INTERNATIONAL CONFERENCE ON MULTIMEDIA FOR HUMANITIES

Toward a Digital Museum - Experiments at the National Museum of Ethnology, Osaka, Japan

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Generally speaking, libraries, historical museums, art museums, aquaria, botanical gardens and zoos, etc. are classified according to the materials that they handle. In these places, materials are classified and arranged in physical space according to period, area, or other category. Real material exhibition is important. But museum activities are restricted because of space limitations. If, however, we construct a multimedia computer database with digitized data, viewer access is released from the limitation of classification and space. Of course guided access is still possible with the computer system. Computerized information system which is introduced to cover the limitation of space or classification is very useful to understand the background of exhibited materials. I will show various concepts for a Digital Museum or Virtual Museum composed of a computer system handling texts, pictures, digitized images of artefacts, sounds, and so on. A Digital Museum will offer visitors information interactively on demand.

In order to realize a Digital Museum, we have to establish databases first. As an example, I will show the multimedia database system so far developed at the National Museum of Ethnology, Osaka, Japan. This database integrates several systems that are connected by LAN: a text database, a photograph and slide image database and artefacts image database, audio database, and others. We have developed a Multimedia Information Retrieval System (MMIR) to provide high speed searching for several files at the same time.

We are also working towards creation of a Global Digital Museum which is realized by connecting digital museums over the world. We currently have an experimental system for connecting the British Museum and our museum with co-operation of Japan IBM and Cornell University, U.S.A.

MUSEUM: A TREASURE-HOUSE OF CIVILIZATION

Historical Museum, art museum, or library, etc. are treasure-houses of intellectual property. For our life, clothes, foods and housing are essential to live. However, adding to them, intellectual activities and human wisdom to record the history of his activities on the earth are also indispensable.

Of course the wisdom varies in societies from low level to high level depending upon the development of civilization. There are societies which hold just necessary things for living. On the other hand, there are societies which hold plenty of materials which are seemed unnecesary just to survive. Human beings have created various civilized things. They have invented more complicated tools from simple tools. For example they made cutters from stones, bowls from soil, and so on. In a society of low level civilization, bowls can be very simple without any color or design. On the other hand, in a society of more developed civilization, bowls are added varying colors or designs, so people can enjoy them and can live with more satisfaction. Civilization means the accumulation of this kind of redundancy or artificial technique, wisdom or sense in a society.

It might be said that an important civilized activity is to record and convey these inventions for the future. Museums including art museums or libraries, etc. are places which accumulate civilized materials and

record the process of advancement of civilization. Museums or archives keep objects selected by tribal intelligence. With no doubt, the earth itself is a kind of museum, "eco-museum", where the buildings, transportations or many kinds of life styles are displayed.

According to a dictionary, "archives" means "various records including old writings, old records and various historical information and materials; and places to maintain them in order to protect them from unexpected disasters." The word "information" can be interpreted as not only written text but also pictures, sound, goods, tools, buildings and so on. All kinds of media can be its objects for collection. Archive is a kind of museum.

WHAT IS A DIGITAL MUSEUM?

By present, museums have collected and exhibited concrete objects which were very important records of civilization. Objects are changing and disappearing. It is important to keep and convey them to our descendants. Yet we have to select the objects to be kept because space for storage and exhibition is limited. Unselected objects will be disappeared from people's memory. We need some system to cover this limitation and retain information about the objects in some form. This is a "digital archives" or a "digital museum". "Digital library" and "digital aquarium" are also the same concepts.

Digital archive is not yet a fixed concept, but if we consider the existing meaning of archives, it can be said "a system to digitize the objects in archives and accumulate, maintain and make efficient use of them." The objects in every field can be its objects: books, tools in daily life, arts, plants, animals, a description of the natural features of a region, cultural heritage in the world, and so on. Although actual objects have different shapes, digitized data can express any letters, any pictures or any solid bodies with a pattem of "O" and "1". Storing, searching and processing can be done by the same way regardless of the difference of media. It is necessary, of course, to convert the digitized data to original form of objects by the audio-visual systems connected with the computers.

By now, library, historical museum, art museum, aquarium, botanical garden, zoo and so forth are classified and named based on the objects which they handle. Certainly, books and totem-polls and fish swimming in the sea are totally different. However, that classification will be disappeared by digitizing the objects into computer data.

Digital archive is a concept which include all the existing libraries, an museum and museum in a broad s5nse. Nevertheless because of the original meaning of archives, we cannot remove the impression that the objects of archives are somewhat "old" things. Furthermore, in Japan, "museum" is considered to be a representative place which handle "old" articles. However, actually, museum is an institution which collect, maintain and exhibit several articles including animals, plants, minerals, and goods concerning history, arts, ethnology and industry. Therefore I would like to define "digital museum" as a concept which

maintain the function of existing archives in a wide meaning and have both old and new objects. Speaking in a more general word, it is multimedia database.

VISITING A MUSEUM

Let's think of visiting an art museum or a historical museum. We look exhibition following the order specified. If it is a historical museum, we look in the chronological order; if natural history museum, we follow time order and look the birth of earth, birth of lives, and the ecology of animals, plants and so on. If it is an ethnological museum, we follow the unit of region and look the exhibition of present life of various people. In an art museum, works are exhibited according to the chronological order or the school like naturalism or impressionism. Certainly they are kinds of orders with selected works in a limited space. However, if we want to compare an exhibited article with an another one in different place, we have to go

to the another place. If another one is exhibited in a far place, it is almost impossible.

In case of pictures, we can see a catalogue and compare it with another one, but if it is a solid body, it is very difficult to fully identify from a flat picture. We can compare figures of fish with a picture on catalogue but we can not see how they swim. Moreover, even if we would like to compare an object with another object which does not exist in the exhibition hall, for example, an object in a storage or in an another museum, we can not do that. It is also difficult to link an information with the concerning information in different field. There is this kind of dissatisfaction caused by limitation of space in the exhibition of objects.

Explanation about the exhibited objects is also unsatisfactory. In an exhibition hall, just a minimum explanation is given. With no doubt, all of the visitors do not require full explanation. Each person has each interest and needs different explanation. How can we give them satisfactory information?

IMAGE OF A DIGITAL MUSEUM

Exhibition by digitization is aimed to resolve this kind of dissatisfaction to some extent. All of the texts, sounds, pictures standing still, video, animation or image of solid body are searched and shown by computers. We can face an object and can aquire relevant information in detail and also get concerning information in different field. We can retrieve any data and display them on the same screen, and compare objects even in different places. Necessary explanation will be given interactively by each person's demand. Not only objects in the exhibition hall, but also objects in other institutions will be seen regardless how far they may be.

What's more, searching and comparing will be done outside of the exhibition hall. In Japan, we have so-called "hyper-topography" by which we can know the features of local areas using intemet. Like this, museums all over the world are linked by establishing a network of communication system. By this, we will feel as if there is a huge integrated museum; this is a virtual museum.

For realizing a virtual museum, large space is not necessary. Just one terminal would be enough. Although it is still on an experimental stage, virtual reality system gives feelings as if a person is walking in the real place and touching a real objects. If he looks right, he can see the view on the right hand. He can feel as ifhe is sightseeing a city. He can also feel as if he is walking through a library or an art museum in the world.

REAL OBJECTS AND DIGITAL DATA

We feel something is lacking, though it is interesting, when we just look at retrieved information displayed on a computer terminal. With today's computer system, the place of terminal is fixed, so it is not flexible. In a decade, computer will be changed greatly. It may not be a fixed equipment like today's one or we may have a computer as flexible as a paper. Besides, under the status quo, many people think information system with computer is rather stiff. Because although searching or processing the targeting object is fast and accurate, it does never go out of its way; it can't do anything useless.

Certainly, looking up a word in an electronic dictionary or in an electronic encyclopedia is much easier than ordinary dictionary or encyclopedia. However, it is true that we often make unexpected findings when we turn over pages of an encyclopedia looking for a word. Also we are sometimes interested in a book when we are looking at bookshelves searching for another book. This kind of unexpected experience can be got only by looking or touching real objects. Presence of real objects is important.

Digital museum should be a guide to the real museum rather than existing alone. Digitized information is not perfect in resolution to represent original objects. It can not give sufficient touch either. Of course it cannot take place of a real museum. But we can fully utilize digital museum as an index to approach real museum. Thanks to the technical advancement, the precision is unlimitedly improving, closer to the real

objects day by day. When real objects and digital information compensate each other, we can have full satisfaction and get sufficient knowledge.

FOUNDATION FOR A DIGITAL MUSEUM

In order to realize a digital museum, it is necessary to build database first. As an example, I will present multimedia database system developed at National Museum of Ethnology. Since 1979, National Museum of Ethnology has introduced computer systems and started to establish multimedia database. The basic concept was to make it enable to handle by computer all the objects which National Museum of Ethnology posesses. They are books, photographs, artefacts, video tape & films, sound tapes, etc. Using the system, we can search and see the image of objects as close as possible to the original materials on the computer terminal.

Today more than 2.1 million items have been accumulated in the computer to be searched. Ajnount of picture data which contain artefacts, slides, and so on is almost 2000 giga-byte. We have developed "Multimedia Information Retrieval"(MMIR) soflware which can search parallelly these various data files.

Fig.1 shows the configration of multimedia computer sytem at our museum, as of April, 1998. Various sorts of equipments are connected with LAN. They are database servers, intemet servers, CD-ROM maker, terminals, and input and output equipments for artefacts, photos, slides, maps, sound data and so on.

SOME TOPICS TO PROCEED A DIGITAL MUSEUM

In order to realize a digital museum, each institution has to proceed digitization of the materials which he posesses. By doing this, network museum will be more enriched. It is not necessary to stick to the standard data format. Each institution may allow to continue to develop its own system acording to dataformat which is useful for themselves. It is the computer which take care of suitable interface as if differents system in the network have the same data format.

No classfication

What becomes a problem first when we are going to build a database is data format. Especially it always becomes a problem how are we going to make classification. There are lots of classification system even in a library. However, although it depends on the field, classification does not have so much meanings when ordinally people are searching objects. Classification is mainly for convenience of a library or a museum to put and keep objects in order. For users, it will be sufficient if they can search the book or the object they want from author's name, book title, printing company, name of the object, or area, etc.

Furthermore, each museum already has each formal and each classification system, so it is impossible to standardize them in fact. Therefore let us leave their format and classification system as they are. The best way to make different data format as if they are the same is to put data in free style using natural language. After that, they make searching by using high speed full-text searching system. By doing this, all the data in every insitution will be commonly searched regardless of the difference of format or classification.

Thesaurus and machine translation

For a system which handle natural language, the introduction of thesaurus is very significant. As the input of chinese character has been succeeded using Japan-China dictionary, it is indispensable to develop thesaurus in order to make efficient search from full-text using natural language.

When language is different, machine translation at a word level is necessary. You may think it a hardwork

making thesaurus or translation dictionary, but it has much more possibility for realization than sticking to making a standard formal or classification.

Multimedia searching

At present, in order to search picture or sound data, we must use descriptive information which are put on the objects. Real multimedia system should be searched their information directly like a human being who get pictures, sound, smell through eyes, ears, and nose. But this is extremely difficult. If we can search a picture by showing a sample picture to the computer, or if we can search an object by drawing a rough sketch of a picture, it will be very useful. Same to the sound. It will be fine if we can search a music by playing a similar melody. This is the future problem in information processing research.

Common data center

In order to realize network museum, each institution has to promote digitization of his own materials. A large amount of budget will be necessary to introduce the system and maintain database. I wonder it will be difficult to realize by single institution. Sometimes there need joint cooperation with a few institutions both in making multimedia database.

What is more, how we maintain and succeed the increasing data will be a big problem in the future. With appearance of new equipment, information storage media will change. High density memory media will be created. In order to keep up with this change, frequent data copy will be necessary.

An organization like a data center for data input and data maintenance will be needed to guarantee the copy to new media from old media.

This is the core of digital archive. It should be realized as an organization which allow joint use. Not all the archives are necessarily to be established as a national one, but as a key center, government should give budget to some extent. Adding to that, private companies, for example, publisher or companies who make information equipment should join to support such information center. They should finance, for example, to establish a service center.

Global digital museum

Now we have an experimental project for a global Digital Museum with Japan IBM, British Museum, Cornell University in U.S.A. The images of artefacts which British Museum and National Museum of Ethnology have are searched by way of intemet system without knowing from the user's point where the object exists. A global Digital Museum will come true if a large number of museums join this network.