archive but also to serve visitors, researchers, and administrative staff. It is the author's hope that this article will help with the effort to build better digital archiving systems.

References

1. Norimichi Tsumura, Hideaki Haneishi, Yoichi Miyake, Estimation of spectral reflectance from multi-band images by multiple regression analysis, Japanese Journal of Optics, Vol. 27, No. 7, pp. 384, 1998 (in Japanese)
2. Markku Hauta-Kasari, Kanae Miyazawa, Sastoru Toyooka, Jussi Parkkinen, Spectral Measurements of Two-Dimensional Color Images, Proceedings of SPIE, International Conference on Optical Engineering for Sensing and Nanotechnology, ICOSN'99, SPIE Vol. 3740, pp. 204, 1999
3. Alex Pentland, On the Extraction of Shape Information from Shading, AAAI, pp. 826. 1988
4. Hideaki Haneishi, Takuya Iwanami, Tomoyuki Honma, Norimichi Tsumura, Yoichi Miyake, Goniospectral imaging of three-dimensional objects, Journal of Imaging Science and Technology, Vol. 45, No. 5, pp. 451, 2001
5. Takuzi Suzuki, Fumio Adachi, Kimiyoshi Miyata, Proc. International Conference on Information Technology and Applications (ICITA2002), IEEE, pp. 218, 2002
6. Kimiyoshi Miyata, Hiroshi Kurushima, Digital Imaging Systems for Historical Documents -Improvement of Legibility by Frequency Filters-, Proc. PICS, pp. 291, 2003

Biography

Kimiyoshi Miyata received his Ph.D. degree in imaging science from Chiba University in 2000. He joined the Department of Museum Science at the National Museum of Japanese History in 2001. He was a visiting researcher at the University of Joensuu, Department of Computer Science, Finland from April to December in 2003. His research interests concern applications of digital imaging studies to museum activities. In 2000 he was awarded the Progressing Award and Itek Award from SPSTJ and IS&T respectively.